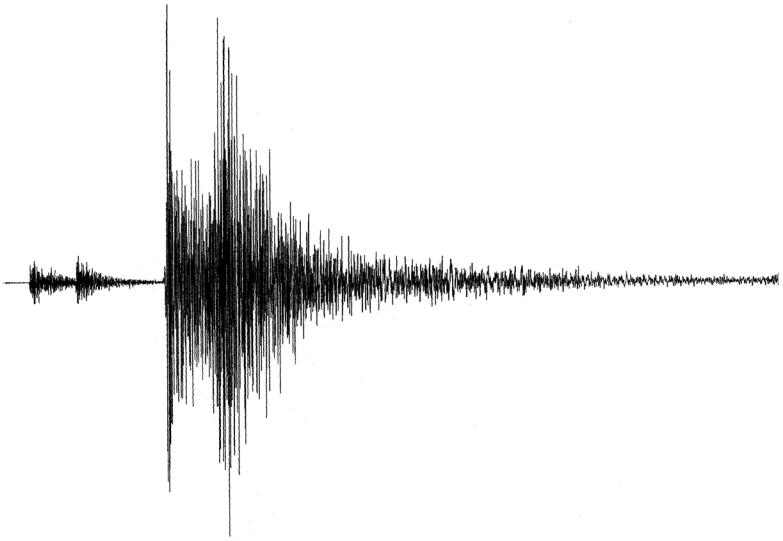
Arab Republic of Egypt
Ministry of Higher Education And Scientific Research
National Research Institute of Astronomy and Geophysics
(NRIAG)
EGYPTIAN NATIONAL SEISMIC NETWORK
(ENSN)

Egyptian Earthquake Bulletin (2020)



January
2021

In Memory of Prof. Ahmed A. Badawy (1966-2021)

"With Our Love and Deepest Sympathy as we remember Professor Ahmed Badawy, who passed away on Jan 4th, 2021". Professor Badawy has graduated from the faculty of Science, Mansoura University, Egypt, in 1987, while he got his master's degree from the same university in 1990. Then he got his Ph.D. From Etvos Lorand University, Hungary, in 1996.

Professor Badawy joined the National Research Institute of Astronomy and Geophysics in 1988. During his career, he promoted scientific cycling until his appointment as professor of seismology in 2008. He held several positions, among them the director of the Egyptian National Data Center (NDC) of the CTBTO, Head of Egyptian National Seismic Network, and Head of seismology Department. He also detained advisory positions in several national and international agencies, most notably the Crisis and Risk Consultant at the Information and Decision Support Center in the Egyptian Cabinet and an expert in the on-site inspection of the Comprehensive Nuclear Test Ban Treaty Organization in Vienna. Dr. Badawy has more than 40 Papers published in international journals and he supervised a large number of master's and PhD students. He, may God have mercy on him, won several awards, the most important of which is the State Incentive Award in the field of geology.

MAY GOD HAVE MERCY ON PROFESSOR DR. AHMED BADAWY, A WIDE MERCY, AND ENTERED HIM IN HIS SPACIOUS PARADISE.

PREFACE

Instrumental recording of earthquakes started in Egypt as early as 1899. Analog equipment was eventually modernized from the Milnshaw to Galitzen to Sprengnether seismographs. In 1962, a seismic station was installed at Helwan as a station on the Worldwide Standardized Seismograph Network (WWSSN). This station is still in operation till now. By the beginning of 1972, four analog stations were installed at Helwan, Aswan, Abu Simbel, and Matrouh, one of them is a Japanese short period, and the rest are intermediate Russian Seismographs consequences.

After the occurrence of the October 12, 1992 earthquake in Dahshour area, 35 km to the southwest of Cairo, the Egyptian Government financed the National Research Institute of Astronomy and Geophysics (NRIAG) to construct and deploy the Egyptian National Seismic Network (ENSN), which covers the whole Egypt. NRIAG upgraded the data communication system from telephone lines to satellite to increase the efficiency of the ENSN.

By mid-2003, the installation of the whole seismic field stations has been completed covering the entire country of Egypt, and five sub-centers have been constructed and equipped. Besides, an earthquake Disaster Reduction Datacenter (EDRDC) was established and supported by GIS technology.

The Egyptian earthquake bulletin is one of the essential products of the ENSN reports, including the recorded earthquakes in Egypt and the adjacent area during 2020.

Prof. Dr. Gad El-Qady

President of NRIAG

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Tectonic Setting of Egypt

Earthquakes are the most typical phenomenon of natural hazards. They have effects on nature, human life, and man-made structures. Assessment of earthquake occurrence sequences for any area plays an important role in proposing measures to minimize earthquake damage.

An earthquake is a geodynamic phenomenon. The present seismic activity and the other geodynamic phenomena related to it (e.g. deformation and ruptures of the crust, volcanoes, geothermal manifestation, topographic features, etc.) are results of a relatively recent geologic process, which is usually, called active tectonics.
The intensity and the form of active tectonics are not the same in all regions of the earth. There are regions where the active tectonics are high today and other regions where this activity is presently weak but was higher in the geologic past. The present active tectonics are the results of active tectonics that take place in certain zones on the earth's surface. These zones define the boundaries of the major lithospheric plates. These systems are the continental fracture and the mid-oceanic ridge systems.
The general tectonic framework of Egypt can be described in simple terms as comprising three units that have controlled the sedimentological history and the structural make-up of the country; these are the Arabian-Nubian massif, the stable shelf and the unstable shelf. The stable shelf covers a large part of Egypt surrounding the Arabo-Nubian massif. It reflects relative tectonic stability towards the south. Much of northern Egypt belongs to the unstable shelf that suffered intense rock deformations. Egypt is located close to one of the continental fracture system (Hellenic arc) at the convergence boundary of two big lithospheric plates (Eurasia and Africa).
Four fault systems oriented at: 55°, 70°, 80° and 150° represent major transcontinental and regional fracture zones. These originated during different Proterozoic episodes of crustal deformation. Phanerozoic intraplate deformation and related processes of erosion and sedimentation were generally controlled by structural trends which were frequently reactivated along existing fault systems. During the Paleozoic, the 150° fault trend dominated the paleogeographic situation. Magmatic and tectonic activity in Egypt at the end of the Paleozoic continued into the Triassic. Over a kilometer of Nubia Sandstone strata were deposited in

southern Egypt from Jurassic to Late Cretaceous or Early Cenozoic. Tectonic and magmatic activity increased again towards the end of the Cretaceous Period as shown in (Fig.1).

The Cretaceous tectonics were so severe that in many parts of Egypt they account for the present day geomorphology. ENE to E-W master wrench faults control the Cretaceous-related structures all over the country. In the central and southern parts of Egypt the sedimentary units of the Jurassic-Nubian interval are capped by younger formations. The base of the Nubia Sandstone forms swell-like uplifts separated by troughs. Restricted tectonic basins are now characterized by a thick accumulation of Mesozoic-Cenozoic sediments. Old fractures inherited from the basement were used after vertical propagation as shear zones along which the whole sedimentary cover would deform. Geological observations made in southern Egypt support the tectonic origin of the Nile Valley. Also, Egypt is affected by the opening of the Red Sea (Mid Oceanic System) and its two branches (the Gulf of Suez and the Gulf of Aqaba-Dead Sea transform system). Thus, the seismicity is due to the interaction between the three plates of Eurasia, Africa, and Arabian plates. Thus, it could be concluded that although the damaging earthquakes occurred infrequently, their risky consequences could not be ignored.

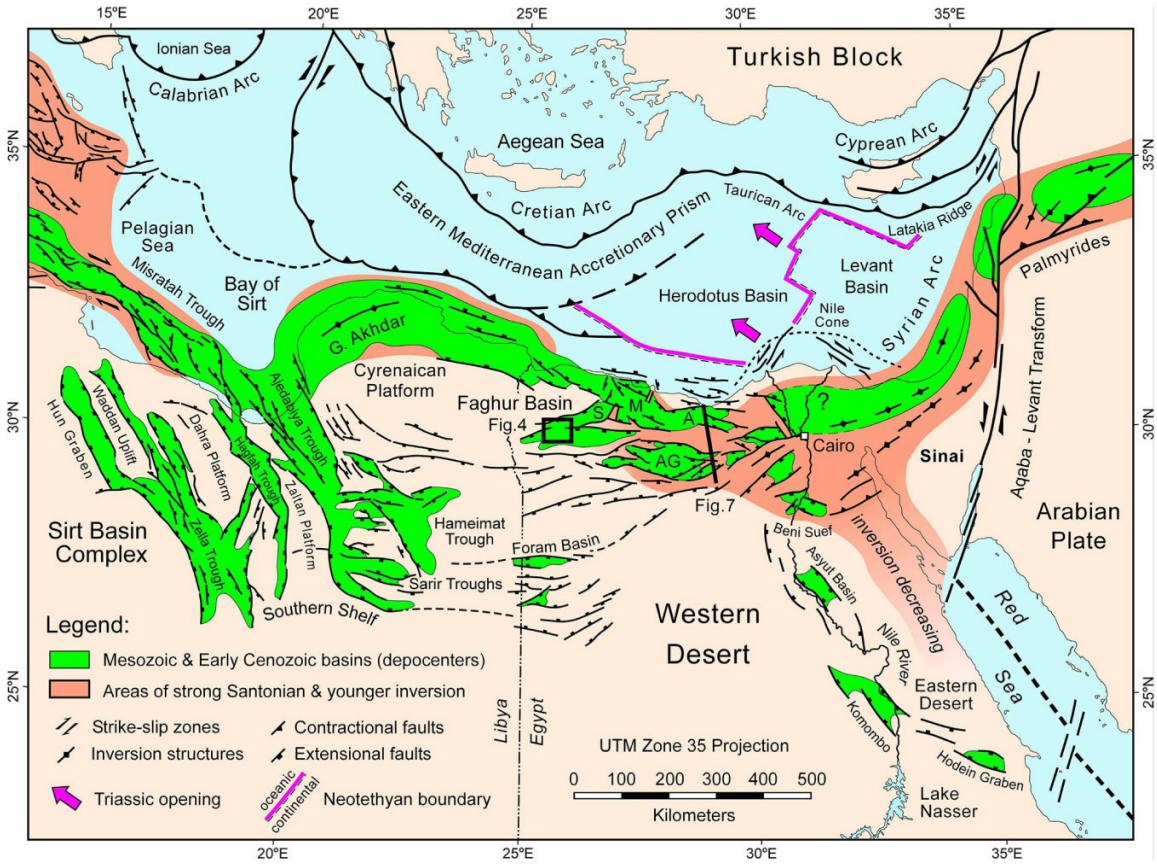


Figure 1. *Tectonic Setting of Egypt*

Egyptian National Seismic Network:

On 12th October, 1992, an earthquake with a magnitude (5.9 Mb) occurred in Egypt. This earthquake caused 561 deaths, 9832 injuries and left damage of more than 35 million US$. As a result of this damage, the Egyptian Government supports the National Research Institute of Astronomy and Geophysics (NRIAG) to install the Egyptian National Seismic Network ENSN comprising from both velocity meters and accelerometer instruments (strong-motion).

The Egyptian National Seismic Network (ENSN) consists of the weak motion network and the strong motion network, the main center at Helwan and five sub-centers at Hurghada, Burg El-Arab, MersaAlam, Aswan, and Kharga. The main center receives the seismic data from the near distance stations through telemetry communication and from the remote stations and the sub-centers via satellite communications. The received data are analyzed for determining the earthquake parameters.

The distribution of the seismic stations (Fig. 2) and the strong motion network units (Fig. 3) are chosen to cover the known seismic sources as can as possible. Also, this distribution covers some regions with known historical earthquakes without any evidence of instrumental activity (e.g. Siwa seismic station) Tables 1 and 2 contain the station›s full name and code together with the geographic locations of ENSN velocity stations and strong motion units respectively. During our location analysis, online available waveforms of some international stations (Fig.4) were used to extract any available phases for the earthquake of interest for enhancing our detectability and earthquake location accuracy.

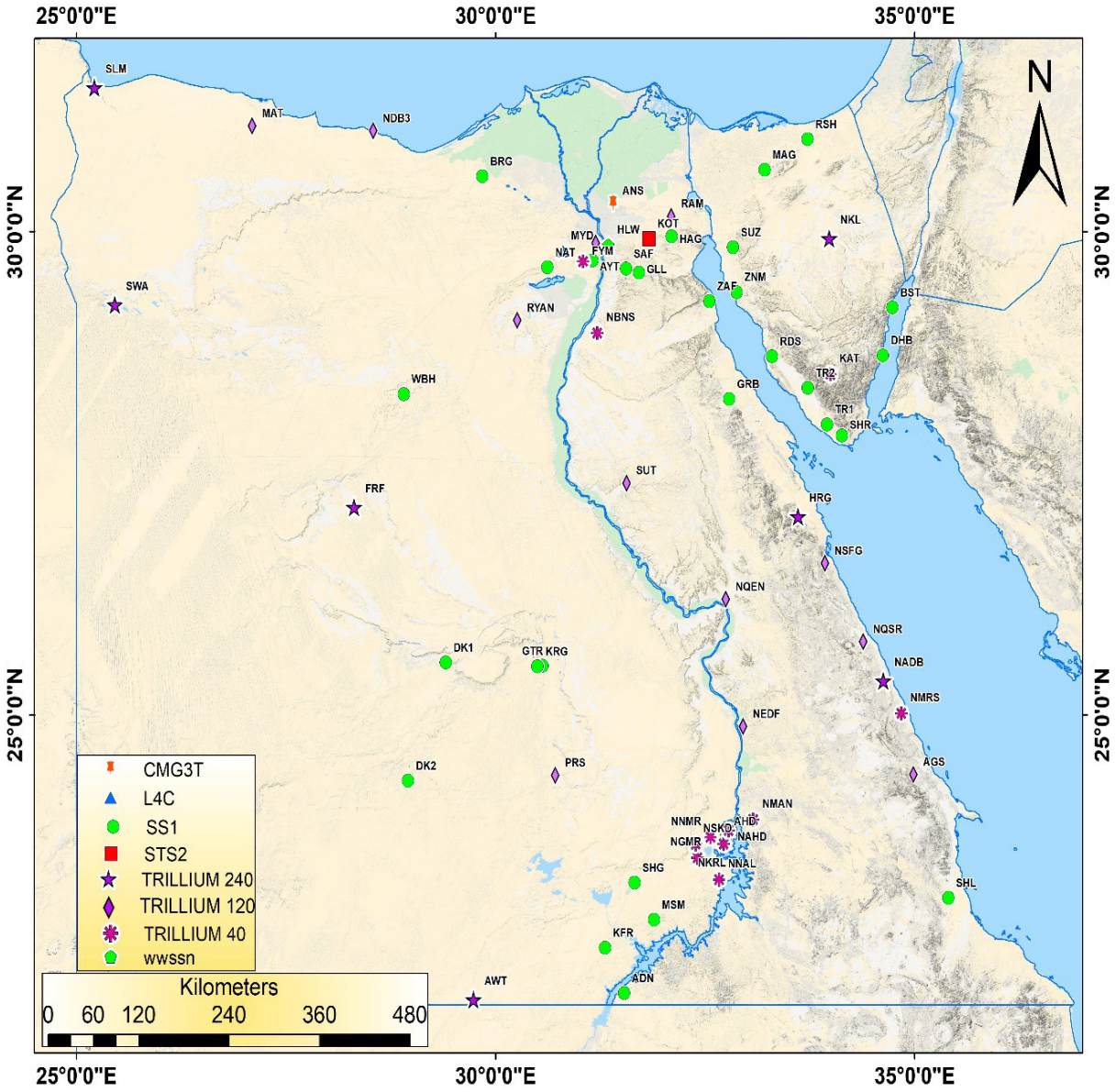


Figure 2. *Distribution of weak motion stations, Egyptian National Seismological Network (ENSN) stations .*

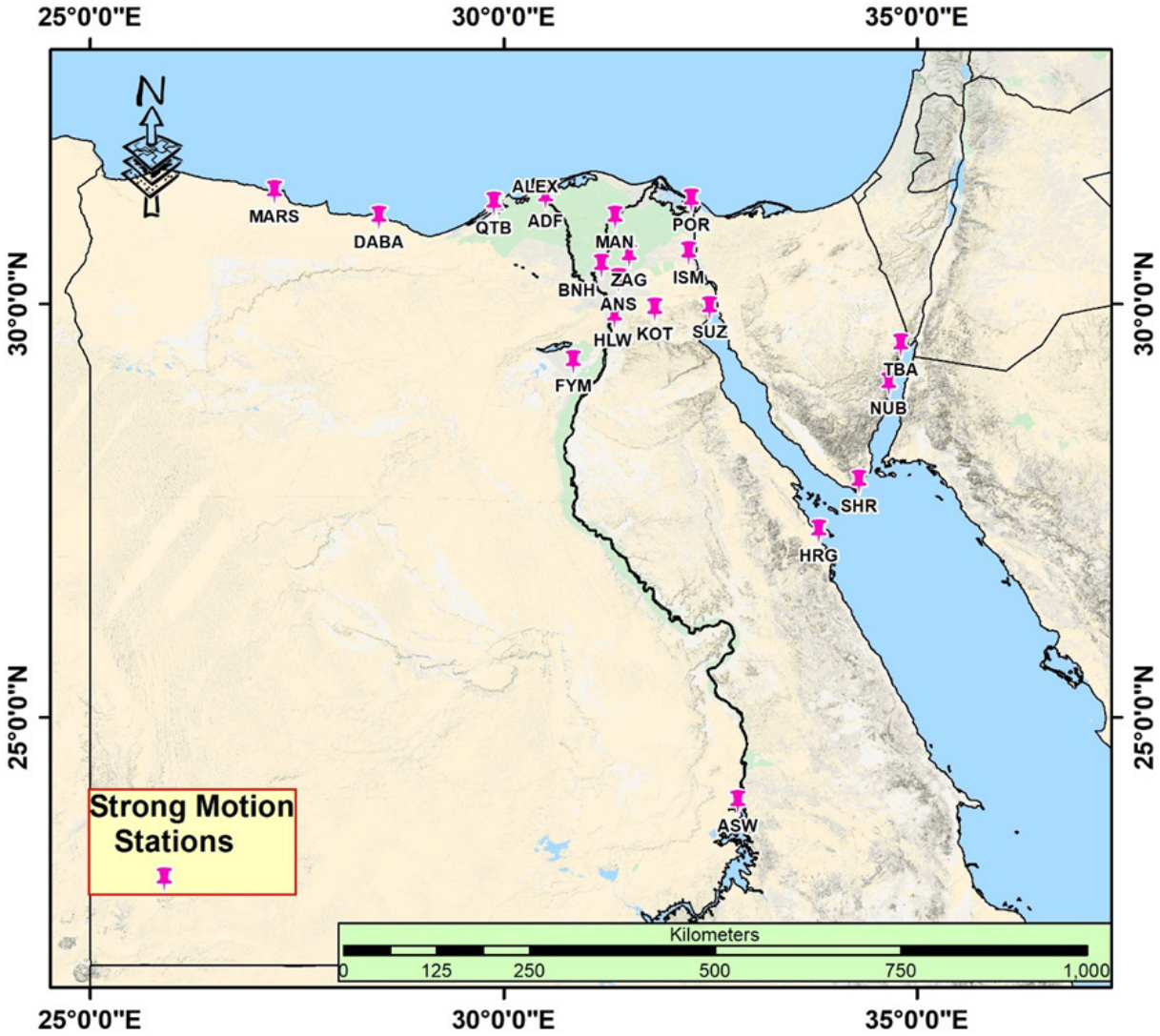


Figure 3. *Distribution of strong motion instruments in Egypt.*

Table 1. *Stations code and location of ENSN velocity-meter Stations.*

Station full name	Station code	Lat. N	Long. E
Abu-Dabbab	ADB	25.351	34.6238
Adendan	ADN	22.1224	31.5307
Abu-Gasoun	AGS	24.3794	34.9866
Ayyat	AYT	29.7044	31.1529
Burg El-Arab	BRG	30.5743	29.8393
Barnees	BRNS	23.8559	34.1143
Basata	BST	29.2166	34.7327
Dabaa	DB2	31.047	28.5039
Dahab	DHB	28.7221	34.6188
Dakhla1	DK1	25.5432	29.4028
Dakhla2	DK2	24.3195	28.9546
Edfou	EDF	25.0945	33.1818
Frafra	FRF	27.1484	28.3105
Fayyoum	FYM	29.6923	31.043
Galala	GLL	29.5772	31.7081
Gareib	GRB	28.2705	32.7859
Gabel Elteer	GTR	25.5096	30.5595
Hagoul	HAG	29.953	32.099
Helwan	HLW	29.8585	31.3432
Hurghada	HRG	27.0517	33.6081
Katren	KAT	28.5229	33.9928
Khafra	KFR	22.5891	31.3047
Kottamia	KOT	29.9276	31.8292
Kharga	KRG	25.5032	30.4985
Kasr	KSR	23.6105	33.0872
Mabd	MABD	22.9726	32.3258
Maghara	MAG	30.643	33.2082
Matrouh	MAT	31.094	27.0964
Matrouh Center	MATC	31.3457	27.2305
MersaAlam	NMRS	25.063	34.868
Masmus	MSM	22.8814	31.889
Mayadein	MYD	29.7958	30.8009
New Abu Dabbab	NADB	25.3405	34.5021
New Abu Hadid	NAHD	23.8022	32.778
Natroun	NAT	29.6329	30.6172
New BaniSuef	NBNS	28.6226	31.2945
New Gabel Aliza	NGAL	23.4192	32.7324
New Gabel Marawa	NGMR	23.52169	32.40756

Station full name	Station code	Lat. N	Long. E
New Gabel Dorwa	NGRW	23.6684	32.7912
Nekhel	NKL	29.9293	33.9804
New Khour El Ramla	NKRL	23.6634	32.7211
New Kurkur	NKUR	24.0042	32.6514
New Manam	NMAN	23.9169	33.0749
New New Aliza	NNAL	23.2931	32.6647
New northern Marawa	NNMR	23.7376	32.5618
New Sen El Kddab	NSKD	23.661	32.386
Nueiba	NUB	28.9893	34.6396
New west Aliza	NWAL	23.38301	32.57781
New west kalabsha	NWKL	23.41309	32.44888
Paris	PRS	24.3718	30.7126
Quseer	NQSR	26.11	34.264
New Qena	NQEN	29.862	32.738
New Edfu	NEDF	24.888	32.947
Roudaes	RDS	28.712	33.2975
Areish	RSH	30.9601	33.7219
Rayyan	RYAN	29.08251	30.27754
Saf	SAF	29.6187	31.5538
Safaga	NSFG	26.723	33.938
Sharm	SH2	27.8817	34.0833
Shagher	SHG	23.2655	31.6576
Shalateen	SHL	23.1067	35.3999
Salloum	SLM	31.4916	25.2123
Saqqara	NSQR	29.8813	31.1959
Assuit	SUT	27.3967	31.5626
Suez	SUZ	29.8406	32.8322
Siwa	SWA	29.2432	25.4556
Tal El Amarna	TAMR	27.6821	30.9175
Tour1	TR1	28.0068	33.9521
Tour2	TR2	28.3853	33.7227
WahatBaharya	WBH	28.3208	28.9038
Zaafarana	ZAF	29.2819	32.5487
Zeneima	ZNM	29.3761	32.8752

Table 2. *Strong motion stations location.*

Sensor	stn	Lat	Long
Kinametrics	HLW	29.85	31.34
Titan	KOT	29.93	31.83
Titan	ISM	30.61	32.24
Titan	TBA	29.5	34.8
Titan	ALEX	31.18	29.9
Reftek	ADF	31.29	30.51
Titan	NUB	29.03	34.66
Titan	BNH	30.46	31.18
Titan	MAN	31.04	31.35
Titan	ZAG	30.58	31.52
Titan	SHR	27.85	34.3
Kinametrics	QTB	31.21	29.88
Reftek	ASW	23.98	32.83
Reftek	SUZ	29.95	32.49
Reftek	ANS	30.29	31.39
Titan	POR	31.25	32.27
Reftek	FYM	29.3	30.84
Guralp	DABA	31.04	28.49
Guralp	HRG	27.25	33.81
Guralp	MARS	31.35	27.23

Figure 4. *Location of Seismic stations that have been used when it is available for the Mediterranean sea earthquakes.*

Data processing of ENSN:

A friendly user interface program with powerful tools for routine work is used to extract the digital data of remote stations online from the ring buffer. This software named "Atlas- ver. 3.8.1" is provided by Nanometrics Inc. (Canada) and can load, view, manipulate, locate, and save digital data from many sources like Earthworm databases, SEED files, and Nanometrics data servers. With Atlas software, we can view and pick events using the intuitive interface, sort traces by first phase time or by channel name, view multiple events simultaneously from several data sources and we can edit events and solutions. Atlas enables editing events; create phase, duration, and amplitude picks which are important for magnitude estimations. With Atlas, we can use simple and robust methods to create digital filters and apply them individually or as a group to trace data. Atlas works with fully interactive maps that combine a geographical display of stations and epicenters. Spectral analysis has also done using Atlas for any trace and easily creates HTML bulletins to view and distribute summaries of events.

Atlas uses Hypo-inverse, a location program written and used by the United States Geological Survey (USGS), to locate earthquakes and calculate magnitudes. This is done by creating an input file listing phases and any magnitude information. For the location: after creating the input file that lists phases, Hypo-inverse operates with a set of files that give instructions for which stations to use in calculations as well as any weights, delays, or corrections to apply, and an important input which is the crustal model that is suitable for the area of interest. In our case, ENSN, different crustal models are used which covers many parts of the Egyptian territory, for example, a model to the northern part and the Mediterranean is applied to events confined to that part, while another one in the northeastern part of Eastern Desert is used, the third one in the central and southern part of Eastern Desert. In southern Egypt, Aswan area, a local crustal model of Aswan is applied. For Dahshour seismogenic zone a local model deduced for a tomographic study is used. A specific model for the northern part of the Red Sea is used as well as another one for the Abo-Dabbab region is applied. Egypt is therefore including different crustal units and types act for a very complex lithospheric structure. The simplest case Hypoinverse handles is one crustal model and one set of station delays used for all epicenters and all stations. Hypoinverse also allows considerable complexity by using multiple velocity models. In any model, velocity varies only with depth. Multiple crustal velocity models give more

reliable earthquake locations which have been combined with different velocity models to reach a more accurate phase picking and precise location for earthquake solution. Due to this ENSN uses a multiple crustal velocity models option of the Hypoinverse -2000 program (Fig.5).

For magnitude calculations: duration and amplitude magnitudes are two types of magnitudes that can be determined using Atlas. The primary traditional duration or coda magnitude (F-P), MD is considered by Atlas (Lee et al., 1972) taking into consideration the phase weight and Eaton's distance correction (BSSA, 1992). The complete form of the duration magnitude expression is:

$$MD(f\text{-}P) = FMA + FMB*\log(f\text{-}P) + FMF*(f\text{-}P) + FMD*D + FMZ*Z + STACOR + FMGN*G$$

The FM coefficients are set by the DUR and DUB commands.

f-P is the end of the coda (F) minus P-time, or duration.

D is the epicentral distance.

Z is the (positive) depth.

STACOR is the duration magnitude correction for the station.

G is the gain correction.

S is the slant distance $S^2 = D^2 + Z^2$.

The form of duration magnitude proposed by Lee et. al. (1972):

$$MD(f\text{-}P) = -0.87 + 2.0*\log(f\text{-}P) + 0.0035*D + STACOR$$

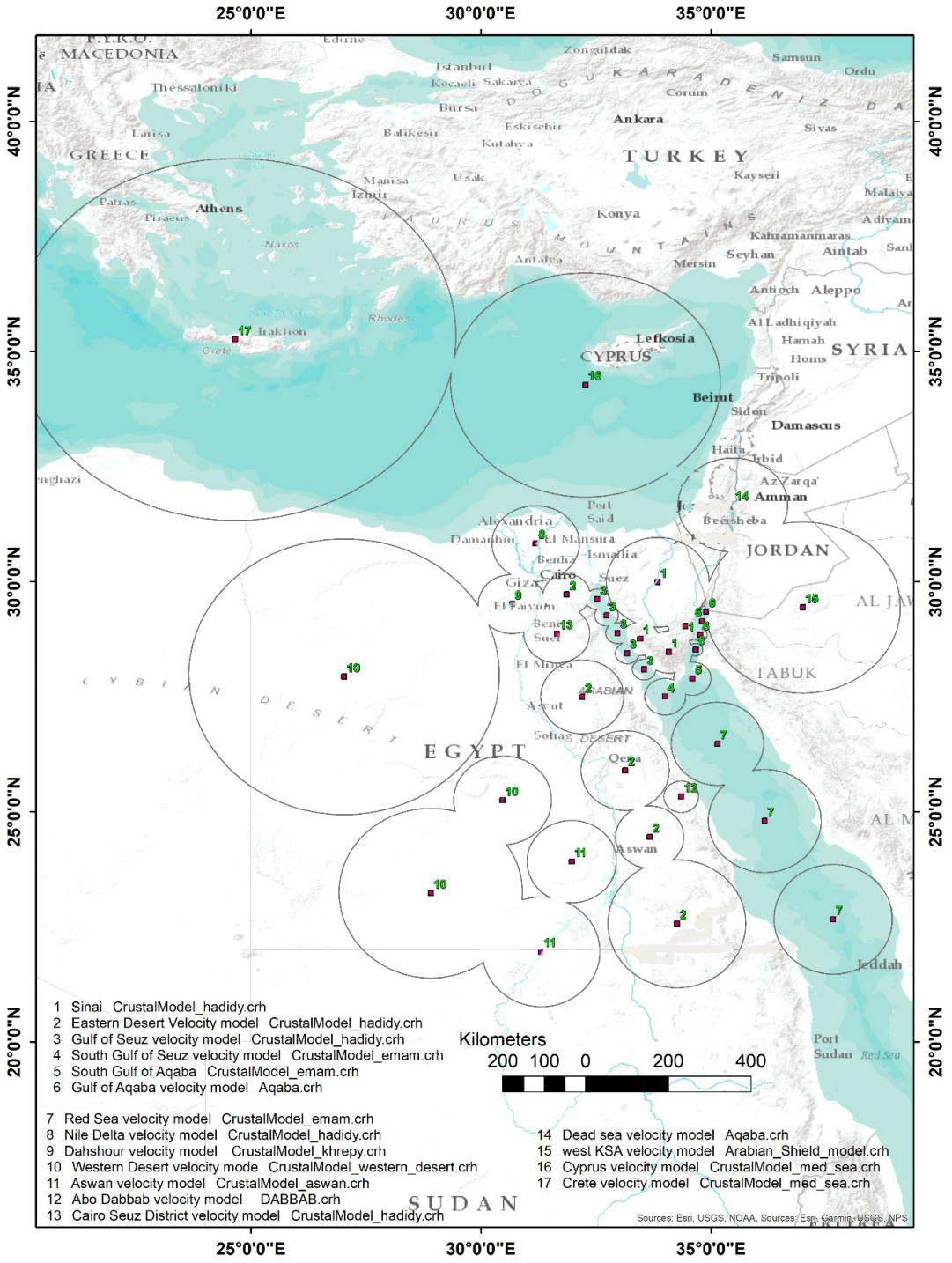


Figure 5. *Multiple velocity models used by ENSN for earthquake location.*

The second type of magnitude determined by Atlas is the amplitude (Local) magnitude. The method for calculating the local magnitude is modeled after the reading of maximum peak-to-peak amplitudes from the standard Wood-Anderson torsion seismograph. If the amplitude is read from an electromagnetic seismometer with velocity output, it is correct to an equivalent Wood-Anderson response using Jerry Eaton's XMAG formulation (1970, 1992), the seismometer motor constant, and the response curve of the seismometer and recording system. Digital amplitudes are handled also by using the appreciate system gain. Richter's original formula is:

$$M_L = \log (A_{WA}/2) - \log (A_o)$$

Where AWA is the maximum peak-to-peak amplitude in mm on the paper record, and log (A_o) is an attenuation term and is a tabulated function of distance. The division by 2 is because of the peak-to-peak reading.

The "X" magnitude formula developed by Jerry Eaton (1992), for velocity seismometers, is used in hypointense. Before the magnitude is calculated, the amplitude is converted to effective Wood-Anderson amplitude using the period at which the amplitude is measured and the response curve for the seismograph type. The MX relation is:

$$MX = \log (A_D / 2 \times CAL \times R(f) \times S)) + F_1(s) + F_2(d) + XCOR_{COMP} + X_{CORSTA}$$

Where A_D is the peak-to-peak amplitude, CAL is the dimensionless calibration factor depending on the system gain, R(f) is the frequency-dependent response curve of the USGS system relative to the Wood-Anderson seismometer, S is the seismometer motor constant in volt/cm/sec, $F_1(s)$ and $F_2(d)$ are the logs (A_o) distance correction, $XCOR_{COMP}$ is the correction made globally to all components with a given component code and finally, $XCOR_{STA}$ is the individual station correction.

Bulletin Hydra:

Hydra is a software are now implemented as one of the analysis programs in our ENSN system. Hydra system performs real-time processing, analysis, and catalog production of seismic event data for the U.S. Geological Survey (USGS) National Earthquake Information Center (NEIC). Hydra was designed with a flexible, modular, and scalable architecture to support (1) seismic event detection, (2) integration of near-real-time and delayed earthquake data from regional and global sources, (3) a robust suite of automatic processing algorithms, (4) a modern tool suite for algorithmic analysis of seismic events, and (5) catalog production. The capabilities of the Hydra software system fall into four major categories: detection, integration, processing, and analysis. Hydra detects earthquake events using seismic waveform data from thousands of seismometer stations around the world, including stations in the Global Seismographic Network. The seismic waveform data are processed using an automatic, real-time phase arrival-time waveform picking algorithm and a nucleation/association back-projection algorithm. These algorithms are used together to pick and associate seismic phases at local, regional, and global distances and automatically create detections as rapidly as possible. Hydra integrates earthquake parametric data from multiple sources, including locally detected and externally contributed events. The system performs this integration as part of a near-real-time exchange of earthquake response data and late-arriving, finalized earthquake catalogs from contributing data sources. Hydra has a robust suite of earthquake-processing algorithms that can relocate earthquakes and perform depth, magnitude, and moment tensor calculations (see, Fig. 6 for Hydra System Redundancy design)

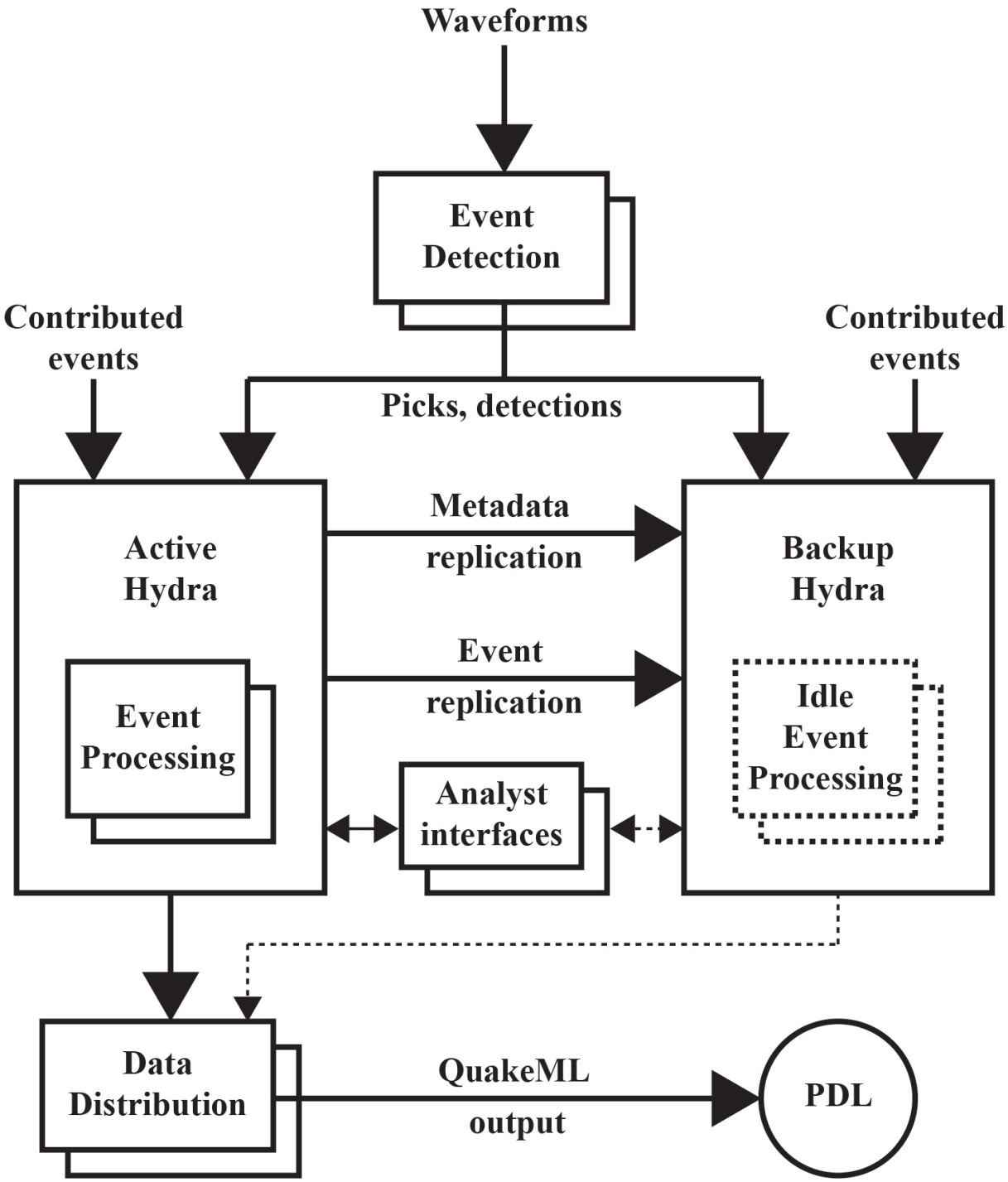


Figure 6. *Diagram showing the Hydra System Redundancy design, including redundant event detection, duplicate inputs to active and backup Hydras, replication, analyst interfaces, redundant data distribution, and QuakeML output to the Product Distribution Layer (PDL)*

ENSN Stations Performance (2020)

Egyptian National Seismic Network (ENSN) consists of six sub-networks. These sub-networks are Cairo, Sinai, Aswan, Red Sea, N-coast, and N-valley which has 8, 9, 15, 8, 4, and 6 stations respectively. The total numbers of in-operation stations are fifty. However, twenty-two stations are out of operation (stolen).

According to Table 3, month-2020 achieved maximum percentage quality (100%) for all sub-networks except Aswan (93%). The minimum percentage in Cairo sub-network was in August and November 2020. While in March 2020 the minimum was for Sinai and in November 2020 in Red Sea sub-networks. For the Aswan sub-network, the minimum was in March 2020.

The N-coast sub-network reached a minimum in January 2020. The N-valley sub-network has achieved a minimum in May 2020. According to Table 4, in 2020, most of operational sub-networks with 100 % on average, while Aswan sub-network was in with 97 % in average. Table 6 and Fig. 7 are created to illustrate the maximum and the minimum percentage for each month in 2020.

Table 3. *The maximum and minimum percentage quality for each sub-network in 2020*

	Cairo	Sinai	Aswan	RedSea	N-Coast	N-Valley
MAX. Percentage	100%	100%	97%	100%	100%	100%
Month-2020	1 & 2	1&5:12	7	1& 2&4&7	4&7&10&11	4&7
Min. Percentage	81%	89%	87%	75%	78%	73%
Month-2020	8&11	3	3	11	1	5

Table 4. *The average percentage quality for each sub-network in 2020.*

	Cairo	Sinai	Aswan	Red Sea	N-Coast	N-Valley
Average Percent in 2020	91%	99%	93%	100%	96%	94%
Best subnetwork in 2020				*		
Worst subnetwork in 2020	*					

Table 5. *The maximum and minimum percentage quality for each Month in 2020*

month-2016	Maximum percentage(%)	sub-network name	Minimum percentage(%)	sub-network name
January	100	red sea & Sinai & cairo	78	N-coast
February	100	red sea & cairo & N-coast	95	aswan
March	96	Cairo	87	aswan
April	100	N-coast & Cairo& nvalley	94	aswan
May	100	Sinai	73	nvalley
June	100	Sinai	90	cairo
July	100	n-coast & redsea & sinai	88	cairo
August	100	Sinai	81	cairo
September	100	Sinai	87	redsea
October	100	Sinai&Ncoast	83	cairo
November	100	Sinai	75	redsea
December	99	Sinai	81	redsea

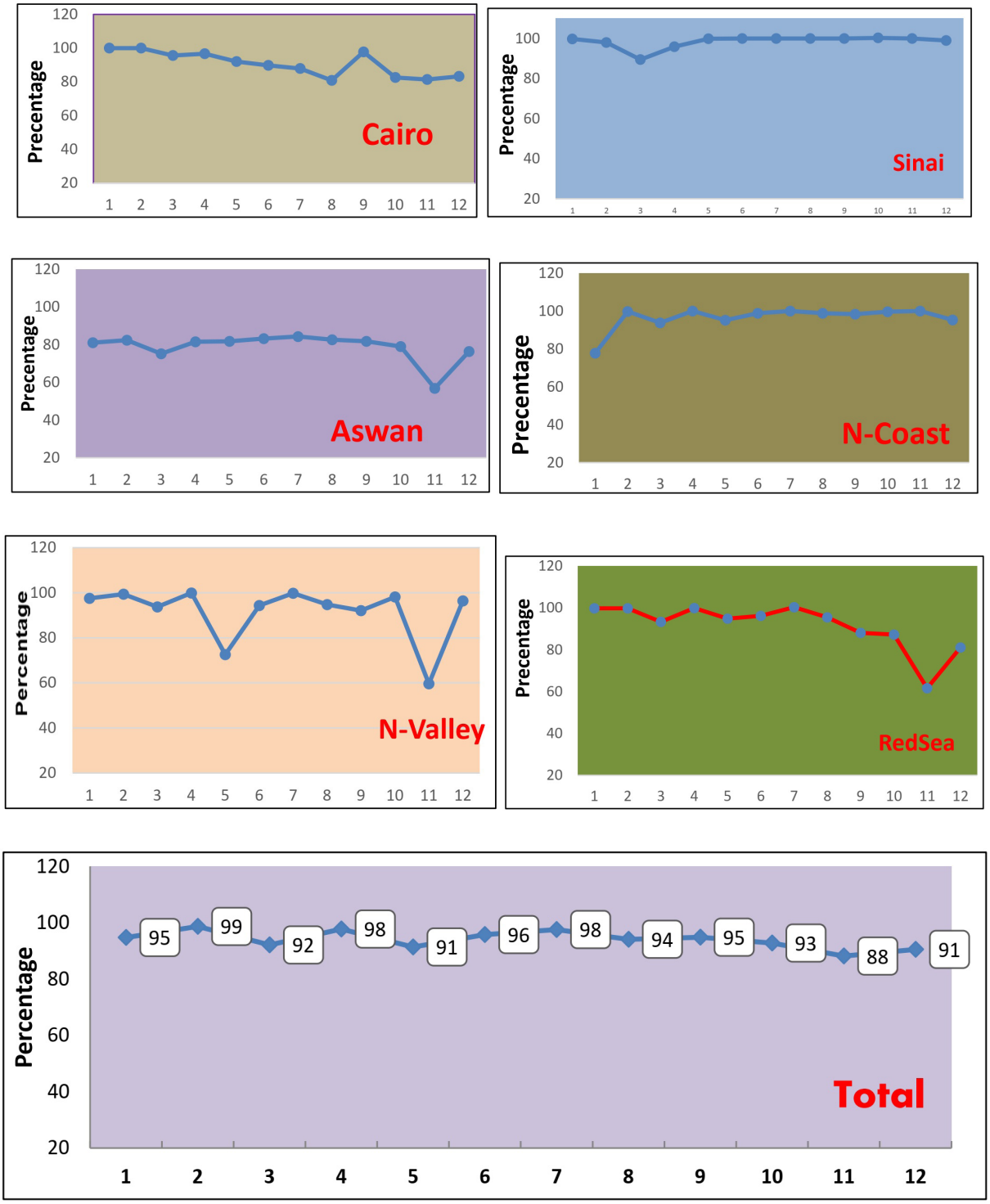


Figure 7. *The Percentage quality for ENSN and Each sub-network in ENSN during each Month in 2020*

Data processing and Station State of Health information of strong-motion network:

A strong-motion network has started working since 2008 compressing 5 stations only that cover the Nile Delta region. From 2008 until now, the total number of accelerographs was increased to 17 stations distributed in and around Nile Delta as shown in Fig. 3. The main goal is to monitor and record the acceleration produced from the active surrounding seismic zones, especially the Mediterranean Sea, as the Nile Delta is characterized by the thick sedimentary cover which has a bad impact in installing seismographs.

Table (6) contains station's information, health of strong-motion stations from 1/1/2020 to 31/12/2020, see also Fig. 8. The strong motion network mainly involves three types of sensors IDS-3602A, TERRA Technology CORP, 130-SMA, Refraction Technology (REFTEK Company), and TITAN SMA, Nanometrics technology (Nanometrics company). Stations send data to the main center at NRIAG over TCP/IP connection using 3G-router. A Master computer at the main center receives data from both Reftek and Nanometrics stations using RTPD and Apollo Server acquisition programs. Compass is special strong motion data analysis software used by ENSN users. A copy of data is manually stored in the mass storage for backup. Figs.9 and 10 show the distribution of the seismic events already recorded by the Egyptian strong motion network during 2020 for local and regional event respectively.

Table 6. *Health of strong-motion stations 2020*

Stn. Name	KADF	GHRG	KHLW	GMAT	RANS	RASW	KQTB	RSUZ	TALX	TBNH
Stn. Health	65%	99%	98%	99%	90%	90%	85%	90%	88%	98%
Stn. Name	TISM	TKOT	TMAN	TNUB	TPOR	GSHR	GTBA	TZAG	RFYM	TDAB
Stn. Health	93%	98%	97%	98%	85%	95%	0%	95%	99%	99%

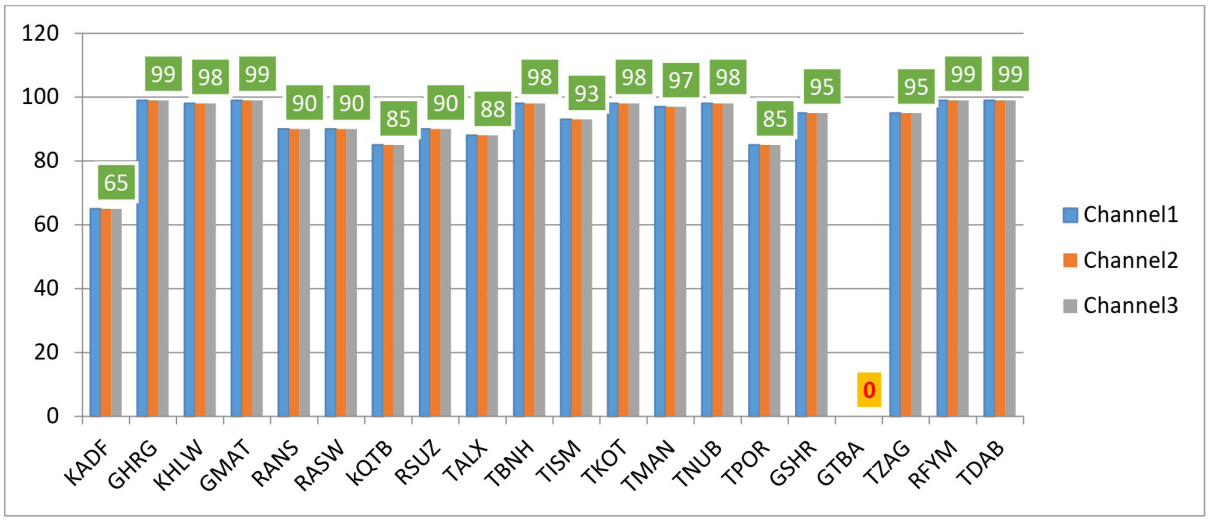


Figure 8. *Strong motion ata efficiency (2020).*

Figure 9. *Local seismic activity as recorded by a strong motion network through 2020.*

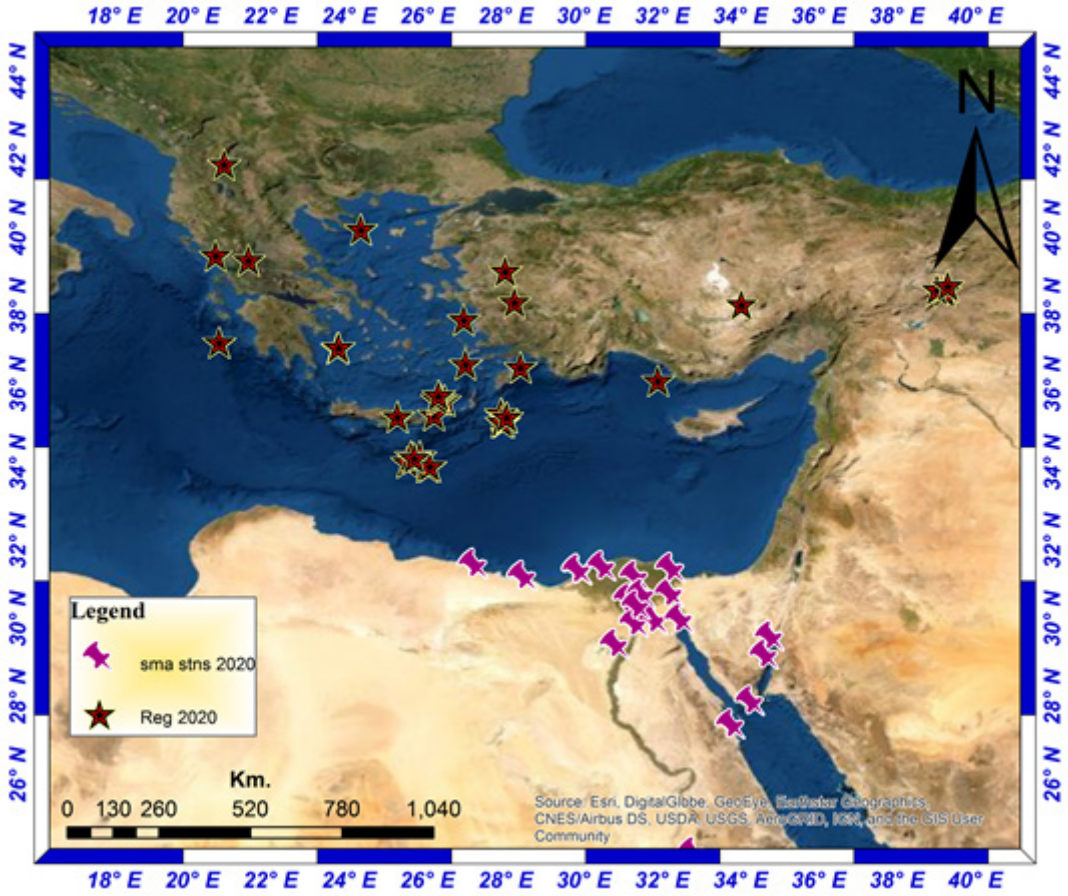


Figure 10. *Regional seismic activity as recorded by strong motion network through 2020.*

Summary of 2020 Seismicity

All recorded seismic activity within the year **2020** in and around Egypt (Fig. 11) reflects the incredible increase in the number of smaller earthquakes. This large number of events could be attributed to the seismic station's delectability of ENSN.

These local seismic activities (Fig. 12) are fit along the previously defined seismic zones during previous years. Figs. (13) and (14) show zoom in for some selected seismic zone in Egypt superimposed on surface faults.

The **regional seismic activities** (Fig. 15) show a cluster of the seismic activity to the southern part of Hellenic and Cyprian arcs. The seismic activity extends north to the southern part of Greece and Turkey. Few events are located along with Southern Jordan, Northern Sudan, Central Red Sea, and along with the Dead Sea Transform Fault System.

Fault plane solution using first motion polarities:

P-wave first motion is the simplest method/tool to determine the fault plane solution. It was used before digital recording. Body waves recorded by an array of stations are used in this method. In the ideal case, not less than 10 stations are used. This method depends on the azimuth and distance from the hypocenter. The polarity of the first P-wave arrival varies between seismic stations in different directions from an earthquake. When the earthquake occurs on the surface of the flat earth divided into 4 quadrants two compressional and two dilatations. If the fault moves towards the station, the First motion is called compression (C) and polarity is up in this station and if it moves away from the station, it is called dilatation (D) and polarity is down in this station. Between these four quadrants, there are two perpendicular nodal planes one is the fault plane and the other is the auxiliary plane first motion on these two planes are very small or equal to zero due to these two planes are transition stage between dilatation and compression, and these planes called nodal planes (Fig.16) (Stein and Wysession, 2003).

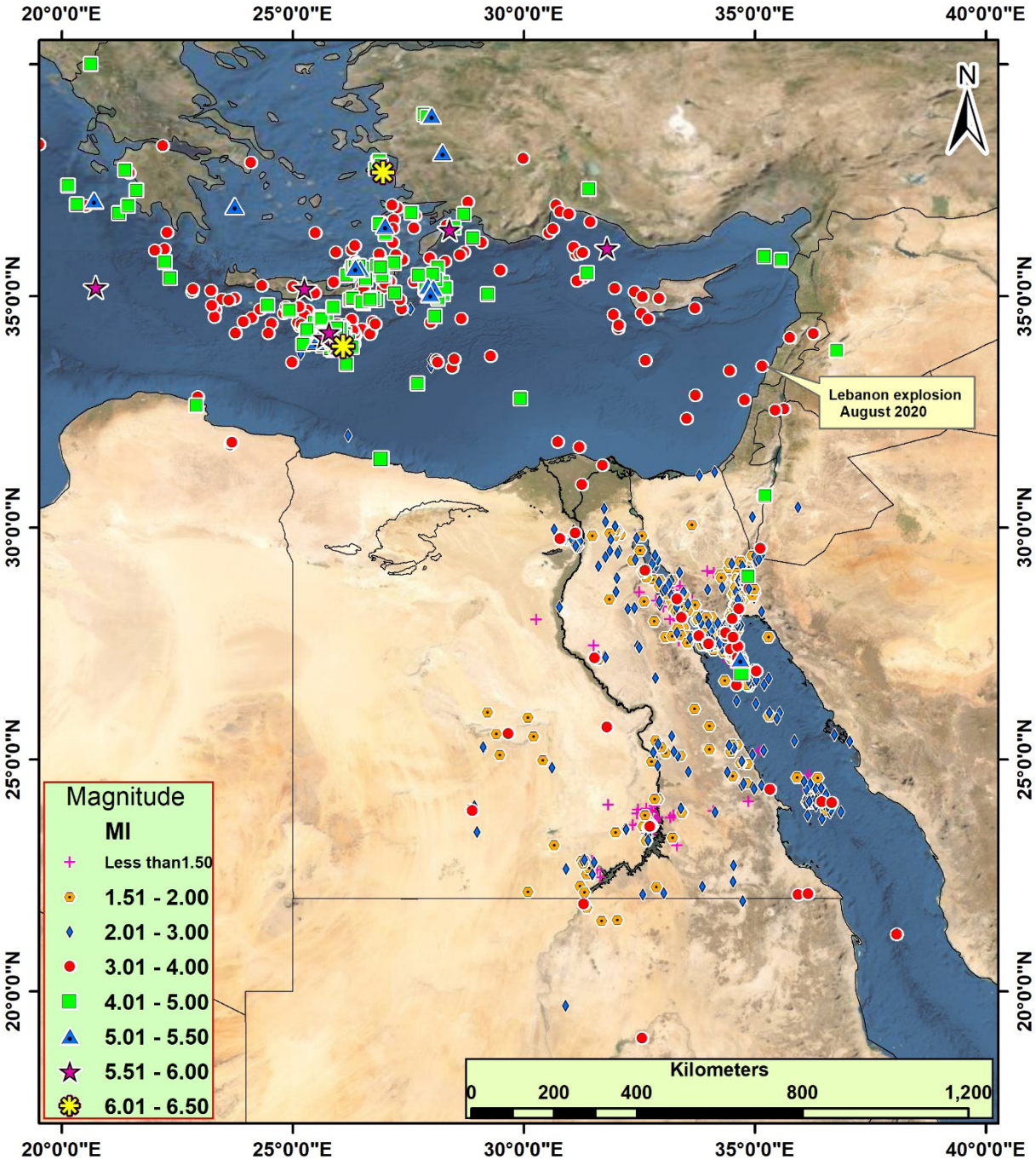


Figure 11. *All recorded seismic activity in and around Egypt as recorded by ENSN through 2020.*

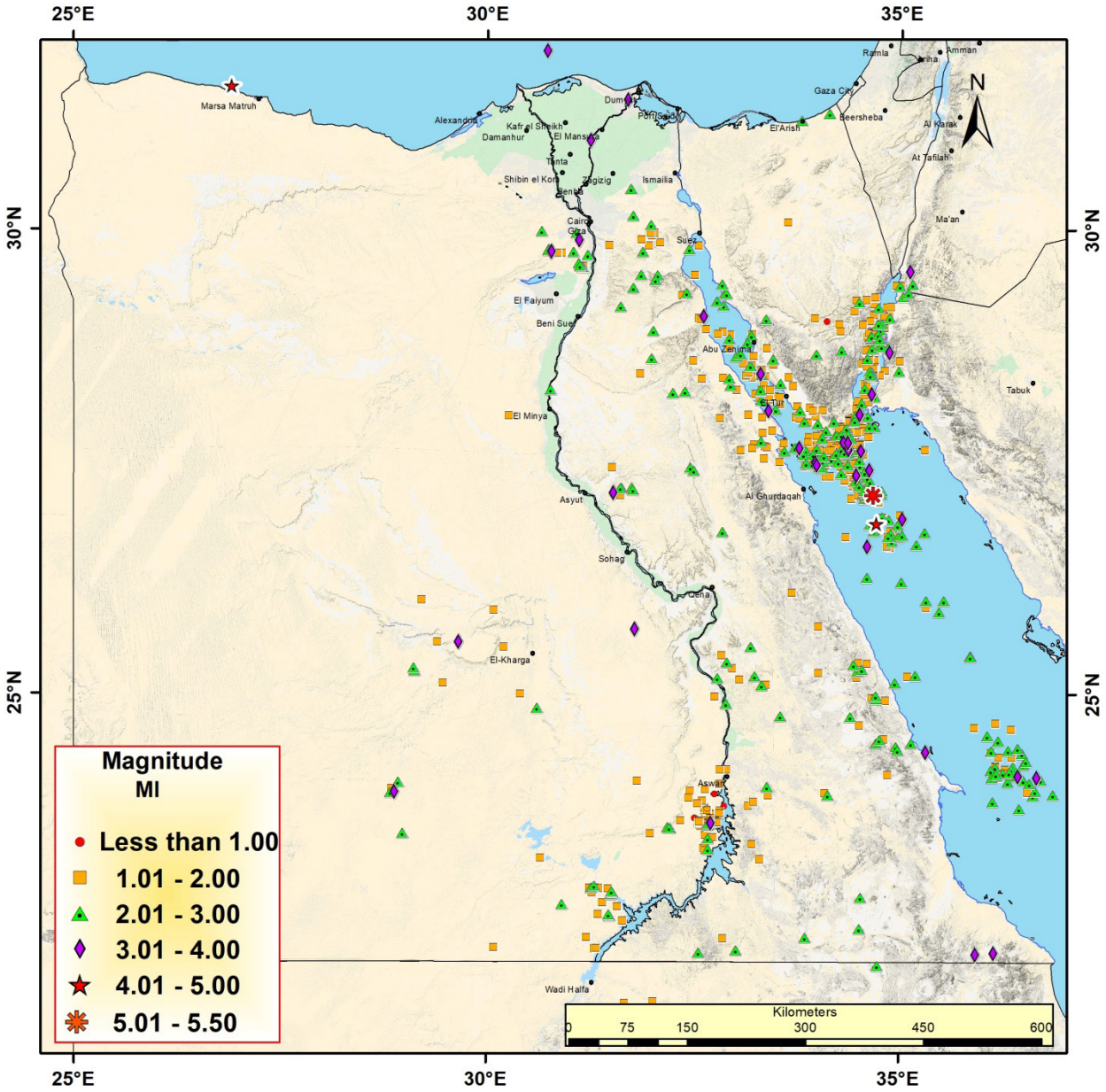


Figure 12. *Local seismic activity in Egypt as recorded by ENSN through 2020.*

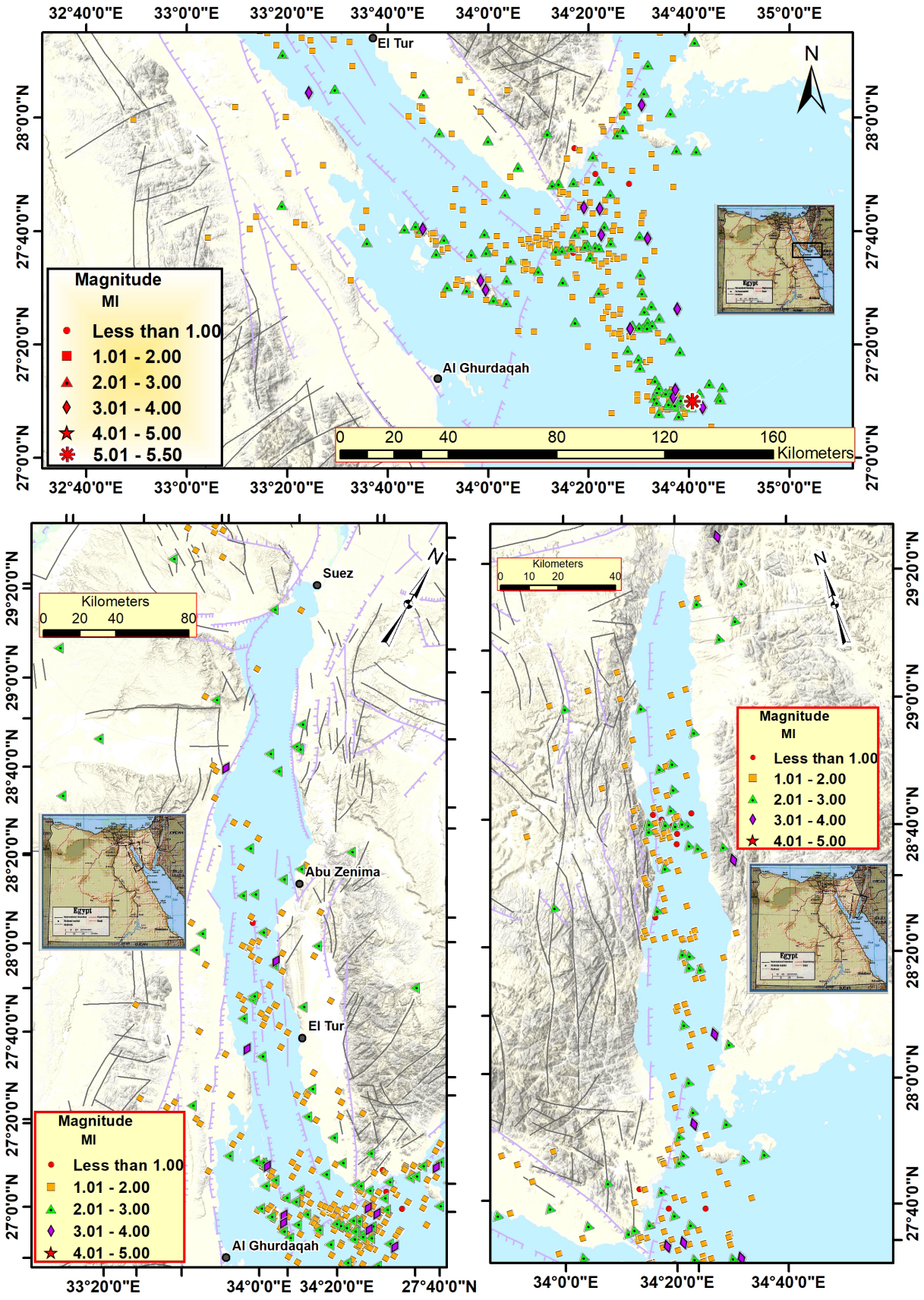


Figure 13. *Local seismic activity in Egypt as recorded by ENSN through 2020 zoomed-in Gulf of Suez, Gulf of Aqaba (lower figures), and their entrance (upper figure) superimposed on surface faults.*

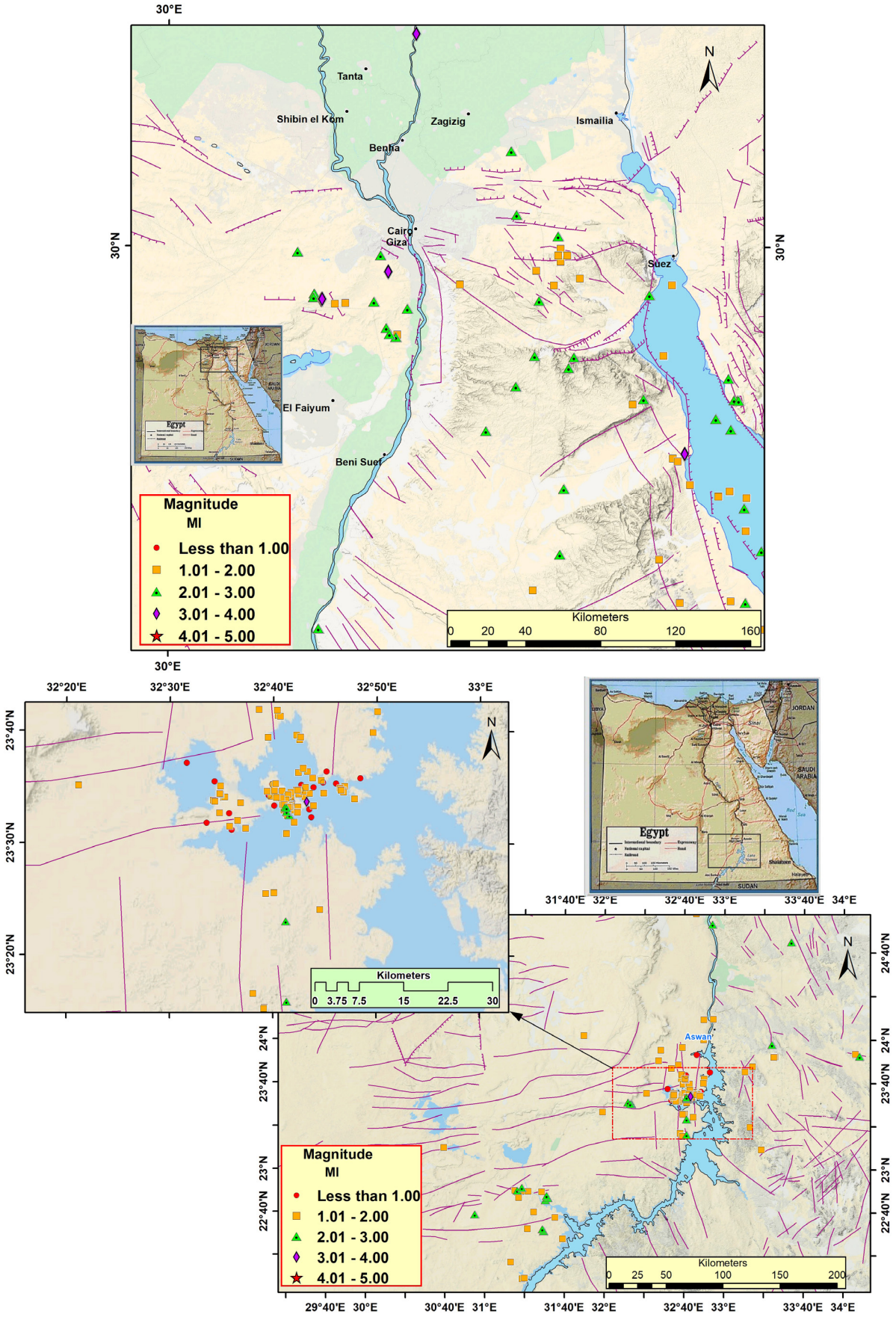


Figure 14. *Local seismic activity in Egypt as recorded by ENSN through 2020 zoomed-in Cairo- Suez district (upper figure) and Aswan region (lower figure).*

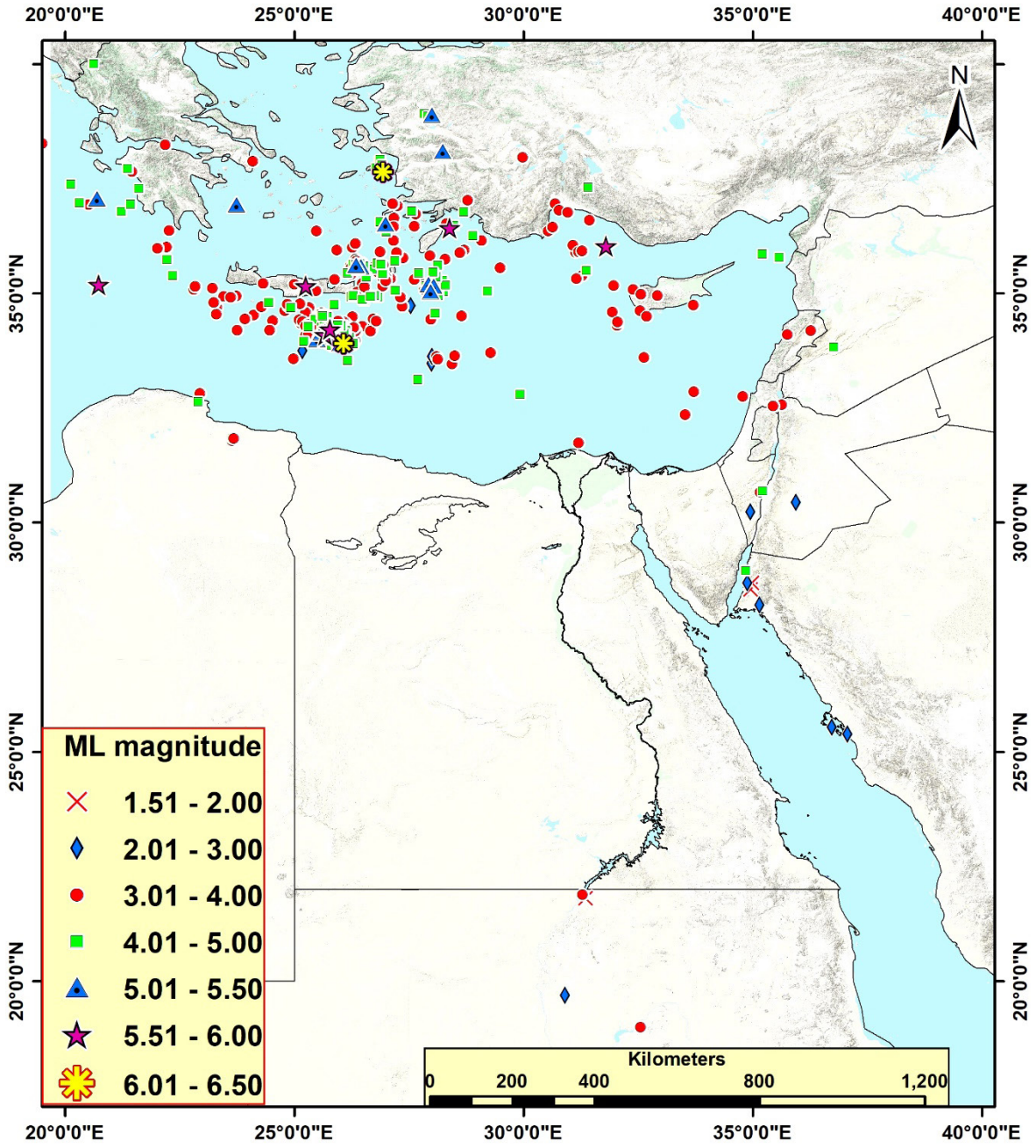


Figure 15. *Regional Earthquake activity around Egypt as recorded by ENSN through 2020.*

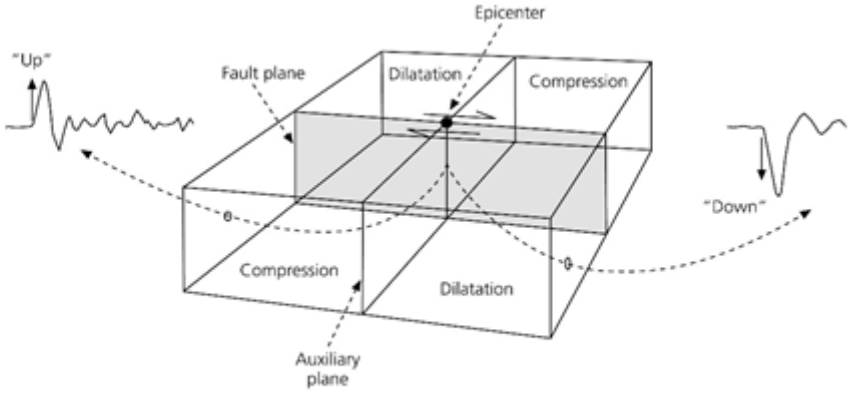


Figure 16. *First motions of P-waves (Stein and Wysession, 2003).*

The analysis of polarity of P-waves gives us only the orientation of the fault plane (e.g., strike and dip, and the direction of the fault motion, rake). Moreover, the focal mechanism gives the stress orientation in the earth, and generally, fault planes are oriented at 45° from the maximum and minimum compressive stresses (P and T axis respectively) and these stresses are halfway (see Fig. 17).
During this stage the following routine procedures are applied:

1. Relocation of these events using HYPOINVERSE program under ATLAS software package as well as using the crustal model for each area.
2. Retrieve the same events from international networks if the event was recorded in these networks because some areas not covering well by ENSN stations.
3. Two input files are using; the polarity of P-wave first motion and stations coordinates in another file.
4. Using the AZMTAK program to calculate the takeoff angle and azimuth and after that, the program uses the takeoff angle to calculate the epicenter distance using (PMAN) (Suetsugu, 1998) program to plot the polarity data and draw the nodal lines. After plotting the polarities data, the two nodal lines are drawn manually.

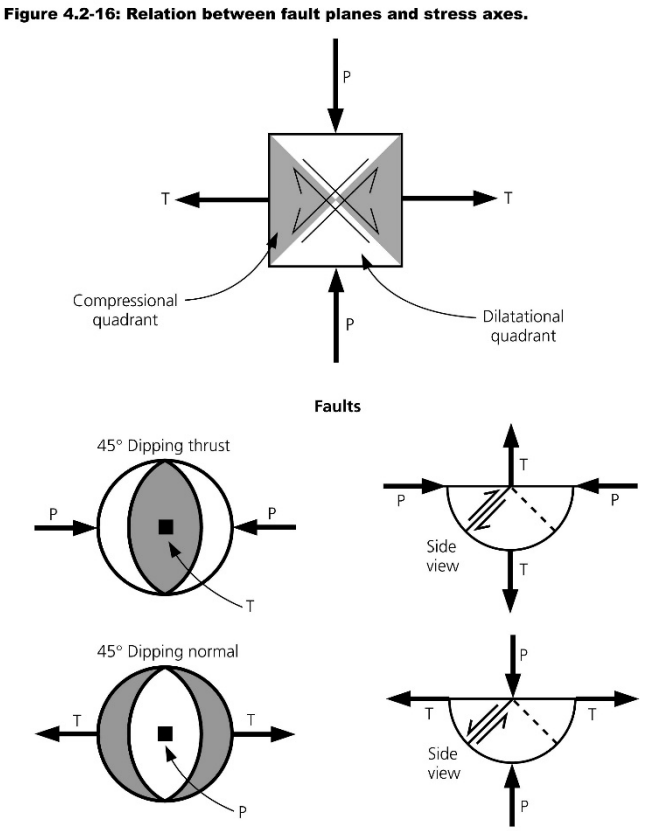
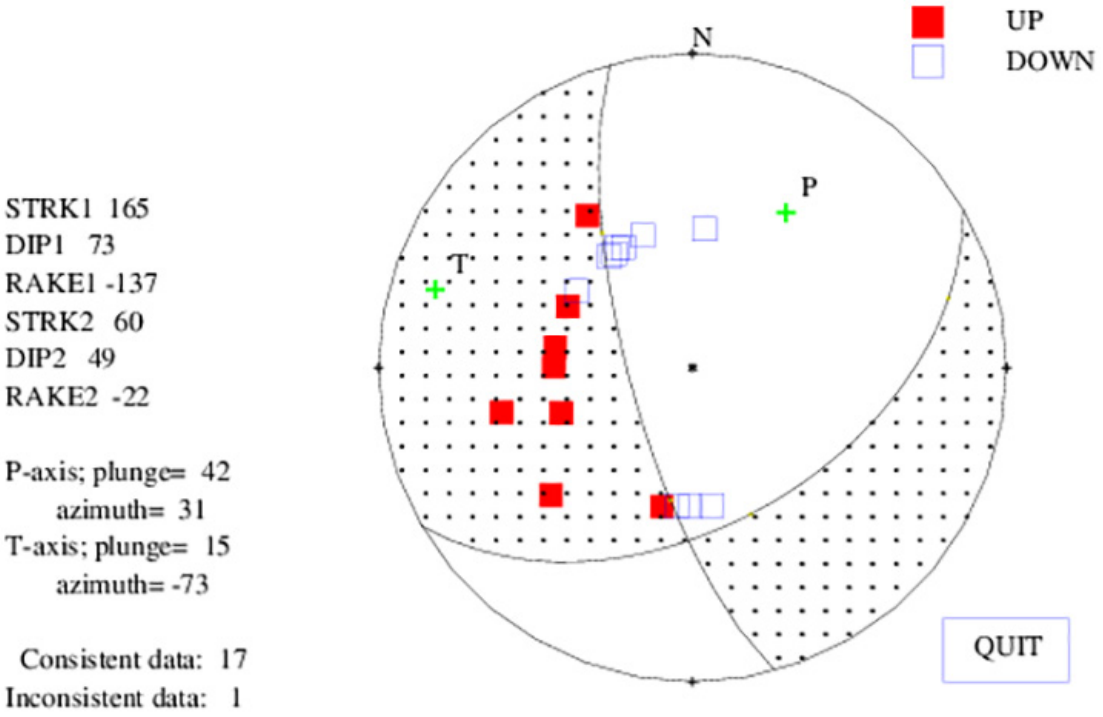


Figure 17. *Relation between fault planes and stress axes (Stein and Wysession, 2003).*

Focal mechanism examples of some recorded earthquakes.

The Red Sea is an active seismic zone in Egypt, and its activity may be attributed to the divergent plate motion between the Arabian plate and African plate. On June 16, 2020, at 14:30:23 (GMT) an earthquake of ML 5.40 Ml and 5.1 Mw occurred at the northern Red Sea, 86 km east of Hurghada, Egypt. The quake has been widely felt in Egypt while no casualties were reported. The instrumental epicenter is located at 27.2087°N, 34.7044°E. Fault plane solution reflects normal faulting mechanisms with minor strike-slip component and their nodal planes trending parallel to the main trend of the Red Sea Rift (Fig. 18). It is obvious that the tension forces trending NW-SE and compressional forces trending NE-SW which are in a good agreement with opening of the Red Sea. On contrary, the Northern Egyptian continental margin is characterized by moderate seismic activity. Northern Egypt has been shocked by some moderate size earthquakes (Maamoun et al., 1984 and Ambraseys et al., 1994).

A. Red sea event



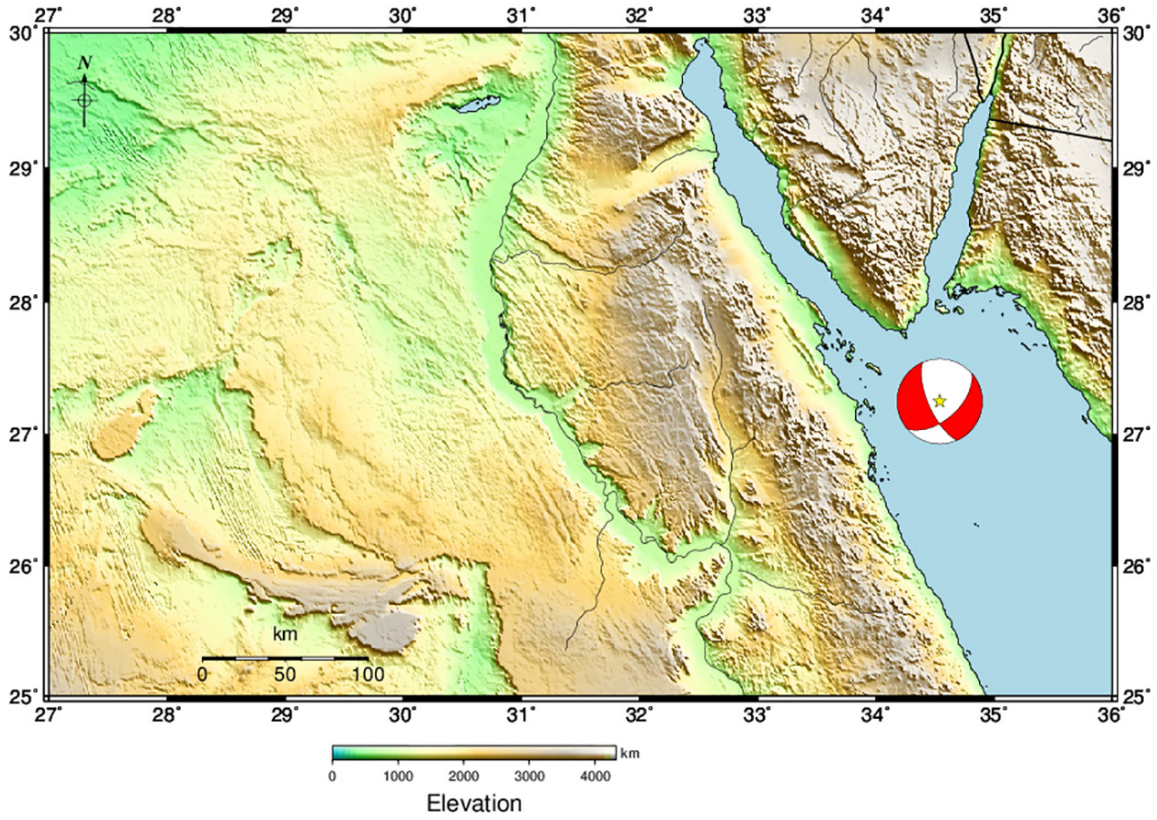


Figure 18. *fault plane solution for 5.1 Mw earthquake occurred on 16th, June, 2020 at Northern Red sea, 86 km east of Hurghada, Egypt.*

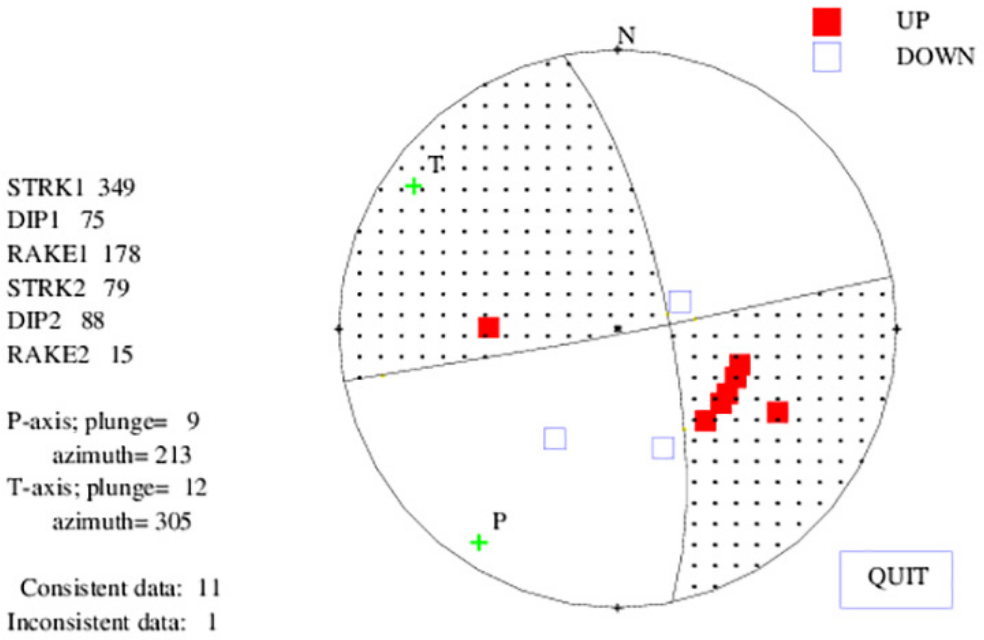
The largest historical events in this area are those of 320 and 956 A.D. The other larger events occurred in 1303 (Ms7.32) and 1870 (VII). These events occurred north of the epicenter of the September 12, 1955 (Ms 6.8) earthquake. The most recent event recorded in this zone is the October 19, 2012 (ML 5.1) earthquake (Hassoup et al., 2016; Abu El Nader et al., 2013). It was the largest offshore earthquake on the northern coast of Egypt after the 1955 earthquake. More recently, On April 11, 2020, a moderate (Mb = 4.4, Ml = 4.29) earthquake occurred approximately 309 km northwest of Alexandria and 50 km west Marsa Matruh (31.38 N; 26.72 E). Approximately, at the same location On May 28, 1998, a moderate (Mb = 5.5) earthquake occurred (27.64_E and 31.45_N). Fault plane solution reflects strike-slip faulting mechanisms (Fig. 19). The last example of focal mechanism solution is recorded in the Nile delta with magnitude 3.5 where fault plane solution represents normal faulting mechanism with minor strike-slip component (Fig. 20).

Hydra program and Regional moment tensors (RMTs) inversion

Bulletin Hydra software program implemented in ENSN calculates Regional Moment Tensors (RMTs) inversion mutually or automatically. An RMT inversion, following the approach of Herrmann et al. (2011). This approach solves for the source depth, moment magnitude, strike, dip, and rake angles of a shear-dislocation source via a time-domain inversion scheme. It assumes a step function in moment release, which is acceptable for smaller earthquakes, where the source corner frequency is greater than the frequencies used for the inversion. The Green's functions were computed using wavenumber integration and represent a complete solution of the elastic wave problem. The inversion process determines the best-fitting RMT solution at 1 km depth intervals over a broad depth range that includes the expected earthquake depth and permits time shifts to account for slight differences in location and origin time. The use of the velocity model was justified by the fact that the predicted waveforms matched the observed waveforms well in the 0.02–0.06 Hz passband, and by the small-time shifts, this approach was required. Other studies (Herrmann et al. 2011) also found that differences in the RMT velocity model primarily influence estimates of the moment magnitude (by approximately 0.1 magnitude units) and RMT depth, but have little influence on the determination of the RMT nodal planes. Figure 21 shows some examples

of some solved Mt solutions and posted to EMSC (European-Mediterranean Seismological Centre) through 2020.

B. April 11, 2020



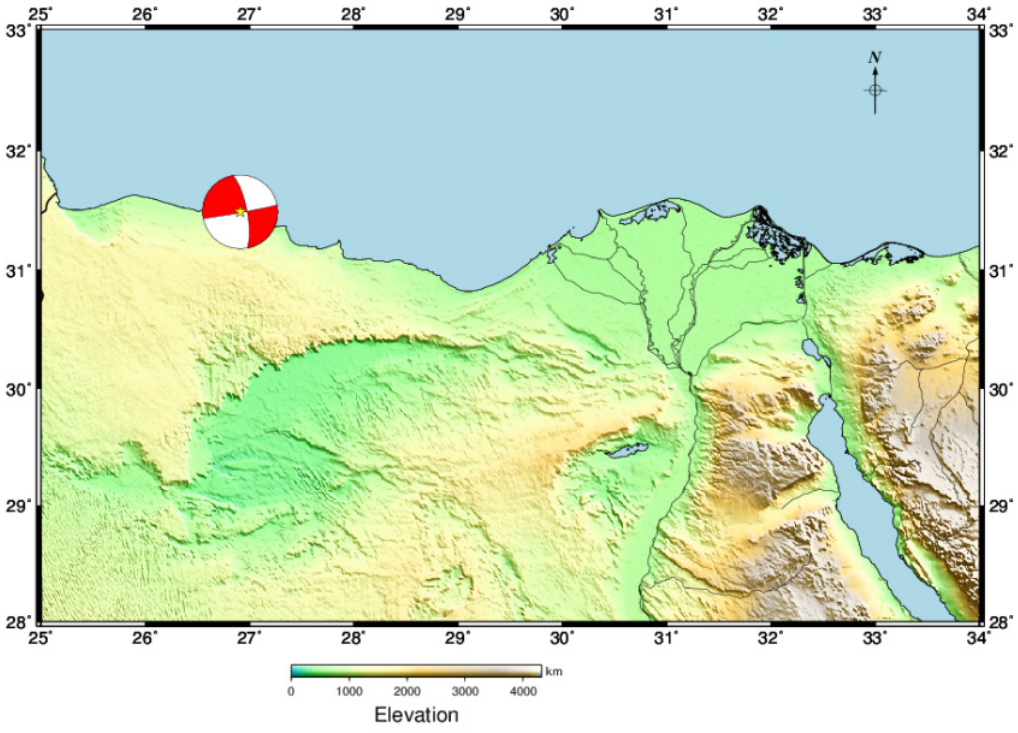


Figure 19. *April 17, 2020 earthquake focal mechanism*

C. Delta Earthquake

Fault plane solution represents normal faulting mechanism with minor strike slip component

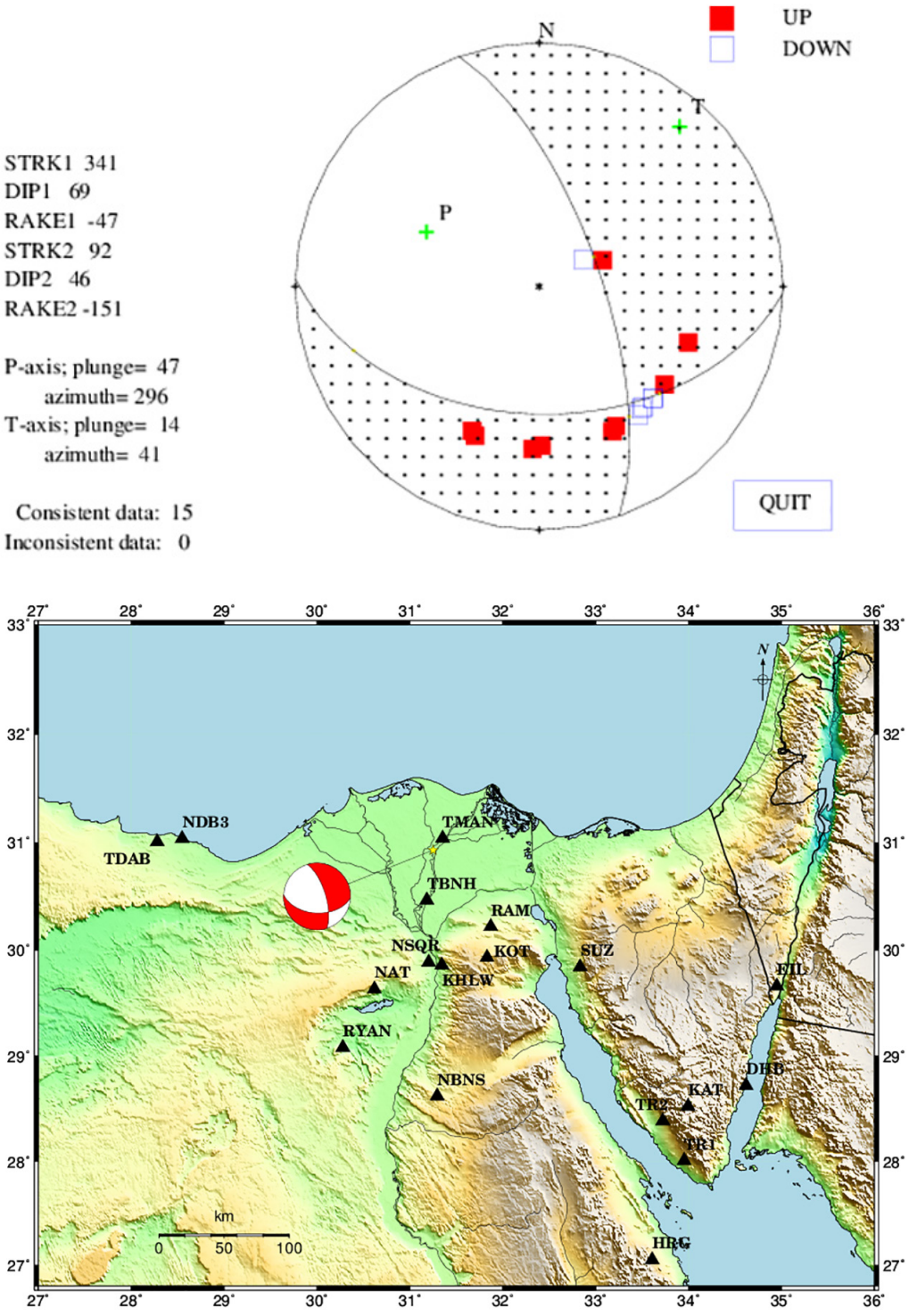


Figure 20. *fault plane solution for 22, November 2020, an earthquake (3.5, Ml) occurred in the Delta region.*

Felt earthquakes through 2020 in Egypt

During 2020, the following earthquakes were felt by people:

- In April 11th, 2020, an earthquake occurred with (Ml 4) west of Marsa Matrouh City at a depth of 2 km.
- On 28th, June, 2020 an earthquake with (5.4) occurred 600 km NE Marsa Matruh city, this earthquake was felt by inhabitants of Cairo City and some cities.
- On 18th, September, 2020, an earthquake with (Ml 5.8) occurred at Crete Island, It was felt by the inhabitants of Alexandria and the northern coast.
- On 25th, September 2020, an earthquake occurred in the Red Sea region, 33 km northeast of Hurghada, Ml (3.9).
- On Sunday, 22nd, November 2020, an earthquake occurred in the Delta region, Ml (3.5).
- On 5th, December, 2020, an earthquake occurred 500 km north of Damietta, Ml (5.6), it was felt by citizens in Cairo and delta cities.
- On 11th, December 2020, an earthquake (3.2), 19 km west of the city of October 6th, it was felt by there are many citizens.
- On 15th, December, 2020, an earthquake occurred with (Ml 5.4), southern Mediterranean Sea, this earthquake was felt by the inhabitants of the coastal cities and Cairo.

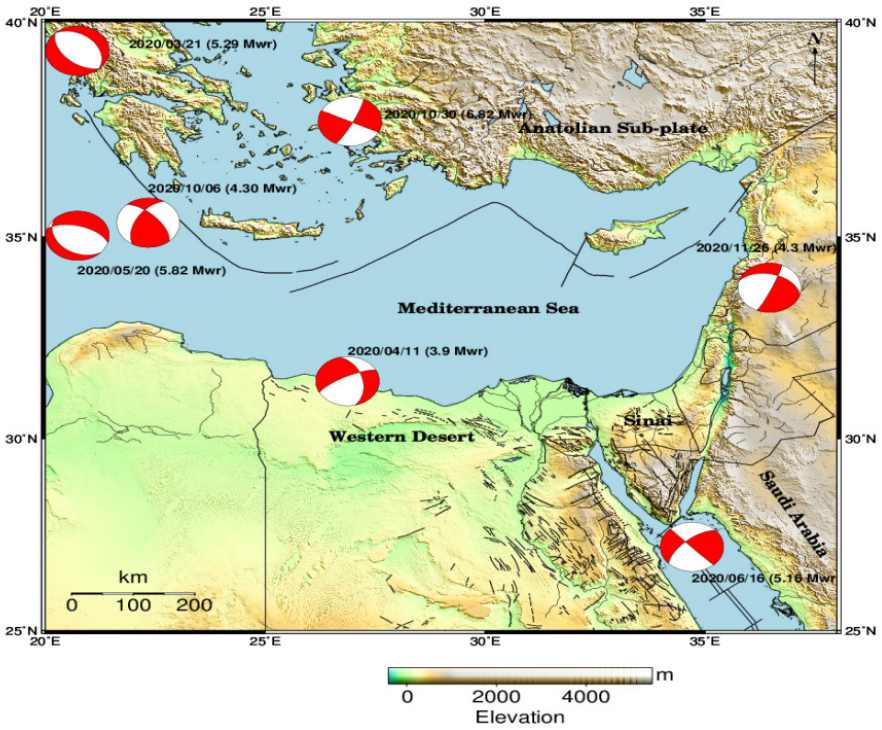


Figure 21. *Moment tensor solutions for felt earthquakes in and around Egypt using Hydra*

The magnitude of completeness

One important issue related to the catalogues is that the recorded earthquakes are never complete in time and space. Completeness can be defined as the extent to which all earthquakes in a given magnitude range and time period are reported in the dataset. The magnitude of completeness (Mc) is the minimum magnitude that is always recorded in a specified zone within a given time period. Mc can be estimated by fitting a Gutenberg-Richter model to the magnitude-frequency distributions, the minimum magnitude at which the magnitude-frequency distribution deviates from the Gutenberg-Richter model is taken as the magnitude of completeness. Using just the earthquakes in 2020 Mc is around 2.5, as shown in figs. from (22-27).

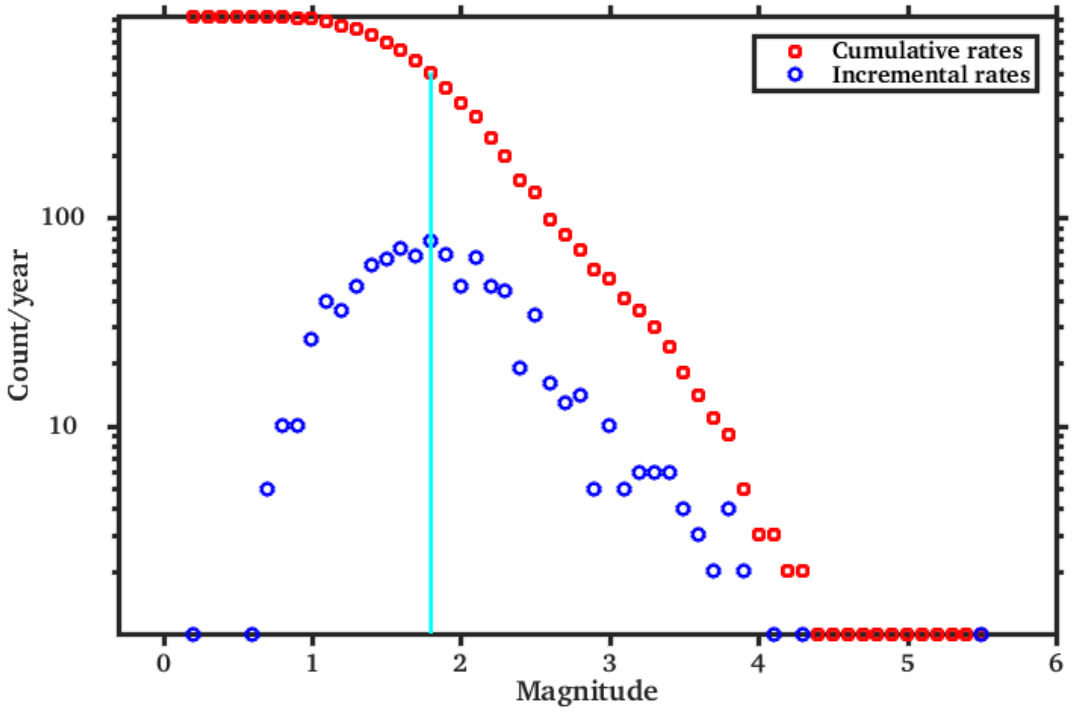


Figure 22. *Magnitude of completeness deduced from the cumulative plot of local earthquakes in 2020*

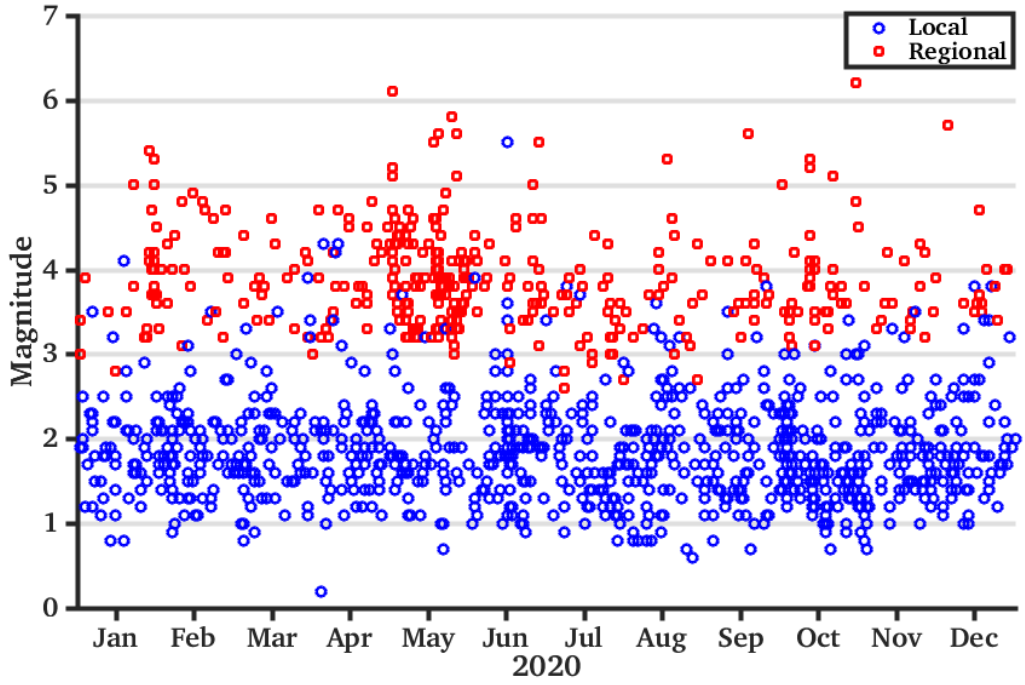


Figure 23. *Distribution of earthquake size of local and regional earthquakes in 2020*

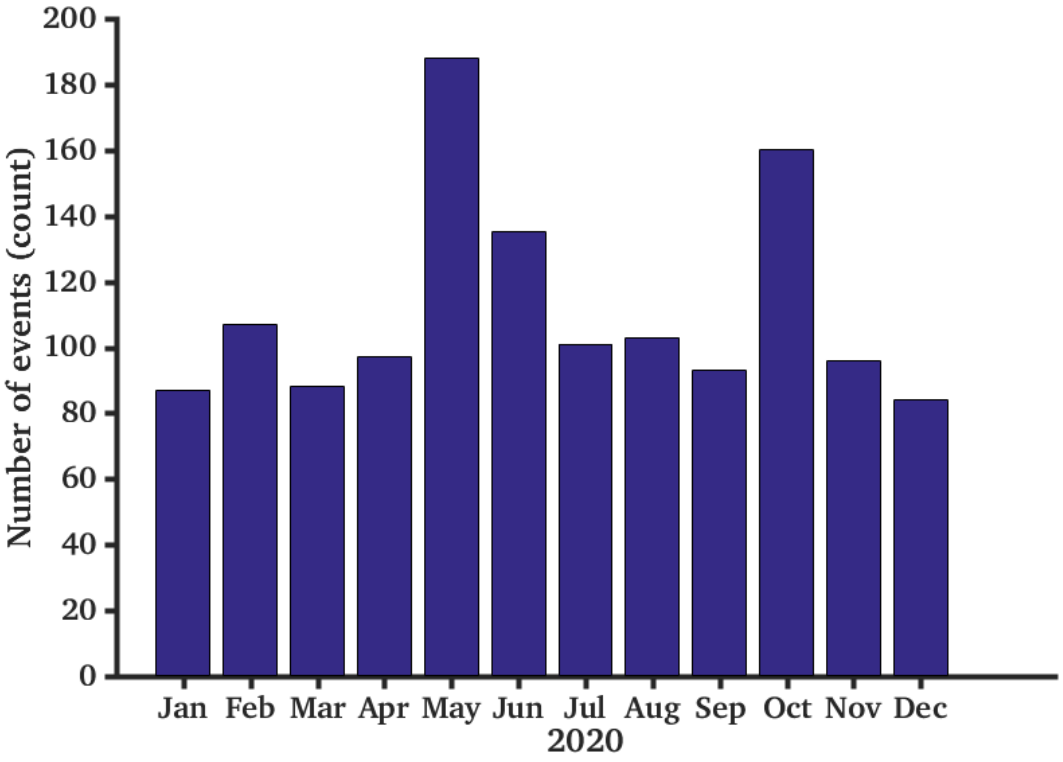


Figure 24. *Earthquake count along the year 2020*

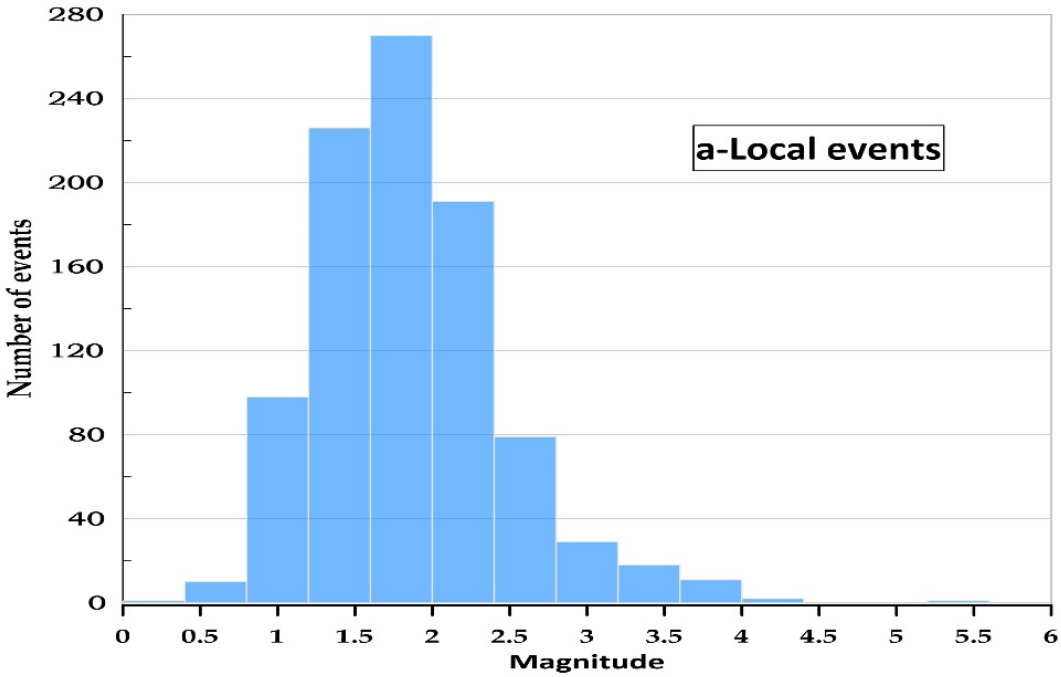


Figure 25. *Histograms showing the number of earthquake magnitudes(local earthquakes) recorded in 2020.*

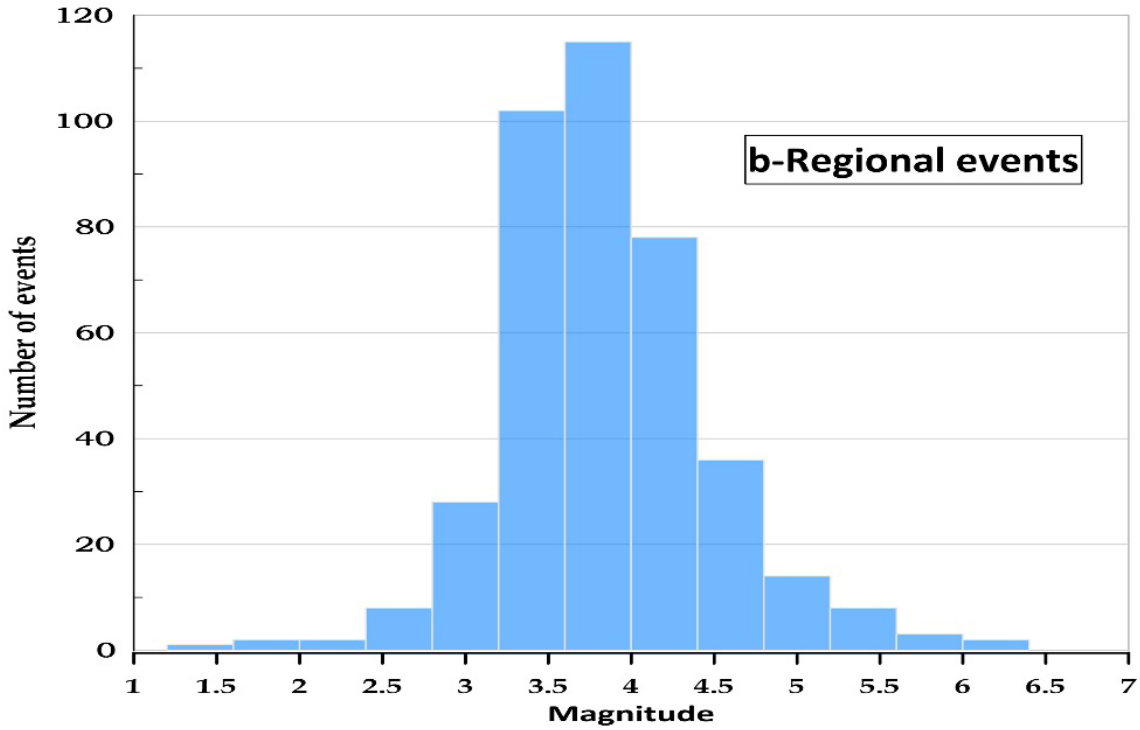


Figure 26. *Histograms showing the number of earthquake magnitudes(regional earthquakes) recorded in 2020.*

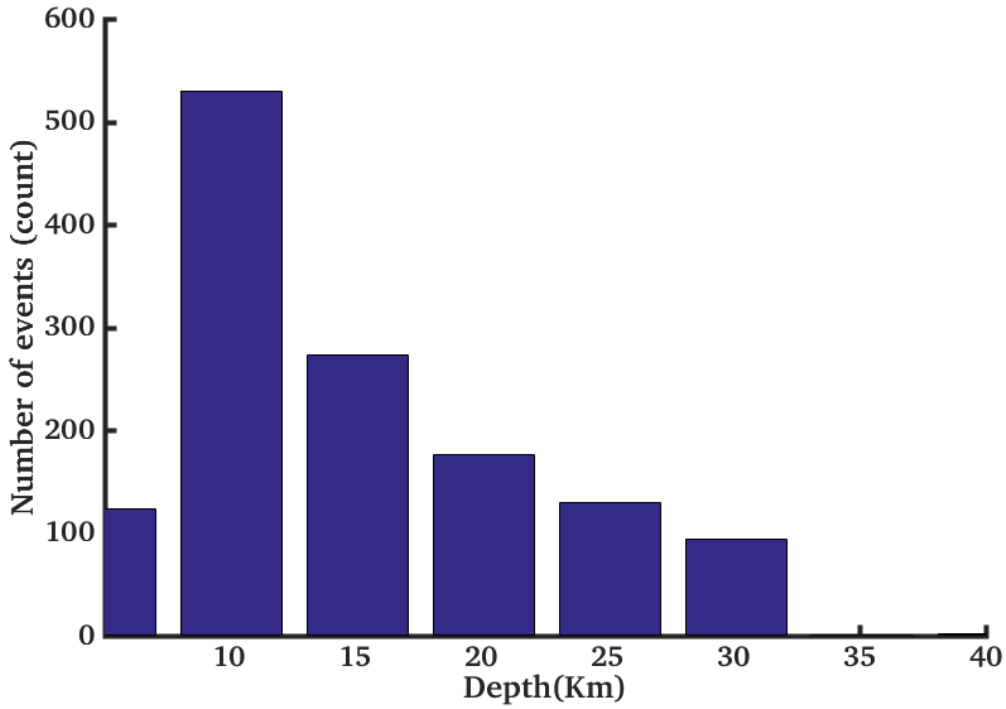


Figure 27. *Depth distribution of recorded earthquakes in 2020.*

Establishment Local Portable Network at Abu-Dabbab area

Abu-Dabbab area is an active seismic source located in the central part of the Eastern Desert, Egypt, along the Egyptian Red Sea coast (Abu El-Ata, 1987; Badawy et al., 2008; Hussein et al., 2011) As well, it has many distinctive features such as the long continuous history of seismic activity, cannon earthquake, and recurrent earthquake swarms. This seismogenic zone is characterized by a unique and complex tectonic situation and heat flow with a high rate of seismic activity throughout the day; it may reach more than 15 events/day, to greater than 60 events/ day during swarms, according to Egyptian National Seismic Network (ENSN) records. Also, this area had suffered from two moderate earthquakes on November 12, 1955, and June 2, 1984 with magnitude Mb= 6.1 and 5.1 respectively and subjected to many earthquake swarms, for examples, 1976, 1984, 1993, January 2003, April 2003, October 2003, and August 2004 (Hamada 1968; Fairhead and Girdler 1970; Dagget and Morgan 1977; Daggett et al. 1986; Hassoup 1987; Badawy 2005; Badawy et al. 2008). The study of this seismic activity a defining the causative tectonics is very important; therefore, the Seismology Department decided to deploy eight temporary Broadband seismic stations in the Abu-Dabbab area and its surrounding. The temporary seismic network and the permanent stations of the ENSN cover the whole region. The seismology department aims to have a high-resolution shear wave velocity model to infer reasonable crustal structure beneath the study area, as shown in Fig.28.

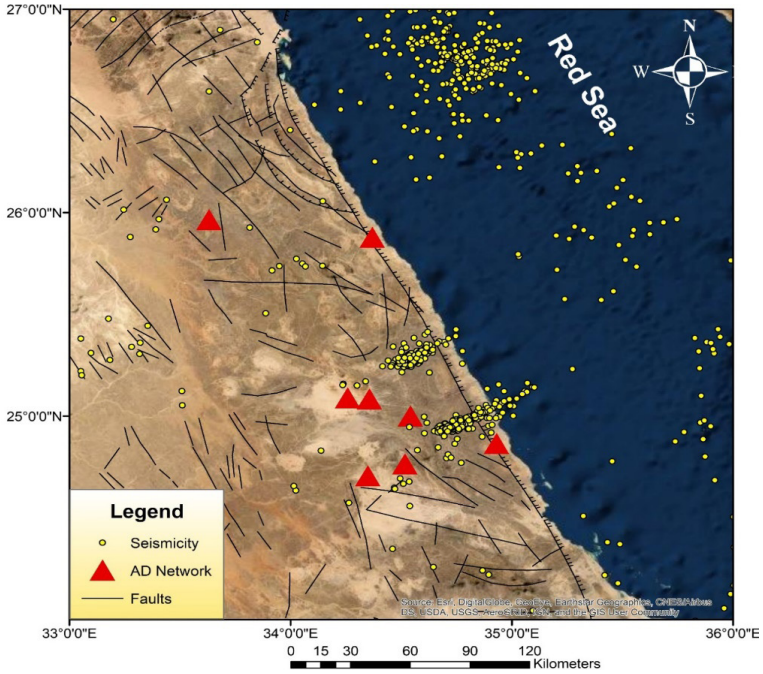


Figure 28. *shows the distribution of Abu Dabbab local Network and recorded seismicity*

Quarries Monitoring project

Applied scientific research that participates in solving the problems encountered by institutions and industry has become a pillar and starting point for every industrial development and economic progress in all countries. Instead, it has become an economic activity, and it plays a significant and vital role in the advancement and growth of industry and the economy. And suppose scientific research and cooperation with various industries is important for developed countries. In that case, it is for developing countries and institutions more essential and urgent, as employing which plans are set on sound and solid foundations, Mistakes are avoided, losses are paid, performance is improved, and returns are increased.

From this standpoint, and in terms of proper planning for the cement industry in terms of selecting its sites and precise control and the inconvenience it may cause to citizens as a result of the explosions that are carried out to obtain raw materials as well as preserving the environment, it has turned to the National Institute for Astronomical and Geophysical Research to monitor the explosions that are carried out in quarries Cement. This is because the institute revives its devices and stations to monitor any (natural or artificial) vibrations within the Egyptian country.

The project had a significant development during 2020. Although we had crises of Covid 19 in the world, including Egypt, the project team made a lot of efforts to overcome the situations.

Future Vision

- Extend our services to include other industry Projects.
- Arrange and held training courses in some missed Skiles (HR, project management, …etc.)
- To be involved in the national projects

El Dabaa Project to monitor seismic activity around the campus of the future nuclear power plant site:

Earthquakes are monitored for the Dabaa site and its surrounding areas continuously by the Dabaa Local Seismic Network (DLSN) and the Egyptian National Seismic Network (ENSN).

The continuous development of monitoring stations, as well as the continuous updating of monitoring and analysis methods for the observed data, has increased the capacity of the local Egyptian network in El-Dabaa to monitor and sign small seismic tremors, whether natural or artificial, up to the magnitude of 0.5 on the seismic magnitude scale in a 50 km radius around the nuclear campus.

The seismic stations operating in the Dabaa local national network were transferred via wireless communication links to the recording unit located at the Dabaa site from 2005 to 2010. Since 2013 a real-time online monitoring system has been developed for the technical condition of the stations to ensure a quick response to any system defects.

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Table 7. *Table (1A) Hypo-central parameters of local earthquakes recorded by ENSN through 2020:*

Year	Mon.	Day	Hour	Min.	Sec	Lat.	Long.	Depth	RMS	Xmag	Fmag
2020	1	1	19	56	2.72	24.1503	36.3091	9.89	0.14	1.87	
2020	1	2	12	29	49.43	27.3645	34.4122	20.77	0.36	2	2.21
2020	1	2	13	39	26.9	28.3405	32.9434	22.5	0.22	2.54	2.65
2020	1	2	14	53	12.3	27.4003	34.5295	15.79	0.25	2.5	
2020	1	2	19	33	5.51	27.3515	34.4413	31.39	0.09	1.88	1.88
2020	1	3	0	10	26.46	23.6981	32.643	6.83	0.03	1.24	1.28
2020	1	4	16	28	46.19	22.2722	31.2159	11.39	0	1.72	
2020	1	4	20	31	12.07	22.2743	31.2169	11.5	0	1.72	
2020	1	5	11	32	48.92	24.3734	36.3198	14.64	0.05	2.27	2.21
2020	1	6	2	25	31.81	23.5596	32.6136	13.81	0.17	1.25	1.17
2020	1	6	2	51	0.35	27.7363	34.319	10.49	0.61	3.46	3.29
2020	1	6	2	55	2.65	27.8558	34.0999	24.58	0.08	2.25	2.05
2020	1	6	3	2	4.04	27.8036	34.2122	5.22	0.13	2.12	2.25
2020	1	6	3	20	8.38	27.808	34.2333	16.01	0.14	2.33	2.23
2020	1	6	9	15	57.69	23.5005	32.227	3.69	0.1	2.34	2.34
2020	1	7	4	54	8.63	23.522	32.6219	9.55	0.09	1.48	
2020	1	7	19	4	48.54	28.3576	33.3464	27.69	0.08	1.8	
2020	1	9	5	16	25.3	28.7179	34.6939	19.58	0.1	1.09	
2020	1	9	22	35	11.58	29.0769	34.7914	15.72	0.05	1.47	
2020	1	10	8	16	17.9	23.6571	32.6578	15.49	0.15	1.33	
2020	1	10	17	39	13.85	27.3669	34.5629	15.22	0.28	1.82	
2020	1	10	19	51	53.35	23.8734	36.6241	9.37	0.25	2.48	
2020	1	11	5	28	55.17	27.776	34.2368	16.56	0.1	1.92	
2020	1	11	12	13	53.69	29.4133	35.0004	24.7	0.09	1.8	
2020	1	13	0	20	45.53	28.8388	34.7164	15.81	0.02	0.85	
2020	1	13	7	58	35.23	24.2973	36.3645	9.17	0.23	1.95	
2020	1	14	8	11	7.63	27.3913	34.4787	21.47	0.09	2.16	2.12
2020	1	15	2	24	24.91	28.2973	33.0204	13.09	0.12	1.39	1.31
2020	1	15	9	45	26.4	28.8861	32.935	3.66	0.17	1.67	1.56
2020	1	15	14	48	2.49	24.951	34.7043	4.75	0.08	2.16	2.22
2020	1	15	17	52	28.36	27.8604	33.4523	15.1	0.06	1.79	
2020	1	15	19	15	10.4	28.4297	33.2371	7.23	0.04	1.14	
2020	1	18	21	46	12.12	26.8601	34.7158	9.48	0.34	4.09	
2020	1	18	23	48	1.12	28.7868	34.7129	18.09	0.01	0.83	
2020	1	19	12	33	39.89	27.3925	34.5452	19.13	0.32	2.53	2.67
2020	1	19	18	8	32.21	27.4482	34.5426	13.33	0.44	2.82	
2020	1	19	18	42	51.92	27.4331	34.5183	16.33	0.34	2.06	
2020	1	20	11	54	7.17	23.5755	32.6678	5	0.03	1.27	
2020	1	20	16	33	52.94	25.239	29.126	21.19	0.21	2.12	2.43
2020	1	22	6	48	9.8	27.9046	34.3031	10.05	0.03	1.6	1.55
2020	1	22	22	8	46.97	29.8603	32.0861	10.53	0.36	1.98	1.98

Year	Mon.	Day	Hour	Min.	Sec	Lat.	Long.	Depth	RMS	Xmag	Fmag
2020	1	22	22	39	22.37	26.779	34.677	31.38	0.29	1.69	
2020	1	23	12	55	3.84	28.9356	34.7512	21.24	0.11	2.09	2.01
2020	1	23	16	0	8.18	28.0793	34.0639	19.67	0.07	1.74	1.36
2020	1	23	23	14	4.15	29.0003	34.2566	9.65	0.08	1.55	1.22
2020	1	25	16	59	6.57	22.1438	31.3131	7.12	0.06	1.6	1.63
2020	1	25	18	41	44.07	28.4505	33.1525	10	0.13	1.42	1.39
2020	1	25	20	52	7.72	22.1492	31.3319	10.06	0.04	1.23	1.24
2020	1	26	8	6	20.06	26.7118	34.851	29.53	0.24	1.94	
2020	1	26	13	35	14.5	23.7273	36.4554	9.58	0.3	2.87	
2020	1	27	13	25	19.03	27.6375	34.1912	16.33	0.22	1.84	
2020	1	27	14	27	58.94	27.6386	34.1785	16.02	0.2	1.98	1.88
2020	1	27	14	34	40.85	27.6447	34.1814	19.88	0.22	1.51	1.69
2020	1	27	18	42	27.67	28.8145	34.6746	19.31	0.05	1.54	1.52
2020	1	31	16	28	0.59	27.551	34.166	21.6	0.16	2.24	2.04
2020	1	31	16	29	50.67	27.6106	33.9962	23.8	0.08	2.13	2.13
2020	1	31	19	47	10.9	27.6056	33.9933	21.42	0.1	2.06	1.88
2020	1	31	21	53	6.34	29.4018	34.9917	15.85	0.3	2.45	2.2
2020	2	1	8	13	5.8	28.8204	34.678	17.38	0.13	1.79	
2020	2	1	9	27	42.18	29.062	32.5602	7.23	0.4	1.72	1.71
2020	2	1	9	49	9.95	29.3254	32.411	1.65	0.34	2.25	
2020	2	1	21	11	50.32	28.2339	33.3805	7.15	0.39	1.55	1.6
2020	2	1	21	42	54.42	28.1862	33.3176	27.77	0.35	2.25	2.18
2020	2	2	8	37	30.19	27.6437	33.8531	24.13	0.03	2.09	2.01
2020	2	2	15	39	3.66	27.5757	34.117	20.62	0.1	1.43	
2020	2	2	18	1	58.84	28.72	34.2884	14.67	0.07	2.12	
2020	2	3	2	32	45.12	29.7543	31.0418	29.26	0.36	2.07	2.18
2020	2	3	2	51	14.03	28.5006	33.1897	15.67	0.3	1.67	1.65
2020	2	3	20	40	30.93	28.0033	33.735	21.59	0.01	1.81	1.81
2020	2	4	16	59	10.93	27.5764	34.1218	23.93	0.15	1.95	2.25
2020	2	4	17	18	14.71	27.3668	34.417	21.36	0.17	1.93	
2020	2	4	18	10	6.19	27.693	33.3628	7.77	0.03	1.88	1.86
2020	2	4	19	6	27.95	29.724	31.2119	8.48	0.17	2.54	2.53
2020	2	5	1	46	30.67	27.5202	33.911	15.12	0.12	1.79	
2020	2	5	5	8	36.5	27.5631	34.3675	15.91	0.22	1.48	1.6
2020	2	5	13	59	37.49	28.8538	34.6935	8.32	0.35	2.41	2.42
2020	2	5	15	58	9.12	27.3573	34.4691	16.08	0.27	1.76	1.98
2020	2	5	19	16	36.17	27.678	33.5819	10.64	0.01	1.52	1.74
2020	2	5	19	19	46.75	27.7091	33.2292	10.24	0.1	1.59	1.69
2020	2	6	2	7	43.12	27.4285	34.3914	19.45	0.02	1.27	1.39
2020	2	6	4	28	0.53	27.3808	34.3988	7.69	0.07	1.35	1.39
2020	2	6	6	2	37.18	23.8817	32.7689	10.96	0.01	0.87	
2020	2	6	7	41	52.08	27.4633	34.3457	28.62	0.75	1.68	

Year	Mon.	Day	Hour	Min.	Sec	Lat.	Long.	Depth	RMS	Xmag	Fmag
2020	2	6	10	37	56.73	25.5063	30.2089	9.58	0.03	1.97	
2020	2	6	15	19	11.62	28.6479	33.0115	17.82	0.06	2.51	2.13
2020	2	6	21	11	13.68	28.8735	33.1941	8.65	0.28		2.03
2020	2	6	22	14	9.6	26.794	34.709	26.44	0.32	2.11	2.67
2020	2	7	10	52	55.66	27.719	34.5157	6.05	0.04	1.72	1.9
2020	2	7	20	13	29.54	23.5674	32.5864	4.88	0.06		1.02
2020	2	8	6	17	34.23	23.5114	32.1973	12.04	0.09	2.52	2.49
2020	2	8	21	11	31.25	28.7975	33.1447	6.24	0.28	2.27	
2020	2	8	21	57	16.18	23.1627	30.6536	4.38	0.01	1.9	
2020	2	8	23	24	17.03	27.6829	33.7588	15.57	0.25	2.28	
2020	2	8	23	29	57.75	27.9584	34.425	18.63	0.11	1.86	
2020	2	9	9	14	26.53	28.1545	34.53	4.82	0.1	2.62	2.52
2020	2	9	20	36	31.92	23.5866	32.6665	8.03	0.12	1.3	
2020	2	9	22	53	49.77	27.2284	34.5535	28.89	0.25	2.06	
2020	2	10	23	5	40.77	28.8301	34.7627	14.73	0.31	2.25	
2020	2	11	17	23	26.11	26.6279	35.202	31.53	0.13	2.21	2.44
2020	2	11	17	44	48.8	23.6957	32.8341	4.04	0.07	1.05	
2020	2	12	3	38	42.71	27.6294	34.1822	12.32	0.14	1.52	1.62
2020	2	12	4	5	40.1	27.3799	34.4726	15.63	0.27	3.07	
2020	2	12	13	48	10.92	25.2289	34.4946	3.34	0.56		1.57
2020	2	12	21	58	17.66	28.9165	32.8487	28.97	0.28	1.3	
2020	2	12	23	42	9.45	27.3849	34.5018	20.36	0.29	2.28	
2020	2	12	23	48	17.09	27.3825	34.5144	17.17	0.4	2.19	
2020	2	13	11	25	28.31	29.7897	30.7389	1.86	0.2	2.75	2.46
2020	2	13	15	24	6.61	27.3838	34.5275	16.95	0.29	2.11	2.18
2020	2	13	15	41	21.61	28.7357	34.6554	7.8	0.42	2.1	2
2020	2	13	19	9	4.73	28.2276	33.4876	21.94	0.1	1.29	1.25
2020	2	13	21	48	34.41	27.4913	34.3902	22.35	0.17	1.75	2.06
2020	2	14	17	43	15.78	28.8209	34.6255	11.55	0.09	1.51	
2020	2	15	0	15	20.22	28.2764	34.5859	9	0.45	1.98	
2020	2	15	4	12	55.4	27.6697	34.1653	26.49	0.15	1.15	
2020	2	16	16	27	21.14	28.4572	33.1719	7	0.22	1.13	
2020	2	17	5	34	51.58	23.5528	32.6901	9.66	0.12	1.74	
2020	2	17	14	53	59.48	27.1806	34.526	13.17	0.28	1.88	2.1
2020	2	17	16	25	22.81	27.6717	34.2176	18.1	0.24	1.55	1.75
2020	2	17	23	8	57.4	28.0026	34.443	3.1	0.21	1.55	1.64
2020	2	18	4	56	33	27.9927	34.4143	22.51	0.17	1.28	1.31
2020	2	18	12	23	16.35	23.8019	36.1376	14.69	0.25	2.03	2.31
2020	2	20	21	26	43.38	27.9987	34.5361	3.58	0.21	1.84	1.81
2020	2	21	0	23	13.63	28.6552	34.6272	2.1	0.04	1.3	1.47
2020	2	21	8	47	44.86	27.6554	34.376	4.16	0.4	3.52	
2020	2	21	11	33	34.49	27.6591	34.202	13.85	0.19	1.18	1.07

Year	Mon.	Day	Hour	Min.	Sec	Lat.	Long.	Depth	RMS	Xmag	Fmag
2020	2	22	17	45	23.75	27.9567	33.8382	18.98	0.29	2.23	2.36
2020	2	22	19	45	20.15	27.6595	33.81	15.69	0.09	1.37	1.45
2020	2	23	1	38	53	27.7761	34.056	5.47	0.18	2.19	2.18
2020	2	24	22	34	55.88	28.032	33.7726	14.3	0.24	1.72	1.98
2020	2	25	16	43	59.84	24.4464	34.7183	8.56	0.16	2.09	2.39
2020	2	26	8	3	20.6	28.8497	34.6965	13.36	0.18	2.02	2.04
2020	2	26	22	21	35.22	27.6225	34.0064	29.73	0.11	1.81	1.79
2020	2	27	17	22	49.81	24.0458	36.717	9.85	0.16	2.71	
2020	2	28	10	32	23.86	28.2774	34.6252	5.28	0.07	1.55	1.57
2020	2	28	10	57	0.02	27.6351	33.597	6.29	0.1	2.13	2.24
2020	2	28	17	16	55.03	24.338	36.4908	15.79	0.07	2.67	
2020	2	29	4	46	28.09	27.6801	33.7609	11.65	0.03	1.96	1.79
2020	2	29	4	50	25.54	27.6603	33.7803	13.96	0.08	1.74	1.81
2020	3	1	19	54	53.59	23.6533	32.7088	3.97	0.14	1.58	
2020	3	2	2	22	16.36	27.643	33.8151	21.58	0.01	1.7	
2020	3	2	14	52	12.7	27.8869	34.3478	3.63	0.18	2.99	
2020	3	3	19	27	11.44	27.9695	34.5048	3.49	0.28	1.56	1.66
2020	3	3	19	34	42.3	27.372	34.4387	21.43	0.26	1.75	1.99
2020	3	4	0	1	21.24	29.1909	32.8551	17.11	0.37	2.17	2.49
2020	3	4	10	57	32.94	22.7546	31.5076	4.09	0.17	2.07	
2020	3	4	20	46	23.38	28.5417	34.6804	3.65	0.06	1.04	1.14
2020	3	5	2	41	13.99	27.9098	34.2863	13.2	0	0.81	0.85
2020	3	5	7	9	29.87	27.6539	33.9896	4.26	0.37	1.38	
2020	3	5	11	31	5.37	23.8686	33.4264	3.39	0.38	1.57	
2020	3	5	13	56	25.67	23.9975	32.8276	6.71	0.07	1.01	
2020	3	5	19	47	22.23	23.8652	33.4165	3.63	0.33	1.69	
2020	3	6	2	48	4.85	25.706	31.7919	3.72	0.43	3.28	
2020	3	6	22	37	21.21	28.1729	34.6131	4.7	0.13	1.74	1.03
2020	3	7	0	44	45.92	27.5682	34.131	16.11	0.04	1.28	
2020	3	7	11	24	59.92	28.2959	30.7643	3.71	0.19	2.31	
2020	3	7	18	38	37.47	22.2613	32.8669	3.84	0.06	1.93	
2020	3	7	18	40	2.74	22.1237	33.0298	25.49	0.12	2.3	
2020	3	8	2	23	26.97	27.5524	34.1183	21.99	0.04		1.24
2020	3	8	2	25	2.65	27.5724	34.1216	16.02	0.06	1.63	
2020	3	8	12	56	11.93	29.5096	32.0569	2.82	0.22	2.88	2.9
2020	3	8	16	17	28.56	28.8927	32.7916	20.81	0.14	1.77	
2020	3	9	0	58	19.28	28.6765	33.9812	7.36	0.13	2.32	2.02
2020	3	9	5	31	45.42	27.458	32.4623	25.82	0.11	2.51	
2020	3	9	10	18	30.08	29.321	32.8869	3.74	0.23	2.34	
2020	3	9	15	15	51.35	27.6299	34.118	23.17	0.2	1.64	
2020	3	9	15	20	38.91	23.5697	32.6631	14.54	0.09	1.56	
2020	3	9	15	31	14.64	28.263	33.4069	16.48	0.33	1.6	

Year	Mon.	Day	Hour	Min.	Sec	Lat.	Long.	Depth	RMS	Xmag	Fmag
2020	3	9	15	47	55.86	23.5774	32.6805	7.99	0.18	1.48	
2020	3	9	16	11	11.66	23.5617	32.6915	11.23	0.12	1.52	
2020	3	9	16	22	33.38	23.5914	32.5715	21.06	0.41	0.92	
2020	3	11	0	39	15.22	26.9511	35.0049	30.62	0.13	1.96	2
2020	3	11	3	40	49.43	27.6474	33.0699	21.24	0.08	1.54	1.58
2020	3	11	8	34	46.09	29.0477	33.3698	9.78	0.11	2.07	1.98
2020	3	12	1	28	15.68	28.9275	34.2727	13.76	0.05	2	
2020	3	12	19	2	21.15	27.7758	34.2652	6.19	0.08	1.26	1.3
2020	3	13	8	26	31.56	23.9604	33.4007	22.48	0.17	2.12	2.09
2020	3	14	11	15	27.49	27.1919	34.6019	9.59	0.24	2.77	
2020	3	14	11	52	49.7	25.2398	34.4916	3.23	0.32	2.47	2.43
2020	3	14	11	54	52.04	27.1962	34.5601	12.29	0.24	2.77	
2020	3	14	22	38	18.31	27.2625	34.4292	11.29	0.07	1.32	1.4
2020	3	15	2	54	13.99	27.1792	34.5276	16.45	0.25	1.74	
2020	3	15	3	18	51.34	27.1766	34.5518	7.25	0.33	2.32	
2020	3	16	6	1	54.34	28.7451	34.848	13.47	0.33	2.62	
2020	3	16	7	48	34.34	28.7767	34.7475	14.92	0.47	2.3	
2020	3	16	21	37	41.03	25.9469	35.3186	16.79	0.29	1.95	
2020	3	17	7	7	52.12	22.6228	31.5868	3.53	0.32	1.28	
2020	3	17	7	57	42.72	26.75	34.8903	24.87	0.39	2.26	
2020	3	17	8	38	24.52	28.8883	33.2057	12.71	0.04	1.56	
2020	3	19	19	13	7.55	25.226	34.0189	4.36	0.01	1.97	1.98
2020	3	20	19	18	6.62	27.6717	33.7785	18.61	0.18	2.23	
2020	3	21	17	7	19.18	23.5844	32.7815	5	0.1	1.05	1.1
2020	3	22	20	19	38.74	27.5553	34.1269	24.17	0.18	1.49	1.88
2020	3	24	21	50	38.74	27.7551	34.4267	26.24	0.22		1.54
2020	3	24	23	49	19.05	24.0943	36.3691	9.39	0.18	2.13	2.28
2020	3	25	11	4	25.83	25.3385	32.9086	10.57	0.12	2.04	
2020	3	25	12	47	41.86	29.5978	31.153	12.24	0.06	2.22	
2020	3	25	21	50	24.74	25.2587	34.5516	3.54	0.07	1.47	1.45
2020	3	26	7	26	14.11	28.944	32.6485	13.04	0.19	1.66	1.54
2020	3	27	15	41	34.27	27.7856	34.2405	2.59	0.11	1.9	1.85
2020	3	27	18	37	22.14	28.6301	34.5939	0.18	0.25	2.32	2.33
2020	3	27	18	41	1.79	27.1812	34.559	12.07	0.24	1.63	1.87
2020	3	28	12	8	43.32	27.8154	34.328	1.36	0.08	1.96	1.7
2020	3	29	16	40	29.61	28.1235	33.7522	12.35	0.1	1.61	1.64
2020	3	29	22	21	30.21	26.7294	34.9136	27.54	0.12	1.81	1.78
2020	3	30	5	2	40.86	28.1503	33.5483	17.83	0	1.17	1.08
2020	3	30	17	48	25.43	27.7579	34.3886	26.62	0.06	1.09	1.19
2020	4	1	5	41	56.56	28.7397	32.9318	6.4	0.23	1.63	1.38
2020	4	2	4	23	44.25	30.1392	31.7639	15.73	0.14	2.25	1.93
2020	4	4	1	20	36.03	23.7476	32.882	3.81	0.02		0.24

Year	Mon.	Day	Hour	Min.	Sec	Lat.	Long.	Depth	RMS	Xmag	Fmag
2020	4	4	18	22	59.46	29.7867	32.4394	18.89	0.18	2.06	2.13
2020	4	5	5	18	20.77	29.0037	34.7722	19.73	0.06	2.16	2.03
2020	4	5	6	22	19.77	29.0002	34.7294	23.99	0.08	2.01	
2020	4	5	7	54	51.54	29.0039	34.7649	15.78	0.03	1.76	
2020	4	5	14	47	48.48	29.0006	34.7524	15.92	0.02	1.75	
2020	4	6	11	39	29.16	23.4401	28.9822	19.74	0.08	2.12	
2020	4	6	15	21	20.16	27.539	34.2902	23.24	0.09	1.51	1.48
2020	4	6	19	8	28.18	28.4326	33.6468	4.56	0.07	1.04	1.09
2020	4	7	2	18	53.4	27.5222	34.1722	22.81	0.04	1.81	1.8
2020	4	7	6	55	44.87	28.4403	33.3661	6.64	0.14	1.56	
2020	4	7	18	11	0.84	29.0957	34.6772	6.55	0.2	1.3	1.36
2020	4	8	7	45	8.93	27.7266	33.5943	12.78	0.2	1.38	1.41
2020	4	8	19	9	4.7	27.7293	33.9149	15.21	0.15	1.41	1.36
2020	4	9	9	37	42.38	24.0884	36.4427	29.5	0.24	3.43	3.25
2020	4	9	15	2	25.34	25.1168	34.9434	29.39	0.23	2.12	2.39
2020	4	11	16	31	1.36	31.4898	26.9093	5.12	0.38	4.29	
2020	4	12	0	33	29.93	24.4783	36.2009	1.36	0.02	2.05	2.09
2020	4	12	8	44	59.23	22.8169	31.2748	1.03	0.08	1.39	
2020	4	12	8	49	30.39	28.4667	33.3131	6.06	0.23	3.13	
2020	4	12	17	23	24.57	24.6463	34.5143	3.2	0.17	1.93	1.99
2020	4	13	14	24	20.99	29.6376	31.1044	17.58	0.14	2.24	
2020	4	13	18	1	59.7	23.7521	33.1747	9.96	0.22	1.14	
2020	4	13	23	53	20.9	30.0445	31.9753	16.75	0.3	2.39	
2020	4	14	14	27	1.64	28.2783	33.3109	18.12	0.31	2.33	
2020	4	15	19	49	14.78	27.7812	34.2474	9.01	0.03	1.6	
2020	4	16	4	25	55.5	27.8794	34.2604	10.15	0.08	1.47	
2020	4	16	7	35	8.66	22.1551	30.0897	12.06	0.03	1.83	
2020	4	16	8	52	1.87	29.2925	35.0269	18.03	0.42	2.93	
2020	4	17	20	38	20.95	28.0168	33.9741	16.13	0.12	1.35	1.57
2020	4	18	8	4	32.6	22.8298	31.3167	3.39	0.18	1.87	1.97
2020	4	18	11	4	1.63	25.417	32.8472	25.47	0.16	1.67	1.74
2020	4	18	14	59	37.13	24.9492	34.6685	3.59	0.28	1.25	1.22
2020	4	18	17	42	16.92	28.2931	33.3079	21.95	0.15	2.03	2.18
2020	4	19	9	41	21.58	28.1098	33.9047	15.29	0.18	1.65	
2020	4	20	9	5	1.08	29.7482	30.8961	3.76	0.22	1.76	1.61
2020	4	20	10	34	46.92	22.5347	31.3574	6.26	0.15	1.83	2
2020	4	20	11	38	38.88	23.9181	36.6478	9.37	0.16	2.16	2.06
2020	4	20	20	23	5.8	24.3004	36.2041	8.03	0.13	1.25	1.56
2020	4	21	1	20	47.64	28.4966	34.982	6.18	0.08	2.19	2.01
2020	4	21	1	38	33.04	29.1816	34.8332	13.77	0.26	1.71	1.42
2020	4	21	7	38	15.8	22.8202	31.3019	2.64	0.17	1.9	1.98
2020	4	21	9	20	32.38	25.1494	33.0633	7.48	0.14	1.88	1.9

Year	Mon.	Day	Hour	Min.	Sec	Lat.	Long.	Depth	RMS	Xmag	Fmag
2020	4	21	13	8	3.77	22.4583	31.6516	29.71	0.04	1.44	
2020	4	21	16	42	2.53	27.5236	34.0615	18.82	0.19	2.84	2.8
2020	4	22	6	56	27.05	22.5134	31.4934	12.09	0.14	2.12	
2020	4	22	9	2	40.75	27.6688	34.3016	27.63	0.07	1.75	
2020	4	23	0	28	33.79	27.6666	33.7636	14.62	0.02	1.44	1.63
2020	4	23	13	28	23.8	27.9333	34.0002	6.66	0.17	2.16	2.13
2020	4	24	6	54	35.64	28.4862	34.6477	5.26	0.28	2.18	2.08
2020	4	24	9	44	23.89	24.9344	34.7215	5.73	0.32	2.41	2.12
2020	4	24	13	28	21.54	26.0152	35.3196	10.66	0.19	2.27	2.47
2020	4	24	18	33	11.59	24.1968	36.1683	3.49	0.17	1.94	2.11
2020	4	24	23	56	16.11	24.1924	36.1712	2.58	0.06	1.16	1.68
2020	4	25	6	48	4.94	24.8297	30.6082	3.54	0.18	2.26	2.18
2020	4	26	6	19	50.52	27.9928	34.4106	14.63	0.11	1.58	
2020	4	26	7	1	13.64	24.88	32.8997	18.06	0.15	2.09	2.32
2020	4	27	8	58	9.21	27.3718	34.0995	15.84	0.17	1.99	1.99
2020	4	27	10	22	1.91	27.6066	33.8461	24.12	0.09	1.66	
2020	4	27	20	23	38.59	28.9438	34.7022	19.64	0.11	1.44	1.48
2020	4	27	22	59	2.51	27.602	34.0233	23.52	0.06	1.43	
2020	4	27	23	3	20.86	27.301	34.4196	16	0.01	1.51	
2020	4	28	1	3	9.96	28.7508	34.6783	16.14	0.16	1.08	
2020	4	28	4	50	29.22	28.8606	34.6692	15.34	0.04	1.66	1.69
2020	5	1	1	49	15.22	28.8289	34.6971	15.25	0.11	1.77	
2020	5	1	7	44	56.96	28.0724	33.4061	14.25	0.27	3.34	2.9
2020	5	1	15	16	58.34	29.4109	34.9492	18.95	0.07	1.89	
2020	5	2	4	13	8.26	27.6728	33.7835	11.98	0.28	3.01	2.88
2020	5	2	23	21	47.35	27.6586	33.822	16.41	0.17	1.83	1.8
2020	5	3	1	14	11.21	27.6603	33.8216	17.96	0.05	1.45	
2020	5	3	16	9	28.9	23.8712	34.1352	10.23	0.49	2.78	2.73
2020	5	3	21	17	10.52	28.553	33.1874	3.35	0.25	2.18	
2020	5	3	23	54	30.26	27.5738	34.2303	23.29	0.2	1.72	
2020	5	4	3	43	39.98	23.6602	32.7038	10.6	0.09	1.76	1.91
2020	5	4	22	8	6.34	28.2469	33.2662	14.98	0.14	1.46	
2020	5	4	23	53	11.08	28.0835	33.4911	18.41	0.09	2.16	
2020	5	5	3	21	48.92	27.6728	33.2085	22.65	0.19	1.78	
2020	5	6	1	13	8.2	25.2444	34.5313	3.79	0.09	1.63	1.6
2020	5	6	9	52	18.42	28.5549	33.2028	19.77	0.19	1.81	1.88
2020	5	7	13	20	19.05	28.8453	34.6404	11.14	0.08	2.19	2.17
2020	5	7	16	16	59.51	28.3405	33.6997	14.27	0.04	1.69	1.79
2020	5	7	23	19	33.71	28.5076	34.8114	21.98	0.07	1.58	1.64
2020	5	8	5	57	58.07	27.7183	34.3468	13.25	0.03	1.58	1.6
2020	5	8	6	48	7.78	27.9725	34.3767	12.47	0	1.08	1.09
2020	5	8	7	40	35.28	27.5808	34.5213	7.46	0.13	1.33	1.41

Year	Mon.	Day	Hour	Min.	Sec	Lat.	Long.	Depth	RMS	Xmag	Fmag
2020	5	8	18	45	19.65	27.6017	33.8278	15.18	0.13	2.65	2.53
2020	5	8	18	58	25.62	27.6121	33.8491	16.21	0.05	1.58	1.59
2020	5	9	0	17	20.37	23.4262	32.6681	5	0.05	1.12	1.25
2020	5	10	17	9	43.14	27.1855	34.495	15.94	0.23	1.7	2.12
2020	5	12	6	26	41.06	27.8262	34.0727	10.37	0.25	1.49	1.86
2020	5	13	11	27	40.21	26.7756	34.6852	30.8	0.18	2.4	2.69
2020	5	13	22	8	7.08	28.6535	33.2164	5.52	0.11	1.11	1.28
2020	5	13	22	9	23.12	28.6581	33.2207	6.56	0.1	1.11	1.48
2020	5	14	3	32	38.68	28.1346	34.4705	25.41	0.19	1.61	2.21
2020	5	14	13	33	46.41	23.5606	32.6821	5.62	0.05		1.51
2020	5	15	5	41	41.53	26.6088	34.6055	29.88	0.14		3.17
2020	5	15	5	48	52.02	27.0903	34.74	10.52	1.98		1.71
2020	5	15	9	8	39.28	27.6825	34.4167	22.61	0.09	1.78	1.77
2020	5	15	19	31	58.77	34.0113	25.8686	0.04	1.25	3.86	
2020	5	16	19	53	30.53	27.633	34.4074	17.19	0.1	2.18	1.97
2020	5	17	3	10	10.61	28.609	34.9903	19.65	0.07		1.66
2020	5	18	16	50	40.64	28.1951	33.4156	16.4	0.28	2	2.11
2020	5	19	1	19	2.27	27.8923	34.5424	7.23	0.29	1.86	1.92
2020	5	19	6	14	23.08	28.5561	34.5575	5.28	0.11		1.85
2020	5	19	22	33	10.04	27.682	34.3857	16.01	0.12	2.15	
2020	5	21	7	32	36.7	23.5884	32.7673	2.11	0.07	0.96	1.02
2020	5	22	1	47	22.19	27.5871	34.4324	16.2	0.4	1.73	1.72
2020	5	22	2	13	59	29.0301	34.1124	2.59	0.13	0.97	
2020	5	22	15	58	30.54	23.6063	32.752	5.46	0.1	0.66	
2020	5	22	16	52	58.01	29.9585	31.0745	1.71	0.15	2.43	
2020	5	22	19	12	55.47	25.2514	34.5096	11.93	0.24	1.63	
2020	5	23	5	5	58.94	31.1345	33.7972	26.89	0.22	2.34	
2020	5	23	6	23	45.78	27.965	34.381	11.5	0.03	1.45	
2020	5	23	7	46	47.6	28.4545	33.3204	3.36	0.23	2.2	2.28
2020	5	23	10	4	23.66	25.1983	35.1909	10.16	0.08	2.57	2.4
2020	5	23	13	32	0.74	28.8676	34.6013	10.16	0.01	1.51	1.55
2020	5	23	16	11	37.11	28.2573	34.6546	4.02	0.25	3.28	2.91
2020	5	24	14	25	1.06	27.7443	33.3148	15.01	0.1	2.09	2.04
2020	5	24	14	25	2.65	27.6597	33.8174	18.38	0.18	1.95	
2020	5	24	15	2	35.5	24.969	34.7155	15.17	0.48	2.64	2.43
2020	5	24	20	38	55.75	28.3518	34.5613	9.89	0.22	1.95	2.23
2020	5	25	19	38	58.04	28.222	34.6854	2.29	0.5	2.35	
2020	5	26	13	19	52.21	24.7375	34.4038	26.76	0.42		2.55
2020	5	26	15	29	44.05	24.9205	34.8323	13.82	0.17	1.9	
2020	5	27	19	58	23.74	28.5084	33.3225	15.26	0.01	1.63	
2020	5	28	8	38	32.2	23.5845	32.5812	10.03	0.09	1.51	1.48
2020	5	29	14	8	56.14	27.7443	34.3058	23.45	0.11	1.91	1.55

Year	Mon.	Day	Hour	Min.	Sec	Lat.	Long.	Depth	RMS	Xmag	Fmag
2020	6	1	5	44	4.11	27.9933	32.8221	13.32	0.28	1.71	
2020	6	2	3	5	41.32	23.4251	32.6548	4.22	0.17	1.04	
2020	6	3	0	39	32.47	28.225	33.4098	8.1	0.25	1.21	
2020	6	3	0	59	51.65	23.5788	32.7037	11.46	0.04	1.34	
2020	6	3	20	57	40.72	22.089	35.9355	33	0.36	3.9	
2020	6	4	19	26	17.48	23.5758	32.6695	4.84	0.24	1.06	
2020	6	4	22	50	51.55	29.2135	34.6787	6.69	0.16	1.6	
2020	6	6	2	3	15.39	27.3707	34.1522	29.98	0.09	1.41	
2020	6	7	4	31	54.94	27.3541	34.6044	4.73	0.37	2.31	
2020	6	7	23	13	6.95	28.9601	34.8055	15.68	0.04	1.42	
2020	6	8	7	40	54.89	24.1889	36.3809	9.36	0.24	2.51	2.63
2020	6	8	15	11	18.22	27.7902	33.8909	17.37	0.08	1.51	1.71
2020	6	8	23	49	42.58	27.2413	31.6252	15.78	0.26	2.4	2.65
2020	6	9	5	12	11.83	22.666	31.4096	16.01	0.11	1.72	1.99
2020	6	9	10	16	27.97	23.5432	32.6881	12.31	0.13	1.78	
2020	6	9	12	33	46.49	29.7593	31.8804	9.98	0.08	2.09	
2020	6	9	19	21	42.18	29.1365	34.4389	16.16	0.16	1.69	
2020	6	9	21	26	26.2	23.7296	32.6448	21.07	0.22	1.33	
2020	6	10	1	28	58.79	28.4161	32.5986	12.15	0.43	1.7	
2020	6	11	1	15	12.15	27.1904	31.5325	9.6	0.25	3.03	2.99
2020	6	11	1	27	33.01	27.2419	31.754	6.45	0.11	2.79	2.6
2020	6	11	2	29	34.62	27.1628	31.6143	10.44	0.39	1.92	1.97
2020	6	11	2	48	27.76	27.2367	31.6174	14.93	0.34	2.34	
2020	6	11	3	48	5.09	27.3135	34.6369	14.16	0.41	2.78	
2020	6	11	13	18	12.58	27.2173	31.7693	11.99	0.24		2.52
2020	6	12	17	29	8.99	23.5501	32.684	11.82	0.21	1.33	1.37
2020	6	12	23	36	0.48	27.5805	34.0677	16.77	0.18	1.26	1.21
2020	6	13	14	7	37.64	28.2958	33.3195	10.08	0.23	1.38	1.43
2020	6	13	18	32	11.74	27.6273	33.8243	21.97	0.08	1.77	
2020	6	14	1	13	22.84	23.6645	32.8269	3.49	0.17	1.04	1.08
2020	6	14	4	41	54.88	27.4245	32.501	3.7	0.23	2.26	2.15
2020	6	15	21	34	12.74	26.0231	29.2106	10.2	0.04	1.81	
2020	6	16	8	31	28.27	23.5685	32.6948	8.97	0.08	1.12	1.25
2020	6	16	14	30	25.04	27.1668	34.6786	23.34	0.36	5.45	
2020	6	16	14	43	57.67	27.2922	34.4986	16.51	0.04	2.21	
2020	6	16	15	9	9.23	27.1498	34.6181	25.62	0.09	2.13	
2020	6	16	15	23	54.28	27.2755	34.4692	15.47	0.17	1.99	
2020	6	16	15	27	44.99	27.1691	34.6367	14.8	0.29	2.29	
2020	6	16	15	39	45.46	27.1559	34.6524	30.37	0.2	2.24	
2020	6	16	15	58	2.16	27.1645	34.5598	30.47	0.25	2.54	
2020	6	16	16	25	25.72	27.1279	34.6519	28.18	0.08	1.95	
2020	6	16	16	28	5.64	27.1646	34.6497	28.25	0.24	2.17	

Year	Mon.	Day	Hour	Min.	Sec	Lat.	Long.	Depth	RMS	Xmag	Fmag
2020	6	16	16	56	48.9	27.2184	34.7336	10.91	0.07	2.55	
2020	6	16	17	6	51.85	27.1773	34.6151	26.29	0.34	3.41	
2020	6	16	17	14	22.34	27.1468	34.6359	21.99	0.2	1.85	
2020	6	16	17	44	34.43	27.1307	34.5666	3.18	0.25	2.98	
2020	6	16	18	3	19.47	27.172	34.6171	27.05	0.2	1.79	
2020	6	16	19	35	1.78	27.1999	34.6222	30.09	0.34	3.61	
2020	6	16	20	14	22.71	27.3173	34.4633	6.06	0.28	2.04	
2020	6	16	20	17	15.54	27.3264	34.3301	20.01	0.22	1.57	
2020	6	16	20	37	12.54	27.2661	34.5038	13.02	0.09	2.33	
2020	6	16	21	0	18.69	26.7598	35.2989	25.01	0.13	2.76	
2020	6	16	23	11	21.29	27.1466	34.7128	23.49	0.33	3.04	
2020	6	17	0	11	56.03	24.0281	31.8258	2.97	0.04	1.35	
2020	6	17	2	19	39.6	27.1677	34.6339	31.11	0.1	1.82	
2020	6	17	2	39	1.05	27.1589	34.6337	15.94	0.17	1.69	
2020	6	17	3	22	51.96	27.281	34.5242	14.88	0.04	1.21	1.42
2020	6	17	8	5	55.32	27.1715	34.6396	28.66	0.17	2.14	2.15
2020	6	17	10	43	30.03	29.3221	32.8709	7.1	0.14		2.01
2020	6	17	18	12	35.3	27.1781	34.7672	32.17	0.27	2.33	2.68
2020	6	17	22	12	6.27	24.1859	36.1648	13.94	0.16		2.33
2020	6	17	22	56	37.42	22.1	32.5763	0.08	0.38		2.15
2020	6	17	23	57	34.16	27.1478	34.6632	14.46	0.28	1.7	1.88
2020	6	18	0	0	22.27	27.223	34.536	18.4	0.19	1.05	1.4
2020	6	18	0	8	44.32	28.3615	34.5671	13.92	0.16	1.16	1.25
2020	6	18	0	37	35.98	27.1422	34.6152	30.76	0.09	1.81	1.93
2020	6	18	1	9	28.81	27.1448	34.6489	10.31	0.2	1.85	1.9
2020	6	18	10	55	22.74	26.9216	34.7951	31.66	0.07	1.7	1.76
2020	6	18	18	30	24.32	27.1732	34.6003	24.36	0.08	1.92	2.25
2020	6	19	4	31	4.86	27.1239	34.6332	20.23	0.14	2.15	2.64
2020	6	19	6	18	38.66	27.1524	34.5968	31.1	0.08	2.15	2.61
2020	6	20	1	47	32.2	27.2072	34.7772	30.01	0.11	2.27	
2020	6	20	6	9	32.53	23.5539	32.6859	12.8	0.16	1.91	
2020	6	20	19	47	25.77	27.1712	34.7709	19.21	0.15	2.46	
2020	6	21	18	33	17.14	23.5706	32.6588	9.48	0.17	0.97	1.51
2020	6	21	21	37	17.53	27.1823	34.626	27.89	0.34	1.55	1.96
2020	6	22	2	32	25.04	29.9902	31.9876	14.87	0.24	1.53	1.52
2020	6	22	4	15	3.42	29.9345	31.9881	13.38	0.21	1.86	1.56
2020	6	22	5	43	1.53	23.577	32.6563	10.67	0.16	1.06	1.41
2020	6	22	19	36	11.89	23.5439	32.5952	4.64	0.07	0.97	1.02
2020	6	22	22	32	50.18	24.1184	36.2604	2.05	0.38	2.15	2.43
2020	6	23	4	49	47.13	23.5196	32.5995	6.2	0.15	0.91	1.08
2020	6	23	6	7	58.15	27.1303	34.41	14.13	0.19	1.47	1.8
2020	6	23	14	34	16.64	28.8523	34.6877	11.12	0.11	1.3	1.01

Year	Mon.	Day	Hour	Min.	Sec	Lat.	Long.	Depth	RMS	Xmag	Fmag
2020	6	24	3	56	48.64	28.1811	34.492	12.75	0.22	1.95	1.74
2020	6	24	19	8	45.54	27.191	34.5895	22.74	0.22	2.02	2.14
2020	6	25	2	55	2.15	28.0198	34.4523	6.22	0.28	2.7	2.54
2020	6	25	4	16	45.57	23.5464	32.688	8.04	0.23	2.37	1.96
2020	6	25	4	30	13.73	23.541	32.6924	3.65	0.23	2.26	2.08
2020	6	25	4	34	43.86	23.5535	32.69	3.5	0.22	1.95	1.73
2020	6	25	5	44	32.23	23.5524	32.6851	11.38	0.22	2.04	1.9
2020	6	25	6	2	9.35	28.3612	34.5919	15.68	0.17	1.52	1.93
2020	6	25	19	6	6.74	21.9548	34.7407	5.75	0.24	2.59	
2020	6	25	23	11	24.78	25.2612	34.5433	5.66	0.16	2.67	
2020	6	26	17	14	45.12	24.1479	36.1118	4.54	0	2.03	
2020	6	28	11	26	1.35	29.6097	31.1609	15.1	0.09	1.95	1.91
2020	6	29	3	19	55.67	28.8312	34.6653	20.05	0.1	1.88	1.87
2020	6	29	9	19	41.07	28.5331	34.6458	12.91	0.02	1.79	
2020	6	30	0	2	48.91	28.4302	33.1972	8.33	0.1		1.91
2020	6	30	17	53	23.19	23.6046	32.7067	8.79	0.41	1.26	1.34
2020	7	1	6	13	14.14	24.1602	36.3619	9.43	0.33	2.34	2.52
2020	7	1	19	36	45.3	27.1896	34.7011	29.11	0.44	2.36	2.42
2020	7	1	19	38	31.38	23.9043	28.8831	6.09	0.17	3.4	
2020	7	2	18	13	26.73	25.1659	32.7959	11.93	0.27	2.07	
2020	7	2	19	20	14.33	22.6431	30.9154	15.96	0.34	2.16	
2020	7	3	4	28	10.31	22.3731	34.5243	17.09	0.08	2.28	
2020	7	4	4	36	52.34	29.181	31.6122	12.74	0.05	2.55	2.57
2020	7	4	22	34	49.39	23.5571	32.6947	8.12	0.12		1.1
2020	7	5	15	36	57.67	25.5095	33.1972	3.66	0.43		2.21
2020	7	5	18	41	1.42	27.2082	34.5675	0.52	3.89		2.17
2020	7	5	18	55	29.03	26.269	34.6018	8.65	0		2.84
2020	7	6	3	24	2.67	23.5487	32.6836	4.07	0.1		1.87
2020	7	6	5	32	8.89	22.8271	31.3186	6.87	0.11	1.79	2.58
2020	7	7	6	5	26.34	28.5784	34.5408	2.53	0.22	1.99	
2020	7	7	6	19	41.54	28.5702	34.5296	5	0.43	1.69	
2020	7	7	21	28	26.2	28.5858	34.539	6.3	0.01	1.52	1.62
2020	7	8	2	38	15.7	23.5754	32.695	10.33	0.07	1.17	1.57
2020	7	8	16	10	40.71	28.5585	33.116	11.64	0.42	0.88	
2020	7	9	7	31	40.37	24.0076	28.9285	2.61	0.42	2.12	
2020	7	9	13	46	33.04	29.0817	32.6201	12.46	0.38	3.76	
2020	7	9	21	15	31.09	27.2008	34.6089	15.68	0.34	2	
2020	7	10	22	37	32.92	27.752	33.9865	14.76	0.12	1.44	
2020	7	11	6	40	2.56	28.8631	34.6391	12.81	0.29	2.29	
2020	7	13	5	17	42.04	23.5781	32.7791	1.92	0.23	1.63	1.56
2020	7	14	3	51	36.73	28.0268	33.7807	18.44	0.39	1.81	
2020	7	14	20	38	46.53	21.2329	38.0713	12.02	0.05	3.68	

Year	Mon.	Day	Hour	Min.	Sec	Lat.	Long.	Depth	RMS	Xmag	Fmag
2020	7	14	23	15	43.43	27.7244	34.162	22.29	0.17	1.47	
2020	7	15	0	28	50.56	27.5234	33.898	14.04	0.11	1.28	1.53
2020	7	15	4	31	41.92	23.8953	28.8326	12.58	0.12	2.35	
2020	7	15	4	59	0.38	29.7734	30.7362	3.59	0.24	2.3	
2020	7	15	20	26	23.46	27.1484	34.673	29.54	0.48	2.18	
2020	7	16	20	58	4.87	23.5502	32.7244	9.84	0.04	0.99	
2020	7	17	4	9	30.93	27.6602	33.9883	6.96	0.05	2.04	2.08
2020	7	17	20	23	32.81	24.9916	30.4083	7.77	0.19	1.65	
2020	7	17	22	51	43.96	27.1681	34.4952	23.58	0.09	1.19	
2020	7	18	2	22	10.37	27.7063	34.2587	6.36	0.29	1.2	
2020	7	18	11	21	30.81	28.611	32.4933	6.3	0.17	1.45	
2020	7	19	0	21	32.67	27.1592	34.599	25.79	0.27	2.39	2.44
2020	7	19	3	14	18.47	28.6782	33.0611	4.89	0.15	2.09	2.15
2020	7	19	5	24	32.04	27.1711	34.6436	30.65	0.23	1.37	1.41
2020	7	19	6	4	39.26	24.0681	36.1231	4.67	0.01	2.48	2.44
2020	7	19	9	42	28.79	27.6427	34.1582	23.58	0.07	1.79	1.74
2020	7	19	19	28	40.8	28.0019	33.328	28.33	0.04	1.35	1.28
2020	7	20	10	19	27.15	23.6575	32.7102	9.74	0.06	1.65	
2020	7	22	2	6	44.87	27.1423	34.5743	21.14	0.09	1.36	
2020	7	23	8	23	59.86	29.0955	34.8618	21.65	0.03	1.63	
2020	7	23	9	31	52.13	28.7845	34.6356	21.31	0.01	1.24	
2020	7	23	14	14	29.81	23.5696	32.6888	14.63	0.07	1.17	
2020	7	23	15	55	51.01	23.5573	32.6817	15.46	0.08	1.35	
2020	7	24	16	35	16.93	23.9189	32.4703	25.28	0.07	1.1	
2020	7	24	16	57	33.89	23.5719	32.6904	15.92	0.06	1.14	
2020	7	24	18	51	37.33	29.9739	30.6546	16.65	0.06	2.67	
2020	7	24	21	54	28.07	23.564	32.6871	15.3	0.09	1.28	
2020	7	24	23	9	10.41	23.837	32.4513	20.18	0.08	1.34	
2020	7	25	14	57	27.21	24.9394	34.7036	5.08	0.07	1.56	
2020	7	26	10	22	35.26	27.6013	33.9446	21.74	0.17	2.22	2.34
2020	7	26	10	36	35.65	23.938	32.6508	24.75	0.34	1.25	0.84
2020	7	26	20	21	55.82	27.5474	34.3976	11.65	0.29	1.63	1.69
2020	7	26	20	26	17.14	27.4234	34.4358	19.06	0.31	1.61	1.8
2020	7	26	23	53	7.93	27.8463	34.409	12.09	0.04	1.49	1.54
2020	7	27	1	16	49.61	24.3452	36.1121	2.1	0.29	1.3	2.08
2020	7	28	11	38	45.18	27.959	34.3833	15.22	0.08	1.09	1.17
2020	7	28	21	6	18.48	27.4891	34.3842	20.87	0.04	1.33	1.61
2020	7	29	3	27	16.92	23.4394	31.9838	11.03	0.17	1.68	2.25
2020	7	29	9	0	5.08	28.7482	34.6621	11.05	0.14	1.07	1.47
2020	7	29	9	9	49.14	28.7592	34.6486	11.85	0.13	1.23	1.78
2020	7	29	9	12	42.4	28.7595	34.6432	8.93	0.14	0.78	1.02
2020	7	30	2	39	34.54	27.6691	34.4389	14.19	0.3	1.74	1.65

Year	Mon.	Day	Hour	Min.	Sec	Lat.	Long.	Depth	RMS	Xmag	Fmag
2020	7	30	13	48	39.93	27.9903	33.7808	8.99	0.13	1.01	1.45
2020	7	30	20	28	37.83	21.529	31.6756	7.9	0.29	1.81	2.09
2020	7	30	21	17	32.45	23.544	32.6872	3.62	0.3	1.92	1.46
2020	7	31	9	17	2.14	26.664	34.8977	20.54	0.38	2.86	2.62
2020	7	31	10	29	46.13	28.6179	34.6873	1.58	0.28	1.89	1.97
2020	8	1	13	44	22.8	29.8281	31.9541	8.34	0.31	1.73	1.29
2020	8	1	20	34	28.14	24.3651	36.1173	1.75	0.36	2.06	2.54
2020	8	2	2	43	58.23	25.7372	34.0174	3.71	0.22	1.53	1.37
2020	8	2	2	44	48.54	27.3418	34.5794	11.2	0.29	1.13	1.45
2020	8	2	20	23	28.51	24.1624	36.2838	21.6	0.26	1.32	1.78
2020	8	2	20	52	47.42	29.9612	32.0211	9.57	0.12	1.72	1.35
2020	8	2	23	20	1.62	26.0181	35.5319	14	0.38	2.81	2.69
2020	8	3	5	30	32.83	27.6529	34.5024	4.04	0.15	2.09	1.93
2020	8	4	0	54	27.85	23.9352	28.849	16.89	0.26	1.68	2.88
2020	8	4	12	29	2.01	28.3095	34.568	1	0.16	2.14	1.81
2020	8	4	15	8	26.31	33.4849	35.1543	0.08	0.29	3.21	3.13
2020	8	4	21	17	51.95	29.9616	31.9751	16.77	0.09	1.92	1.82
2020	8	4	22	17	42.85	28.8835	34.6686	7.01	0.23	0.83	0.98
2020	8	4	23	6	45.34	28.8562	34.7843	22.54	0.13	0.89	0.97
2020	8	5	4	1	42.63	28.536	34.6429	5.53	0.09	1.47	1.44
2020	8	5	15	52	21.96	27.5826	34.0749	25.62	0.11	2.12	2.06
2020	8	6	0	37	18.25	28.863	34.6902	19.76	0.03	0.85	1.34
2020	8	6	11	35	24.17	28.248	34.5692	3.34	0.18	1.63	
2020	8	8	3	47	37.34	23.5689	32.7175	11.12	0.14	1.47	
2020	8	9	2	3	58.08	29.0643	33.9668	6.71	0.07	1.16	
2020	8	9	7	17	13.93	27.6162	33.866	16	0.13	1.55	
2020	8	9	11	47	51.59	23.6063	32.7214	3.76	0.23	1.03	
2020	8	9	14	38	57.18	23.5556	32.6677	7.38	0.07	0.76	
2020	8	9	20	45	40.7	27.6906	34.5083	2.77	0.13	1.79	
2020	8	9	23	23	4.51	27.4726	34.5144	17.44	0.46	1.97	
2020	8	10	0	6	45.93	27.6312	33.8255	16.97	0.23	1.4	
2020	8	10	13	13	1.65	29.2513	34.46	6.99	0.13		1.85
2020	8	10	22	36	15.19	23.574	32.7247	7	0.25	1.15	
2020	8	11	4	4	45.88	23.5965	32.7297	12.49	0.13	1.63	
2020	8	11	4	8	23.62	24.3951	36.4349	6.64	0.22	2.09	
2020	8	11	5	3	59.74	22.8318	31.2514	0.03	0.33	1.67	
2020	8	11	23	39	27.13	23.583	32.731	14.88	0.2	0.78	
2020	8	12	13	40	37.82	24.494	34.8093	17.3	0.12	2	
2020	8	12	13	45	55.56	31.3517	31.6996	30.07	0.19	3.29	
2020	8	13	21	21	48.53	24.019	36.3193	3.62	0.07	2.09	
2020	8	13	21	29	33.34	24.1077	36.1766	8.04	0.14	2.53	
2020	8	13	21	35	17.32	24.0883	36.1364	3.61	0.07	1.82	

Year	Mon.	Day	Hour	Min.	Sec	Lat.	Long.	Depth	RMS	Xmag	Fmag
2020	8	13	22	59	48.34	27.7319	34.3712	12.38	0.3	3.62	
2020	8	14	14	11	19.42	24.0753	36.2092	25	0.17	1.82	
2020	8	14	16	52	53.98	30.0753	33.6355	19.15	0.09	1.8	
2020	8	14	19	59	44.76	24.1182	36.2683	25.42	0.18	1.79	
2020	8	14	20	40	6.86	28.2535	33.2417	9.7	0.39	1.76	
2020	8	15	3	49	56.98	23.5615	32.7204	4	0.16	3.2	
2020	8	15	5	18	39.71	25.3273	34.6101	9.04	0.17	1.89	
2020	8	15	9	21	37.5	24.0992	34.8617	3.51	0.05	1.13	1.22
2020	8	15	10	32	37.38	23.5864	32.7115	7.45	0.13	0.89	0.87
2020	8	15	12	12	51.25	28.2624	32.2488	11.62	0.21	2.4	
2020	8	15	16	56	5.37	27.7374	34.3039	12.87	0.28	1.08	1.18
2020	8	16	1	4	52.89	23.5784	32.7146	3.5	0.26	1.15	
2020	8	16	1	42	29.36	27.1643	34.6125	28.27	0.26	1.44	
2020	8	16	2	31	1.34	28.4204	34.6469	3.63	0.21	1.4	
2020	8	16	12	27	48.31	27.6044	34.3399	16.77	0.23	1.99	
2020	8	16	19	17	22.74	23.5729	32.7072	5.01	0.18		1.05
2020	8	16	21	29	37.84	24.4476	35.1452	7.06	0.29	2.66	
2020	8	17	6	57	2.85	28.4971	34.6349	11.93	0.13	1.9	
2020	8	17	7	4	53.54	28.4963	34.6284	0.05	0.18	2.56	
2020	8	17	12	36	48.13	29.3191	32.8941	6.59	0.07	2.5	
2020	8	18	1	17	4.96	24.3535	35.3224	0.02	0.62	3.1	
2020	8	18	3	51	55.06	24.409	34.9582	5.03	0.45	2.09	
2020	8	18	12	33	53.61	23.582	32.774	5.02	0.1	1.37	
2020	8	18	16	28	27.55	29.2381	32.7784	11.85	0.17	2.03	
2020	8	19	12	17	5.95	27.1826	34.6176	4.76	0.2	2.55	
2020	8	19	13	5	22.8	29.4168	32.8422	2.61	0.35	2.53	
2020	8	19	20	26	17.37	27.6177	34.276	18.47	0.35	2.8	2.62
2020	8	19	21	8	46.12	27.6594	34.3472	13.86	0.01	1.8	
2020	8	20	19	21	6.89	29.4196	35.1436	15.3	0.37	2.34	
2020	8	20	22	53	3.19	27.5779	34.3911	16.22	0.04		1.69
2020	8	22	2	4	8.53	27.4373	34.6289	7.61	0.31	3.2	
2020	8	22	2	24	3.13	28.4162	32.9308	15.89	0.26	2.57	2.66
2020	8	22	6	29	54.44	27.903	34.6909	18.37	0.07	2.13	2.11
2020	8	23	1	30	26.6	23.3833	32.6872	3.12	0.18		2.45
2020	8	23	15	0	45.27	25.1886	35.0984	30.51	0.01		1.26
2020	8	24	0	37	7.11	23.804	32.6177	30.01	0.5		1.56
2020	8	24	4	51	53.3	27.4108	34.3809	18.3	0.18	1.92	
2020	8	24	17	26	20.54	25.1073	29.4732	5.02	0.32	1.59	
2020	8	25	2	11	46.68	23.5876	32.6643	13.89	0.21	0.7	
2020	8	26	7	7	42.13	28.631	31.9892	3.63	0.38	2.59	
2020	8	27	20	22	41.98	23.5616	32.6965	11.15	0.06	0.55	
2020	8	28	11	48	27.02	23.5632	32.5699	9.62	0.3		1.73

Year	Mon.	Day	Hour	Min.	Sec	Lat.	Long.	Depth	RMS	Xmag	Fmag
2020	8	29	20	45	26.57	29.0341	34.6311	11.34	0.01	1.52	
2020	8	29	20	46	29.79	32.0002	26.1947	13.4	0.28	2.73	
2020	8	30	0	24	52.3	23.9082	36.5545	9.57	0.23	1.99	
2020	8	31	17	17	34.66	26.8994	34.8608	31	0.14	2.43	
2020	9	1	4	47	15.55	23.1514	33.3134	9.04	0.17	1.43	1.72
2020	9	1	5	28	52.96	28.8393	32.9245	19.3	0.22	2.31	2.13
2020	9	1	8	13	11.25	23.5684	32.5882	6.99	0.14		1.07
2020	9	1	9	0	47.55	27.684	33.3904	7	0.17		1.7
2020	9	1	9	37	33.77	27.8356	33.336	7	0.04	1.9	
2020	9	1	13	47	9.38	28.839	34.6609	11.71	0		1.34
2020	9	2	3	53	44.05	28.9137	34.6252	19.32	0.14	1.53	
2020	9	4	16	25	47.62	23.5934	32.7436	10.42	0.03		1.13
2020	9	4	16	45	20.28	23.59	32.7465	9.4	0.03		0.8
2020	9	4	18	4	38.02	25.3371	34.5011	14.25	0.21	1.66	
2020	9	4	23	28	54.32	23.5774	32.7146	10.85	0.05	1.46	
2020	9	5	2	22	17.06	24.3711	34.9795	10.99	0.15	2.09	
2020	9	5	11	5	14.83	23.5759	32.7797	7.42	0.17		1.8
2020	9	5	23	47	32.85	28.909	34.6157	9.7	0.24	1.77	
2020	9	6	0	20	30.89	23.5557	32.7313	6.81	0.44	1.41	
2020	9	6	5	29	46.93	22.5289	31.4825	13.91	0		2.3
2020	9	6	15	15	28.3	27.1734	34.6487	16.18	0.24	1.4	
2020	9	6	17	0	52.76	29.174	34.729	7.01	0.37	2.14	
2020	9	6	18	24	13.44	27.2875	34.5366	11.15	1.47	1.58	
2020	9	7	4	27	17.96	22.8287	31.271	0.06	0.29		2.07
2020	9	7	19	36	40.05	28.4241	32.8571	23.11	0.2	1.36	
2020	9	7	22	10	13.59	23.5517	32.6881	24.3	0.23	2.51	
2020	9	9	3	11	25.22	23.5666	32.679	3.6	0.19	1.26	
2020	9	9	16	13	7.81	27.9516	33.8786	3.25	0.21	1.24	
2020	9	9	19	0	19.6	28.5578	34.6281	5.1	0.11	1.87	
2020	9	10	1	54	7.92	27.5215	33.9763	13.2	0.32	3.45	
2020	9	10	4	54	15.58	25.8942	35.4779	5	0.26	2.6	
2020	9	10	8	40	0.81	27.8098	34.2829	10.33	0.26	2.99	3
2020	9	10	16	43	4.59	27.1651	34.6252	8.66	0.32	2.07	
2020	9	10	20	0	7.33	27.53	34.294	21.79	0.23	1.33	
2020	9	10	20	50	55.86	26.8677	34.7015	15.44	0.36	2.33	
2020	9	12	15	57	35	23.5332	32.6091	10.95	0.07	1.45	1.44
2020	9	12	18	18	4.08	27.5918	34.2183	11.78	0.24	1.78	1.88
2020	9	12	23	9	55.89	25.1733	34.4817	9.5	0.14	1.81	1.88
2020	9	13	0	24	53.89	29.6111	31.1206	7.35	0.3	2.56	2.48
2020	9	13	1	49	44.45	24.5342	36.0667	12.36	0.11	2.16	2.23
2020	9	13	5	7	13.56	27.156	34.6193	11.67	0.35	2.05	2.12
2020	9	13	15	27	54.43	23.5678	32.6716	3.46	0.3	1.53	

Year	Mon.	Day	Hour	Min.	Sec	Lat.	Long.	Depth	RMS	Xmag	Fmag
2020	9	13	23	38	26.93	27.815	34.3668	3.59	0.37	2.08	
2020	9	14	12	42	20.89	22.7699	31.5278	3.82	0.36	2.14	2.38
2020	9	14	14	1	36.71	28.5469	34.6887	8.15	0.27		1.36
2020	9	14	19	43	32.13	28.2977	33.4179	12.14	0.31	1.12	1
2020	9	15	17	21	57.09	23.5782	32.6683	5.61	0.11	1.26	
2020	9	15	20	16	33.83	24.2146	36.5058	9.62	0.09	2.32	
2020	9	15	22	10	45.89	23.5827	32.7184	7.48	0.04	1.42	
2020	9	16	18	12	38.54	28.8553	34.7317	15.19	0.17	1.53	
2020	9	16	22	21	14.36	28.449	33.1324	14.8	0.09	1.27	
2020	9	16	22	43	45.9	24.2524	36.5392	19.27	0.31	2.69	
2020	9	17	10	37	4.64	23.5487	32.6947	8.61	0.09	1.56	
2020	9	17	13	30	42.96	27.6369	33.826	9.87	0.01	1.1	
2020	9	18	18	54	33.58	24.9625	32.7639	4.35	0.47	1.82	
2020	9	18	20	19	58.16	26.7144	34.3458	10	0.07	1.62	
2020	9	18	21	19	33.72	25.9099	30.0837	9.58	0.11	1.98	
2020	9	19	17	49	25.33	23.53	32.5591	9.28	0.06	0.73	0.54
2020	9	20	0	1	40.87	23.4015	32.7421	9.76	0.13	1.01	1.12
2020	9	20	3	46	37.4	27.6704	34.3148	19.99	0.36	2.19	2.18
2020	9	20	16	14	11.95	22.8218	31.4751	5.01	0.21	1.01	
2020	9	20	22	53	52.44	27.3698	34.477	18.01	0.23	1.85	
2020	9	21	3	44	20.51	31.8528	30.7287	19.5	0.41	3.23	
2020	9	22	4	30	12.06	28.0737	33.9448	13.91	0.07	1.68	
2020	9	24	17	46	43.58	24.125	36.3329	4.71	0.27	2.57	
2020	9	24	17	47	1.49	24.4843	34.7585	5.51	0.01	2.59	
2020	9	24	17	52	37.2	24.0885	36.4325	3.66	0.24	2.84	
2020	9	24	22	28	23.6	23.5965	32.8065	7	0.03	0.96	
2020	9	25	12	3	43.58	23.5449	32.5799	17.6	0.05	1.11	
2020	9	25	12	42	19.84	27.5919	34.3387	14.03	0.27	2.43	
2020	9	25	13	37	33.36	27.658	34.1933	7.09	0.02	1.54	
2020	9	25	20	22	33.95	27.4937	33.9933	16.32	0.48	3.83	
2020	9	26	1	3	37.72	26.2184	35.0174	27.99	0.19	2.35	
2020	9	26	1	49	0.43	34.3596	25.3799	10.01	0.28	3.66	
2020	9	26	20	3	14.69	23.5504	32.6895	10.01	0.06	1.14	
2020	9	27	5	38	13.88	27.5857	33.9371	9.95	0.07	1.33	
2020	9	28	0	16	38.19	24.7452	33.561	11.11	0.36	2.29	
2020	9	28	16	36	39.56	21.5482	32.0243	3.7	0.77	1.88	
2020	9	30	11	53	18.64	23.531	32.7004	4.57	0.11	1.44	1.51
2020	9	30	15	42	49.66	27.4207	34.4162	22.02	0.25	1.96	
2020	9	30	15	45	16.4	26.9249	34.785	26.01	0.19	1.76	
2020	9	30	16	39	45.44	26.9273	34.7849	31.12	0.06	2.33	
2020	10	1	1	5	34.85	29.2852	34.693	3.49	0.05	1.6	
2020	10	1	11	44	33.87	27.4949	33.9283	14.85	0.15	2.07	

Year	Mon.	Day	Hour	Min.	Sec	Lat.	Long.	Depth	RMS	Xmag	Fmag
2020	10	1	21	3	1.92	28.8274	34.6868	16.19	0.12		1.44
2020	10	2	0	39	49.99	29.2323	34.5011	8.56	0.09		2.02
2020	10	2	10	18	18.8	26.7108	34.9775	28.27	0.23	2.28	
2020	10	2	12	53	54.68	29.8313	32.5529	5.57	0.21		1.76
2020	10	2	14	10	8.24	27.6212	34.3554	18.36	0.27	2.5	
2020	10	2	19	8	28.06	27.6266	34.3309	17.25	0.3	2.95	
2020	10	2	23	34	48.09	27.6232	34.1365	24.35	0.19	1.52	
2020	10	3	1	17	47.22	27.6591	34.288	16.72	0.18	2.07	
2020	10	3	1	51	10.55	27.6138	34.2306	23.23	0.17	1.7	
2020	10	3	3	6	3.1	27.6145	34.3253	16.42	0.15	1.7	
2020	10	3	12	46	26.33	27.6178	34.3686	19.32	0.18	2.4	2.14
2020	10	3	12	47	36.72	27.633	34.2053	22.6	0.05	1.99	1.95
2020	10	3	16	55	14.53	27.6119	34.2624	16.27	0.04	1.53	
2020	10	3	17	22	15.77	24.6233	35.91	17.46	0.07	1.72	2.11
2020	10	3	18	1	42.25	27.6258	34.2028	15.22	0.3	1.86	1.78
2020	10	3	19	55	54.67	29.5146	31.8577	9.7	0.25	2.19	
2020	10	3	20	25	25.08	27.706	34.2508	9.57	0.03	1.2	
2020	10	3	20	58	48.49	27.6843	34.3229	12.93	0.01	1.31	
2020	10	3	21	25	16.97	27.6265	34.1695	22.43	0.14	1.53	
2020	10	3	22	16	12.14	27.5238	33.9994	21.96	0.01	1.86	
2020	10	4	1	18	10.39	27.613	34.2955	14.81	0.04	1.83	
2020	10	4	3	25	19.59	27.6175	34.2214	22.69	0.13	1.78	
2020	10	4	4	50	48.03	27.9049	34.6246	17.25	0.26	2.31	2.25
2020	10	4	7	17	5.97	27.656	34.245	16.4	0.07		1.57
2020	10	4	16	12	55.49	28.8648	34.6487	10.92	0	2.09	
2020	10	4	20	0	10.34	23.5011	32.2162	2.31	0.08	2.71	
2020	10	4	22	57	12.17	27.5043	33.8641	22.58	0.14		2.44
2020	10	5	11	5	55.54	28.8389	34.7242	13.12	0.01		2.05
2020	10	5	15	38	29.99	27.3647	34.4345	8.15	0	2	
2020	10	5	16	37	18.95	28.4534	34.7507	17.79	0.37	1.71	
2020	10	5	17	28	12.89	28.4424	34.6679	10.19	0.46		2.06
2020	10	5	17	47	45.42	28.4709	34.6311	9.95	0.16		1.76
2020	10	5	18	7	42.25	27.6117	34.2449	17.29	0.15		2.33
2020	10	5	19	20	15.41	27.4005	34.2887	20.12	0.01	2.08	
2020	10	5	21	31	42.7	27.612	34.3116	13.42	0.01	1.62	
2020	10	6	1	1	45.36	29.7621	30.7738	4.25	0.36	3.04	
2020	10	6	3	17	55.85	27.625	34.0584	10.61	0	1.44	
2020	10	7	5	54	39.04	27.6313	34.2777	17.66	0.13	1.53	
2020	10	7	6	12	49.81	27.585	34.4142	11.29	0	1.56	
2020	10	7	21	28	45.2	22.7887	31.5174	4.02	0.24	2.51	
2020	10	8	5	13	53.71	27.5801	34.3528	11.07	0.11	1.41	
2020	10	8	18	36	15.18	28.4836	33.1658	9.99	0.32	1.29	

Year	Mon.	Day	Hour	Min.	Sec	Lat.	Long.	Depth	RMS	Xmag	Fmag
2020	10	8	20	24	43.32	27.7247	34.3871	3.71	0.4	1.77	
2020	10	8	20	39	6.01	26.7139	34.8595	30.26	0.44	2.61	
2020	10	9	15	17	40.56	27.6106	34.2243	12.1	0.08		2.07
2020	10	10	6	9	6.26	28.4566	34.636	4.34	0.25	2.03	
2020	10	10	12	3	34.98	29.3795	31.7626	9.23	0.15	2.03	
2020	10	10	18	7	24.58	27.5708	34.3769	17.21	0.18		1.7
2020	10	12	10	22	22.87	24.1557	32.9087	5	0.19		1.53
2020	10	12	13	46	48.04	27.6217	34.2289	20.13	0.16	1.55	
2020	10	13	1	38	13.12	27.5921	34.4158	11.87	0	1.79	
2020	10	13	7	2	58.35	27.5903	34.45	3.78	0.1	1.35	
2020	10	13	14	53	58.23	27.6549	35.2996	10.01	2.79	1.53	
2020	10	13	18	52	50.58	27.6165	34.1414	15.06	0.01	1.3	
2020	10	13	18	58	39.31	27.6852	33.9171	14.27	0.19	1.11	
2020	10	13	23	23	41.29	28.8589	34.7426	15.87	0.2	1.22	
2020	10	14	5	56	9.5	28.5654	33.4648	52.54	0.01	1.52	
2020	10	14	10	51	28.62	28.0195	30.2636	3.18	0.01	1.46	
2020	10	14	11	32	28.37	23.5788	32.7756	10.09	0.17	1.24	
2020	10	14	13	8	59.65	29.7655	30.7778	2.23	0.37	3.12	
2020	10	14	16	24	23.07	27.6366	34.1465	25.47	0.13	1.25	
2020	10	14	17	3	21.18	27.5954	34.261	23.31	0.22	1.67	
2020	10	14	19	0	28.47	29.7449	30.8436	3.58	0.08	1.61	
2020	10	14	19	59	22.56	24.6722	36.1647	18.22	0.11	1.34	
2020	10	15	21	33	28.39	25.0853	33.3312	3.56	0.39	2.15	
2020	10	15	22	13	44.02	28.9252	34.7356	17.1	0.08	2	
2020	10	16	2	25	58.58	27.6013	34.4003	12.93	0.33	1.98	
2020	10	16	10	8	58.22	25.0948	33.3853	22.52	0.36	1.7	
2020	10	16	21	39	11.87	25.4139	35.8589	3.65	0.26	2.48	
2020	10	17	2	57	59.97	27.6521	34.0288	20.53	0.16	1.62	
2020	10	17	9	38	15.55	27.6281	34.2278	16.35	0.08	1.52	
2020	10	17	21	6	57.29	24.6096	36.3592	3.99	0.05	1.7	
2020	10	17	22	1	10.47	27.6085	34.2345	23.51	0.07	0.97	
2020	10	18	5	22	44.21	28.0311	33.1594	13.11	0	1.03	
2020	10	18	13	16	23.8	23.5532	32.6882	10.8	0.19	0.92	
2020	10	18	14	3	7.4	27.6106	34.2503	24.86	0.29	1.09	
2020	10	18	21	8	40.48	27.6101	34.243	21.88	0.21	1.42	
2020	10	18	21	45	1.48	23.556	32.6926	11.51	0.03	1.25	
2020	10	19	0	26	34.61	27.603	34.2822	21.48	0.22	0.99	
2020	10	19	0	28	37.99	27.6186	34.3208	16.73	0.01	1.18	
2020	10	19	7	32	6	23.794	33.2384	10	0.29	1.03	1.37
2020	10	19	10	54	17.48	25.2724	32.9724	4.97	0.6	1.61	
2020	10	19	19	4	47.71	23.5745	32.7476	12.62	0.09	1.64	
2020	10	20	11	14	15.21	27.623	34.3216	15.48	0.35	2.75	

Year	Mon.	Day	Hour	Min.	Sec	Lat.	Long.	Depth	RMS	Xmag	Fmag
2020	10	20	18	0	58.72	23.5387	32.7276	11.8	0.17		0.65
2020	10	21	0	57	58.62	27.4864	34.5102	11.36	0.23	2.54	
2020	10	22	6	32	20.92	22.8248	31.3619	5.43	0.34	1.27	
2020	10	22	17	18	48.56	26.1053	33.6963	31.05	0.26	1.83	
2020	10	22	18	32	54.37	24.1532	32.8289	10.55	0.34	1.86	2.09
2020	10	22	20	42	10.86	27.5419	34.5054	13.05	0.31	2.24	
2020	10	22	21	8	31.82	27.8534	34.5562	2.42	0.19	1.8	1.51
2020	10	23	17	56	32.59	27.8048	33.9879	21.3	0.08	1.5	1.49
2020	10	23	20	4	21.16	28.6839	34.627	10.72	0.14	1.2	
2020	10	24	7	32	27.71	29.0486	32.585	6.07	0.22	1.65	1.73
2020	10	24	20	34	51.84	26.6941	34.9014	30.87	0.01	1.65	1.71
2020	10	25	8	18	14.49	29.8936	31.8648	0.27	0.38		1.55
2020	10	25	12	5	33.81	23.3247	33.219	3.67	0.12		1.93
2020	10	25	18	2	12.5	23.566	32.7975	3.97	0.3	1.37	
2020	10	26	4	13	56.18	27.805	34.4669	6.92	0.49	0.91	
2020	10	26	15	28	30.18	23.5787	32.7102	4.99	0.3	0.96	
2020	10	26	17	38	29.95	26.8366	34.9747	28.7	0.44	3	
2020	10	26	17	58	31.61	28.6211	33.4583	22.6	0.25	2.73	
2020	10	26	21	23	18.19	27.6306	34.3228	16.22	0.01	1.53	
2020	10	26	22	47	9.87	27.4367	34.4379	22.84	0.27	1.95	
2020	10	27	1	58	11.2	24.0741	36.6687	9.45	0.51	3.41	
2020	10	27	5	29	14.56	22.7751	31.2819	0	0.09		1.52
2020	10	27	11	27	49.64	27.4615	31.5125	10.32	7.62	1.38	
2020	10	27	12	6	36.92	27.5024	34.3786	18.89	0.14	1.48	
2020	10	27	21	4	6.58	27.6382	34.4053	24	0.31	1.34	1.95
2020	10	27	23	20	49.51	27.6809	34.2266	15.94	0.21	1.51	1.73
2020	10	28	4	21	0.63	27.5558	34.0494	24.81	0.15	1.74	1.73
2020	10	28	9	59	57.44	23.6894	32.6738	10.57	0.27	1.31	
2020	10	29	21	33	6.78	23.5248	32.5962	3.2	0.27	1.42	
2020	10	29	22	1	29.2	23.5719	32.5814	3.42	0.38	1.63	
2020	10	31	0	40	44.37	28.8356	34.7456	7.47	0.15	1.82	1.82
2020	10	31	8	37	50.66	26.7305	35.0284	24.32	0.42	2.95	
2020	10	31	11	3	5.99	23.6883	32.6774	6.02	0.11	1.18	
2020	10	31	13	39	22.14	23.6974	32.6727	4.91	0.1	1.48	
2020	10	31	15	41	54.43	29.327	35.0903	14.73	0.44	2.74	
2020	11	1	3	55	46.92	28.923	34.7293	15.46	0.27	1.29	
2020	11	1	11	8	21.28	23.7236	32.681	4.92	0.19	0.88	0.96
2020	11	1	11	21	59.79	27.9662	34.4478	23.97	0.17	2.31	2.23
2020	11	1	11	25	55.29	27.9502	34.4287	15.17	0.47	2.12	1.92
2020	11	1	21	6	18.12	27.8809	34.3532	13.14	0.35	1.63	
2020	11	1	23	34	22.8	27.8349	34.3557	17.79	0.04	0.88	
2020	11	1	23	52	33.69	29.0838	34.8037	3.46	0.36	1.23	

Year	Mon.	Day	Hour	Min.	Sec	Lat.	Long.	Depth	RMS	Xmag	Fmag
2020	11	2	1	26	31.33	28.8133	34.7237	16.69	0.06	0.84	
2020	11	2	5	15	54.97	29.2595	34.5882	3.53	0.04	1.39	
2020	11	2	6	55	39.46	29.0681	34.866	10.13	0.08	2.2	
2020	11	2	17	13	37.48	28.6993	34.8698	4.97	0.4	3.15	
2020	11	2	17	15	32.14	28.7623	34.771	3.7	0.36	2.55	
2020	11	2	20	10	50.75	28.9017	34.6796	5.74	0.06	1.4	
2020	11	2	20	20	25.94	28.8114	34.6993	11.52	0.07	1.1	
2020	11	2	23	41	17.18	27.5886	34.3006	24.76	0.07	1.78	
2020	11	3	18	48	59.69	28.5524	34.5938	11.41	0.14	1.27	
2020	11	3	18	59	49.22	28.7069	34.5899	25.49	0.1	1.2	
2020	11	3	19	4	54.43	28.7123	34.5867	25.76	0.19	1.04	
2020	11	3	19	13	47.37	27.1936	34.5715	28.04	0.01	1.68	
2020	11	3	22	18	53.08	23.6188	32.5267	22.12	0.01	0.72	
2020	11	4	8	25	24.95	27.6746	33.7222	15.6	0.1	2.09	
2020	11	4	15	8	14.92	23.7775	32.5586	9.15	0.03	1.19	
2020	11	6	2	37	20.9	28.7249	34.5869	15.26	0.1	1.86	
2020	11	7	6	39	28.93	27.4571	34.0597	16.54	0.22	2.3	
2020	11	7	7	32	25.72	27.4662	34.0176	13.13	0.44	2.19	
2020	11	7	23	28	57.71	24.0415	36.506	15.33	0.1	2.58	
2020	11	9	3	29	50.81	23.5883	32.6702	11.42	0.08	1.41	1.67
2020	11	9	4	22	45.1	27.1896	34.5886	16.37	0.29	1.89	
2020	11	9	5	27	27.5	25.1842	33.2461	9.61	0.33	2.16	
2020	11	9	16	12	32.36	28.2768	32.3922	23.91	0.13	2.26	
2020	11	9	20	32	50.58	29.3023	32.3561	22.1	0.06	1.54	
2020	11	10	21	49	17.2	33.3911	34.4539	29.51	0.37	3.65	
2020	11	12	1	38	28.27	27.5221	33.5432	25.74	0.18	1.7	
2020	11	12	16	13	58.92	28.6232	34.6162	20.26	0.03	1.03	
2020	11	12	23	35	21.73	28.416	34.6693	13.37	0.19	1.21	
2020	11	13	22	33	46.55	26.9116	35.0281	14.49	0.23	3.28	
2020	11	14	19	43	6.56	28.3605	33.5458	19.89	0.14	2.16	
2020	11	15	23	58	24.87	27.4563	34.0335	20.35	0.07	1.81	
2020	11	16	8	10	41.72	28.0696	33.7853	11.66	0.34	2.09	2.1
2020	11	16	20	13	9.24	27.4643	33.9929	19.37	0.08	1.6	1.64
2020	11	16	21	0	54.02	27.6079	34.5519	18.48	0.06	1.3	1.28
2020	11	16	22	22	17.39	27.8433	34.4776	10.49	0.01	1.41	1.25
2020	11	17	3	44	25.85	28.8836	34.7263	18.46	0.13	2.12	2.06
2020	11	17	6	21	9.89	27.7786	34.3223	26.85	0.07	1.84	1.87
2020	11	17	12	10	37.61	29.5181	32.5114	0.63	0.67	1.9	
2020	11	17	15	27	20.53	27.7765	34.4054	27.55	0.4	2.65	
2020	11	18	6	5	33.9	23.256	32.653	4.74	0.16	1.45	
2020	11	18	6	58	9.45	27.4806	33.9421	20.22	0.07	1.7	
2020	11	18	22	7	20.39	28.0371	34.5107	10.72	0.42	3.16	

Year	Mon.	Day	Hour	Min.	Sec	Lat.	Long.	Depth	RMS	Xmag	Fmag
2020	11	19	9	16	9.86	31.21	34.1337	9.97	0.45	2.66	
2020	11	19	15	14	11.29	27.5858	34.4278	12.89	0.01	1.49	
2020	11	20	0	34	20.04	26.6005	34.8785	29.24	0.29	1.86	
2020	11	20	1	43	6.99	29.8319	31.4773	20.83	0.16	1.51	
2020	11	20	4	45	15.53	28.337	34.5925	2.4	0.05	1.84	
2020	11	20	8	24	45.49	22.2719	33.8621	4.91	0.01	2.07	
2020	11	20	15	53	47.25	26.7627	32.8524	8.88	0.23	2.24	
2020	11	20	21	25	34.59	27.3554	34.4803	17.4	0.01	1.76	
2020	11	21	14	3	16.27	28.8605	34.7401	16.74	0.06	1.53	1.56
2020	11	22	9	52	10.57	30.932	31.2523	21.03	0.31	3.51	
2020	11	22	16	17	18.79	27.6562	33.767	3.64	0.76	1.38	
2020	11	23	0	50	55.65	27.5084	33.8926	3.61	0.66	1.97	
2020	11	24	18	59	53.99	23.5854	32.3523	21.44	0.11	1.03	1.3
2020	11	25	0	47	57.62	23.2764	32.6347	3.47	0.28	1.76	
2020	11	25	15	42	1.96	28.5771	33.0981	26.17	0.05	1.54	
2020	11	25	17	41	40.93	23.611	32.7143	4.79	0.04	1.43	
2020	11	26	0	20	28.17	28.9939	34.5422	7.66	0.01	1.26	
2020	11	26	0	29	8.2	28.5303	34.6816	8.4	0	1.49	
2020	11	26	8	21	50.06	27.629	34.1901	13.18	0.08	1.92	
2020	11	27	9	34	34.97	27.4121	34.5685	14.05	0.36	2.31	
2020	11	27	18	0	46.8	23.2541	32.6519	2.79	0.18	1.83	
2020	11	27	20	50	11.37	27.6675	34.4134	21.02	0.16	1.86	
2020	11	27	21	43	13.17	28.2115	33.296	6.48	0.12	1.71	
2020	11	28	2	37	42.6	23.8843	36.8646	21.89	0.09	2.46	
2020	11	28	4	33	44.53	23.5538	32.7062	10.82	0.14	1.6	
2020	11	28	16	2	0.69	28.2964	33.4239	18.87	0.03	1.54	
2020	11	28	19	44	16.44	23.562	32.5721	15.69	0.07	1.37	
2020	11	28	20	28	31.69	27.64	34.1088	24.43	0.08	1.23	
2020	11	29	20	2	8.81	27.1383	34.5446	9.7	0.12	1.34	
2020	11	30	22	40	29.47	27.8031	34.2909	6.31	0.12	1.62	
2020	12	2	4	55	14.59	27.5165	34.5098	15.5	0.07	1.93	
2020	12	2	9	34	21.94	30.4194	31.7357	5.45	0.05	2.11	
2020	12	2	19	37	33.32	29.4615	32.031	3.69	0.18	2.38	
2020	12	2	20	6	2.31	27.7964	34.6149	17.62	0.16		1.8
2020	12	3	1	6	4.05	27.6424	34.133	24.47	0.08	1.24	1.46
2020	12	3	1	31	9.29	22.7222	34.5342	6.13	0.18	2.14	
2020	12	3	16	35	24.42	23.5554	32.6855	8.25	0.12	1.46	
2020	12	3	16	37	11.9	23.5788	32.7056	3.9	0.05	1.14	
2020	12	3	17	28	30.3	27.5616	33.3541	4.54	0.24	1.05	
2020	12	4	11	33	17.89	23.5142	32.6877	3.68	0.13	1.74	
2020	12	5	22	25	29.18	26.6119	34.8403	30.64	0.26	1.79	
2020	12	6	0	30	49.64	27.8597	34.3856	12.08	0.01	1.65	

Year	Mon.	Day	Hour	Min.	Sec	Lat.	Long.	Depth	RMS	Xmag	Fmag
2020	12	6	11	57	55.36	27.5198	34.2481	16.84	0.41	2.53	
2020	12	6	16	23	41.97	29.1854	34.8823	13.2	0.01	1.29	
2020	12	6	19	34	14.6	23.8915	34.0997	15.17	0.96	1.43	
2020	12	7	2	29	14.67	27.6468	34.1593	15.29	0.27	1.72	
2020	12	7	10	8	28.26	28.2208	33.5403	13.77	0.24	1.75	
2020	12	7	10	9	5.41	23.549	32.6893	8.65	0.2	1.64	
2020	12	7	14	1	36.86	23.5569	32.6846	18.12	0.11	1.74	
2020	12	7	23	8	52.3	24.0065	36.5809	15.05	0.12	2.58	
2020	12	8	5	13	32.66	23.5406	32.6893	17.41	0.1	1.5	
2020	12	8	10	47	58.98	27.1405	34.5946	9.09	0.17	1.87	
2020	12	8	14	36	56.28	28.8395	34.7472	12.73	0.19	2.16	
2020	12	8	21	26	10.9	23.5731	32.5803	5.93	0.05	1.39	
2020	12	8	21	33	56.78	25.2746	29.1161	9.11	0.25	2.24	
2020	12	9	6	5	20.93	27.5502	34.1467	23.5	0.09	1.73	
2020	12	10	2	14	7.12	28.9247	32.0081	19.02	0.15	2.15	
2020	12	11	0	29	25.21	28.6122	34.5825	15.8	0.02	1	
2020	12	11	9	28	55.83	28.0146	34.6051	6.45	0.27	2.53	
2020	12	11	15	47	17.82	29.887	31.1127	7.18	0.3	3.29	
2020	12	11	19	42	55.27	28.0331	34.4662	6.84	0.38	1.79	
2020	12	12	8	43	53.28	28.0973	34.4697	3.21	0.16	1.85	
2020	12	12	15	47	14.89	27.444	34.397	18.4	0.08	1.43	
2020	12	13	14	46	44.06	28.7369	34.7857	25.09	0.18	1.15	0.97
2020	12	13	15	48	10.7	23.2642	32.6886	3.06	0.22	2.48	
2020	12	13	19	59	0.78	23.546	32.7056	6.42	0.03	1.64	
2020	12	13	20	2	42.27	23.5538	32.6909	10.61	0.12		1.01
2020	12	13	20	5	8.42	23.5541	32.6927	8.89	0.1	1.38	
2020	12	15	2	30	11.31	29.5573	35.1161	20.2	0.21	3.83	
2020	12	15	3	19	42.12	28.5285	34.6678	4.16	0.1	1.92	1.9
2020	12	15	13	47	22.06	26.8523	34.635	31.07	0.05	2.45	
2020	12	15	15	55	5.6	26.872	34.7091	29.39	0.28	2.67	
2020	12	16	1	34	24.27	27.7154	34.4297	0	0.66	1.64	
2020	12	18	3	40	26.32	27.7392	33.8822	23.96	0.12	1.76	
2020	12	19	0	44	27.56	25.5599	29.66	2.67	0.22	3.4	
2020	12	19	2	4	36.2	27.2844	34.502	8.02	0.1	1.77	
2020	12	19	14	1	10.7	28.7444	33.384	7.03	0.11		1.3
2020	12	19	21	15	15.62	28.894	34.6941	15.91	0.25	1.8	
2020	12	21	4	13	56.53	25.3142	34.4421	0	0.1		2.25
2020	12	21	4	43	54.73	27.6446	34.5301	13.37	0.33	3.42	
2020	12	21	5	56	54.89	25.5609	29.4034	15.97	0.05	1.75	
2020	12	21	6	34	21.94	25.4071	35.8578	4.57	0.37	2.91	
2020	12	21	20	6	47.16	27.5073	33.9306	21.47	0.2	1.46	
2020	12	21	21	21	59.46	27.617	34.3678	25.08	0.12	1.4	

Year	Mon.	Day	Hour	Min.	Sec	Lat.	Long.	Depth	RMS	Xmag	Fmag
2020	12	22	2	13	33.19	27.508	34.4368	19.84	0.12	1.61	
2020	12	22	13	1	41.89	22.1031	36.154	9.95	0.27	3.83	
2020	12	23	12	8	58.51	28.0732	34.5168	0.11	0.13	2.39	
2020	12	24	16	50	29.63	27.7513	34.3372	17.7	0.11	1.2	
2020	12	25	11	18	56.56	28.4474	34.6716	1.17	0.15	1.65	
2020	12	25	20	40	55.98	26.7786	34.886	31.29	0.35	1.69	
2020	12	26	4	44	7.77	27.7119	34.5111	15.67	0.37	1.69	
2020	12	27	3	58	42.98	27.4731	34.2799	23.05	0.14	1.77	
2020	12	27	9	31	54.4	22.8498	31.3102	6.68	0.28	2.16	
2020	12	27	18	18	9.95	27.4796	33.8511	22.77	0.14	1.9	
2020	12	28	0	23	23.14	27.4874	34.3673	20.76	0.08		2.03
2020	12	28	21	46	21.97	27.4835	34.0945	19.38	0.07	1.67	
2020	12	30	18	9	8.77	28.4703	31.8522	0.23	0.34		1.85
2020	12	31	13	33	59.97	27.9537	34.1969	23.72	0.26	2.03	

Table 8. *Table (2A) Hypo-central parameters of regional earthquakes recorded by ENSN through 2020:*

Year	Mon.	Day	Hour	Min.	Sec	Lat.	Long.	Depth	RMS	Xmag
2020	1	1	9	22	16.94	34.0294	25.3712	9.81	0.05	3.43
2020	1	1	17	37	25.7	34.0616	25.4279	21.88	0.3	3.03
2020	1	3	15	43	49.61	34.4088	24.5307	11.82	0.38	3.91
2020	1	12	20	37	5.23	34.7195	27.3501	15.77	0.32	3.46
2020	1	14	10	28	53.36	21.8843	31.2873	10	0.36	3.22
2020	1	15	1	48	51.94	34.7374	27.5363	28.98	0.09	2.79
2020	1	19	7	19	54.26	34.6283	24.7934	24.74	0.45	3.52
2020	1	22	19	22	15.84	38.9002	27.9979	0.08	0.74	5.04
2020	1	22	23	30	48.91	34.6022	31.9348	11.04	0.33	3.77
2020	1	26	16	11	45.85	34.2843	26.484	11.77	0.19	3.17
2020	1	27	2	50	14.74	34.9332	23.6851	10.28	0.33	3.31
2020	1	27	20	20	3.17	35.9141	26.8708	12.29	0.23	3.23
2020	1	28	15	38	33.26	35.2065	27.9217	11.67	0.22	5.4
2020	1	28	16	12	41.2	35.2103	27.8597	8.11	0.19	4.17
2020	1	28	21	44	59.8	35.1763	27.9157	27.67	0.15	4.13
2020	1	29	2	43	12.34	35.2114	28.14	10.48	0.34	3.74
2020	1	29	5	10	22.11	35.3098	27.6149	20.69	0.12	3.96
2020	1	29	13	37	2.95	35.0469	28.2498	8.92	0.31	4.69
2020	1	30	1	28	5.55	35.1652	28.0363	8.56	0.55	5.04
2020	1	30	1	46	21.91	35.2924	28.2292	19.45	0.42	4.15
2020	1	30	2	10	56.85	35.0497	27.9694	26.36	0.52	4.07
2020	1	30	2	59	10.21	35.181	27.9218	1.2	0.41	3.83
2020	1	30	5	12	3.36	35.1543	27.9531	7.05	0.36	4.03
2020	1	30	5	43	56.88	35.1142	27.953	5.17	0.18	3.96
2020	1	30	11	21	37.96	35.0466	27.9663	16.58	0.37	5.27
2020	1	30	18	26	16.72	35.1602	28.1156	10.7	0.34	3.68
2020	1	31	4	34	37.64	35.2377	28.0244	10.41	0.41	4.45
2020	1	31	8	37	48.12	35.1549	28.0841	2.06	0.27	3.66
2020	1	31	8	41	48	35.1897	28.0227	2.06	0.24	3.6
2020	2	1	3	15	39.04	35.1519	27.9157	5.88	0.56	3.33
2020	2	2	10	40	3.07	35.1626	27.9924	3.32	0.37	4
2020	2	4	2	10	53.49	35.1715	28.1161	15.72	0.36	4.3
2020	2	4	21	48	43.27	35.1617	27.8506	22.53	0.06	3.6
2020	2	6	4	53	51.61	32.7597	34.7794	13.08	0.22	3.97
2020	2	7	2	24	0	34.9167	26.8208	10.54	0.41	4.37
2020	2	7	3	11	47.8	34.9608	26.7476	15.03	0.39	4.44
2020	2	10	13	44	28.64	36.3632	30.5375	14.71	0.2	3.09
2020	2	10	22	46	58.33	34.5728	28.0738	15.96	0.25	4.82
2020	2	11	20	2	42.97	34.4328	27.9732	25.71	0.18	4
2020	2	13	16	20	58.85	35.1785	27.9006	5.21	0.29	3.78

Year	Mon.	Day	Hour	Min.	Sec	Lat.	Long.	Depth	RMS	Xmag
2020	2	14	16	2	15.75	35.717	27.1942	2.44	0.46	4.92
2020	2	17	22	2	51.29	25.3965	37.0581	15.02	0.18	2.15
2020	2	18	5	42	2.18	28.5509	34.9481	48	0.35	1.81
2020	2	18	16	9	25.32	38.9273	27.833	13.6	0.33	4.83
2020	2	19	8	19	1.01	32.646	22.8969	6.94	0.35	4.67
2020	2	20	1	54	57.49	32.8213	22.9347	9.76	0.09	3.4
2020	2	22	22	26	42.21	37.3155	31.4038	6.43	0.34	4.6
2020	2	23	4	38	36.04	34.6956	25.3211	3.48	0.23	3.53
2020	2	23	23	8	50.24	35.2259	28.02	1.88	0.58	3.54
2020	2	24	2	43	36.25	38.8709	27.9088	20.16	0.56	4.24
2020	2	26	14	20	8.86	35.1677	27.8723	14.54	0.3	4.18
2020	2	26	18	27	36.35	35.1874	27.9273	18.78	0.32	3.25
2020	2	27	12	20	18.51	35.141	28.0499	5.08	0.59	4.17
2020	2	27	14	36	14.64	35.1552	28.054	8.14	0.4	4.7
2020	2	28	15	44	18.81	35.9013	31.1298	13.16	0.4	3.89
2020	3	5	0	21	26.19	35.2226	27.9856	7.5	0.41	3.58
2020	3	5	9	32	38.47	34.9536	28.1395	65.77	0.23	4.36
2020	3	9	22	19	32.3	37.6593	21.4571	23.27	0.36	3.81
2020	3	10	2	12	26.73	35.0906	32.3936	23.83	0.53	3.41
2020	3	11	0	32	14.35	35.7476	28.2923	1.14	0.24	3.93
2020	3	13	21	57	51.88	36.9094	27.2524	10.07	0.2	3.83
2020	3	15	17	27	8.08	36.0545	31.0748	28.11	0.35	3.41
2020	3	16	1	53	24.65	35.0714	27.1989	28.39	0.37	4.63
2020	3	17	18	14	33.77	36.8009	27.5603	11.73	0.4	4.34
2020	3	18	22	36	50.51	31.7436	31.1955	17.19	0.43	3.46
2020	3	22	2	43	0.03	36.3757	22.2696	10.17	0.92	3.87
2020	3	25	9	49	47.86	38.2705	19.5	6.86	0.12	3.96
2020	3	25	17	46	32.15	35.0915	22.8116	8.05	0.21	3.26
2020	3	29	4	34	30.07	37.2871	21.6045	8.22	0.44	4.17
2020	3	30	13	30	26.89	34.9521	23.7306	28.75	0.39	3.22
2020	3	30	15	56	41.17	37.7278	21.3629	25.03	0.17	4.1
2020	3	30	19	13	5.08	31.7925	23.6379	12.76	0.22	3.89
2020	3	31	20	50	38.6	31.8498	23.6442	6.52	0.42	3.23
2020	3	31	21	8	48.89	31.8424	23.6745	14.11	0.48	3.38
2020	4	1	17	30	2.06	35.9109	31.2012	23.07	0.49	3.02
2020	4	3	0	2	56.21	34.4981	26.2672	7.01	0.1	3.91
2020	4	4	18	44	31.48	34.9896	32.5587	28.11	0.22	3.16
2020	4	5	5	4	7	28.9586	34.8517	18.65	0.27	4.32
2020	4	6	10	4	3.23	34.9337	23.4604	24.72	0.18	3.29
2020	4	7	16	19	31.17	34.7003	23.3117	2.38	0.35	3.16
2020	4	8	2	33	45.67	34.1628	26.3415	14.12	0.3	3.39
2020	4	9	1	11	46.4	34.9149	23.6108	11.37	0.2	3.53

Year	Mon.	Day	Hour	Min.	Sec	Lat.	Long.	Depth	RMS	Xmag
2020	4	9	18	37	11.31	35.181	28.2972	22.53	0.46	4.23
2020	4	10	1	34	8.16	35.0973	27.9626	29.69	0.51	3.8
2020	4	10	16	31	6.61	30.6961	35.2169	25.36	0.13	4.17
2020	4	11	10	22	52.93	34.925	26.2331	12.12	0.18	4.73
2020	4	13	11	22	51.04	34.5317	24.1072	24.86	0.19	3.81
2020	4	15	7	40	5.75	35.7881	35.5735	14.5	0.38	4.61
2020	4	15	8	18	39.4	35.8632	35.2022	18.61	0.26	4.46
2020	4	18	6	27	52.82	34.2263	26.683	29.35	0.18	3.57
2020	4	19	10	34	28.96	34.3556	25.1411	18.1	0.23	3.8
2020	4	19	12	1	13.15	35.1677	27.898	12.46	0.24	3.75
2020	4	20	0	25	43.86	36.0176	22.2121	8.79	0.5	3.81
2020	4	22	2	33	4.54	34.1847	26.6641	14.74	0.11	3.71
2020	4	22	6	5	47.87	34.9592	26.2856	11.11	0.26	4.45
2020	4	22	10	58	40.64	35.174	31.9613	5.59	0.34	3.28
2020	4	22	13	55	28.81	34.7455	33.703	11.11	0.11	3.61
2020	4	24	13	16	3.02	35.6208	28.1251	13.03	0.44	4.78
2020	4	25	10	48	32.8	34.8101	24.442	9.73	0.29	4.13
2020	4	26	13	23	37.64	34.6958	24.9224	18.46	0.29	4.26
2020	4	27	12	36	52.34	21.8106	31.3541	3.49	0.15	1.86
2020	4	28	13	1	37.69	33.1218	27.6974	2.77	0.27	4.21
2020	4	30	10	9	49.13	36.7782	28.6947	14.03	0.4	4.5
2020	5	1	18	3	18.31	34.4395	25.4572	10	0.31	4.3
2020	5	2	12	51	7.09	33.9089	26.0747	10.83	0.23	6.09
2020	5	2	13	33	47.8	34.0068	25.4942	10.65	0.2	5.18
2020	5	2	13	45	22.23	33.8412	25.8686	9.59	0.16	4.73
2020	5	2	14	21	25.66	33.9351	25.6455	0.08	0.29	4.09
2020	5	2	16	13	3.76	33.8663	25.9689	16.28	0.24	4.24
2020	5	2	16	44	28.7	33.904	25.9949	14.42	0.3	5.13
2020	5	2	20	16	16.11	33.8548	26.002	11.12	0.23	3.9
2020	5	2	20	32	39.76	34.0047	26.2564	11.79	0.33	3.69
2020	5	3	0	38	6.83	34.3024	26.0607	24.53	0.24	4.04
2020	5	3	2	8	57.13	35.4507	26.1664	10.51	0.37	4.62
2020	5	3	5	54	44.07	34.0374	26.2042	9.47	0.42	4.26
2020	5	3	6	38	37.12	33.9766	26.3275	14.08	0.14	3.82
2020	5	4	1	2	8.68	34.128	25.6416	8.86	0.28	4.41
2020	5	4	3	33	54.88	33.6085	32.6304	7.14	0.27	3.58
2020	5	4	12	36	36.8	34.0208	25.808	7.18	0.21	4.27
2020	5	4	22	55	18.22	32.3553	33.5259	23.5	0.18	3.48
2020	5	5	0	43	37.66	35.5614	29.489	6.54	0.19	3.35
2020	5	5	11	40	34.53	34.0317	25.8839	5.01	0.2	4.47
2020	5	5	17	20	36.04	33.8508	25.8591	22.29	0.22	4.43
2020	5	6	0	56	21.5	30.6686	35.1598	5.53	0.27	3.7

Year	Mon.	Day	Hour	Min.	Sec	Lat.	Long.	Depth	RMS	Xmag
2020	5	7	15	28	39.95	33.8716	25.814	14.4	0.11	4.12
2020	5	7	16	2	10.18	33.9055	25.8893	27.35	0.1	3.58
2020	5	7	18	25	51.66	33.9121	25.9772	6.68	0.14	3.81
2020	5	7	19	55	8.17	34.0421	25.7696	28.32	0.08	4.36
2020	5	7	21	42	6.36	35.222	24.3192	7.56	0.16	3.19
2020	5	7	23	11	55.26	33.9092	25.8876	24.94	0.09	3.35
2020	5	8	0	48	0.08	33.8891	25.9036	13.4	0.04	3.65
2020	5	8	2	3	16.25	34.5534	23.2963	19.37	0.02	3.25
2020	5	8	3	14	25.34	33.9084	25.977	10.68	0.07	4.69
2020	5	8	5	40	29.59	33.8429	25.9419	30.67	0.06	3.48
2020	5	8	23	36	33.33	33.8534	25.9549	13.97	0.17	4.31
2020	5	9	9	39	30.73	34.0129	25.7118	26.64	0.16	4.45
2020	5	10	8	40	10.55	34.0465	25.5994	7.21	0.74	4.29
2020	5	10	10	2	55	34.141	25.8309	27.3	0.26	3.34
2020	5	10	12	8	15.38	36.5626	26.8699	30.26	0.67	4.56
2020	5	11	2	38	20.88	32.5715	35.6336	7.9	0.37	3.92
2020	5	11	20	56	15.6	35.9511	25.9247	18.56	0.37	3.79
2020	5	11	22	55	5.39	33.9258	25.7319	10.49	0.44	3.19
2020	5	11	23	2	47.37	33.9222	25.6991	11.67	0.4	3.26
2020	5	12	3	7	58.74	33.96	25.8738	19.84	0.46	3.88
2020	5	12	12	55	19.45	33.9775	25.6783	14.38	0.32	3.27
2020	5	12	15	16	59.19	33.9725	25.8237	17	0.25	3.25
2020	5	13	16	50	7.62	33.9353	25.7117	11.06	0.35	3.42
2020	5	13	17	3	53.13	34.4063	15.6314	28.17	0.32	3.76
2020	5	14	22	33	38.83	33.9099	26.2818	2.2	0.47	4.2
2020	5	15	19	32	1.1	33.9161	25.9368	15.93	0.21	3.87
2020	5	16	2	30	21.41	34.2935	25.8224	16.84	0.15	4.29
2020	5	17	12	44	53.87	36.6027	31.4334	24.46	0.24	3.21
2020	5	18	11	48	7.14	34.1085	25.6795	9.75	0.36	4.63
2020	5	18	14	11	10.15	34.0806	25.7603	17.29	0.28	3.85
2020	5	18	23	22	34.99	34.1557	25.8175	10.02	0.3	5.47
2020	5	19	0	2	41.01	34.0832	25.6661	6.46	0.37	4.5
2020	5	19	4	23	48.64	34.108	25.5752	14.28	0.23	4.23
2020	5	19	8	3	23.8	35.3601	28.0888	16.5	0.2	4.19
2020	5	19	8	43	2.4	33.8734	26.0854	8.83	0.19	4.02
2020	5	19	9	24	41.5	34.2276	25.6034	10.88	0.26	4.6
2020	5	19	14	10	15.21	34.2085	25.7495	17.83	0.07	3.32
2020	5	19	14	35	55.92	34.266	25.5945	24.8	0.1	4.09
2020	5	19	14	58	36.93	33.54	26.1593	7.24	0.04	4.08
2020	5	19	15	44	22.18	34.2172	25.8366	28.65	0.12	3.97
2020	5	19	16	15	22.1	34.4365	25.3687	24.17	0.15	3.72
2020	5	19	17	8	28.12	34.3594	25.6961	23.6	0.09	4.05

Year	Mon.	Day	Hour	Min.	Sec	Lat.	Long.	Depth	RMS	Xmag
2020	5	19	17	55	26.4	34.0048	25.6513	7.84	0.08	4.17
2020	5	19	19	9	9.11	34.5471	25.5857	23.85	0.14	4.56
2020	5	19	23	23	22.95	34.1865	25.6622	11.17	0.06	3.68
2020	5	20	1	6	15.86	34.3401	25.6002	1.02	0.04	3.97
2020	5	20	6	11	12.13	34.3114	25.643	7.08	0.08	3.18
2020	5	20	10	36	9.81	34.3208	25.523	11.01	0.06	3.73
2020	5	20	11	1	28.19	34.3894	25.5897	18.95	0.12	3.85
2020	5	20	11	12	13.36	34.4112	25.648	13.03	0.16	4.12
2020	5	20	12	18	32.11	34.1296	25.644	30.64	0.16	3.26
2020	5	20	15	44	47.79	35.4695	28.0217	6.12	0.16	4.2
2020	5	20	18	0	28.25	34.4918	25.7197	16	0.12	4.17
2020	5	20	18	53	22.67	36.4546	30.6283	2.46	0.07	3.61
2020	5	20	20	57	14.2	34.5161	25.6098	17.95	0.05	4.14
2020	5	20	23	43	15.2	35.2001	20.7237	22.33	0.12	5.59
2020	5	21	6	19	41.21	34.1617	25.7839	14.4	0.17	3.76
2020	5	21	13	1	42.21	34.2944	25.5941	17.11	0.29	3.37
2020	5	21	14	5	57.8	33.9915	25.6853	13.13	0.4	4.4
2020	5	21	19	32	59.1	33.8771	26.2453	12.04	0.3	3.6
2020	5	22	3	40	28.72	34.1919	26.0328	0.04	0.17	4.7
2020	5	22	6	23	0.66	34.1062	25.577	10.53	0.2	3.2
2020	5	22	9	16	23.19	34.2365	26.1422	16.14	0.37	3.79
2020	5	22	11	2	2.25	33.8809	26.2607	25.01	0.36	3.93
2020	5	22	11	8	42.26	34.3349	26.1285	22.52	0.36	3.81
2020	5	22	11	43	57.78	34.2596	26.0164	8.36	0.36	3.89
2020	5	23	9	6	24.8	34.2502	25.7701	20.61	0.55	3.72
2020	5	23	13	35	25.86	34.2921	25.5758	27.24	0.35	3.7
2020	5	23	22	50	11.37	34.2119	25.725	8.78	0.2	4.87
2020	5	23	23	21	34.12	34.5093	25.2898	14.92	0.25	3.85
2020	5	24	16	11	6.27	34.1474	25.624	2.93	0.63	3.85
2020	5	24	16	18	26.52	34.0606	25.5575	3.87	0.49	3.79
2020	5	25	1	28	41.62	34.2165	25.6579	15.11	0.29	4.14
2020	5	25	11	11	54.82	35.9513	28.7008	25.72	0.18	3.42
2020	5	25	12	4	47.13	34.0979	25.6394	14.04	0.34	3.47
2020	5	25	16	51	5.23	33.9689	25.8172	25.01	0.34	3.16
2020	5	25	18	11	1.47	33.9916	25.6034	17.84	0.31	3.33
2020	5	25	19	8	40.92	34.2793	25.9042	134.79	0.34	3.47
2020	5	25	19	32	26.1	34.1104	25.6699	10.03	0.97	5.81
2020	5	26	0	58	34.84	35.4237	26.2381	55.35	0.33	3.03
2020	5	26	4	37	20.17	34.4725	25.5049	13.79	0.28	3.63
2020	5	26	4	42	0.57	35.7831	27.3746	53.69	0.59	3.13
2020	5	26	9	36	26.64	34.2564	25.6468	31.35	0.3	3.65
2020	5	26	13	53	33.84	34.0321	25.6882	28.84	0.48	3.83

Year	Mon.	Day	Hour	Min.	Sec	Lat.	Long.	Depth	RMS	Xmag
2020	5	26	14	44	24.29	35.8934	27.2287	29.07	0.08	3.15
2020	5	27	0	40	30.32	34.232	25.777	12.02	0.77	5.6
2020	5	27	0	47	12.12	35.1665	26.929	26.33	0.23	3.26
2020	5	27	1	9	56.19	34.1532	25.5895	63.45	0.31	5.08
2020	5	27	2	34	43.93	35.3248	27.0951	3.51	0.4	3.34
2020	5	27	14	23	34.68	34.286	25.7819	8.66	0.06	3.43
2020	5	27	16	52	43.1	35.4629	26.914	19.81	0.34	3.54
2020	5	28	0	55	11.28	35.4579	26.7759	9.67	0.37	3.53
2020	5	28	6	27	47.66	35.671	26.4658	20.32	0.46	3.28
2020	5	28	13	5	57.46	36.9819	20.3164	22.12	0.34	4.06
2020	5	29	2	8	10.26	34.1812	25.6379	18.06	0.09	4.24
2020	5	29	16	8	20.46	35.4538	26.881	12.46	0.23	3.51
2020	5	29	18	49	9.11	34.1696	25.7918	9.26	0.04	3.59
2020	5	30	7	22	59.9	35.5338	26.85	12.49	0.09	3.95
2020	5	30	11	21	16.32	35.5463	26.8312	9.46	0.09	3.63
2020	5	30	15	58	37.09	35.4452	26.8378	10.06	0.59	4
2020	5	30	18	21	57.02	35.5347	26.6962	5.64	0.5	4.1
2020	5	30	23	50	14.34	35.6295	26.9363	21.91	0.41	3.86
2020	5	31	0	57	8.35	35.4984	26.8572	14.02	0.39	3.71
2020	5	31	1	13	56.03	35.5131	26.8234	8.33	0.5	3.93
2020	5	31	5	17	23.09	34.1927	26.1211	14.2	0.5	4.09
2020	6	1	10	56	15.2	36.9599	27.1417	25.21	0.44	3.87
2020	6	1	23	51	35.62	34.0549	25.7691	9.61	0.27	3.9
2020	6	2	1	35	48.74	35.8888	28.6142	10.18	0.4	3.83
2020	6	3	5	20	6.5	35.0478	29.2139	20.44	0.35	4.18
2020	6	3	9	3	30.67	34.1218	26.0828	8.01	0.36	4.37
2020	6	4	11	8	36.55	34.0894	25.898	97.18	0.38	3.48
2020	6	4	21	10	30.85	35.6632	26.8103	22.85	0.59	4.11
2020	6	7	0	27	7.93	36.9429	20.5142	8.05	0.3	3.75
2020	6	8	11	7	55.73	34.0192	25.8171	18.13	0.1	3.86
2020	6	9	2	46	26.69	34.1567	25.7394	28.71	0.29	4.27
2020	6	15	20	12	53.26	34.7606	25.868	10.76	0.41	4.1
2020	6	16	19	18	10.58	37.9731	29.9799	15.25	0.4	3.82
2020	6	17	1	16	32.3	33.4853	27.9901	10.37	0.32	2.92
2020	6	17	11	27	40.06	33.6239	28.0973	10.45	0.31	3.27
2020	6	17	23	50	3.67	33.5782	24.981	1.98	0.42	3.92
2020	6	19	7	43	24.92	34.0343	25.8906	26.25	0.37	4.62
2020	6	19	20	34	13.21	34.2912	26.0194	10.37	0.25	4.52
2020	6	19	21	17	9.7	33.9601	25.2112	27.9	0.37	4.46
2020	6	22	11	7	35.43	34.5869	25.2448	9.32	0.22	3.38
2020	6	22	12	21	9.3	34.0922	25.2425	10.32	0.22	3.37
2020	6	24	9	57	48.71	33.4637	28.4438	21.27	0.4	3.39

Year	Mon.	Day	Hour	Min.	Sec	Lat.	Long.	Depth	RMS	Xmag
2020	6	24	18	34	43.37	36.1604	27.1597	6.55	0.2	3.83
2020	6	26	7	21	19.96	38.1018	28.2355	7.31	0.16	5.04
2020	6	26	12	56	2.58	35.4428	26.9316	7	0.27	4.08
2020	6	26	19	36	36.84	35.3673	26.572	26.03	0.24	4.59
2020	6	26	22	8	9.65	35.3436	26.9277	3.81	0.25	3.65
2020	6	26	22	15	17.2	35.3526	26.9964	4.31	0.4	3.46
2020	6	27	19	40	18.38	33.6454	28.4925	23.65	0.25	3.6
2020	6	28	11	18	36.17	35.6358	26.8905	29.73	0.41	4.01
2020	6	28	17	43	27.19	36.4409	28.3848	16.22	0.33	5.53
2020	6	28	19	24	20.37	34.6285	32.5396	10.61	0.34	3.14
2020	6	29	4	6	24.83	36.4841	28.4773	22.34	0.26	4.58
2020	6	29	13	54	14.46	36.4771	28.3882	27.85	0.28	3.65
2020	6	29	20	14	49.84	35.5598	26.8119	23.22	0.08	3.77
2020	6	30	0	44	37.73	35.5978	26.7581	14.48	0.37	3.71
2020	7	4	2	36	12.62	36.1583	29.0797	31.24	0.33	3.46
2020	7	7	21	11	19.33	34.5829	25.5903	28.64	0.38	3.71
2020	7	8	4	20	3.08	33.6317	27.9913	27.25	0.38	2.57
2020	7	8	22	57	49.07	34.1559	26.0357	10.1	0.17	2.79
2020	7	9	16	36	7.84	35.4723	26.8263	10.14	0.48	3.74
2020	7	10	19	7	25.17	35.9352	31.276	19.69	0.36	3.45
2020	7	10	23	32	42.68	35.1544	22.8319	7.54	0.47	3.87
2020	7	13	1	48	53.84	34.1643	25.6516	21.69	0.41	3.63
2020	7	14	8	33	13.6	35.5014	31.3699	31.34	0.26	4.04
2020	7	14	13	49	36.26	34.1978	24.4602	13	0.18	3.11
2020	7	15	12	16	38.34	35.0935	27.8359	11.34	0.37	3.79
2020	7	17	10	16	53.2	35.3586	26.923	8.71	0.21	3.22
2020	7	19	21	56	30.43	34.0242	25.8051	14.58	0.25	2.93
2020	7	19	23	44	20.55	35.4957	26.6058	8.58	0.4	3.05
2020	7	20	18	33	24.97	37.3908	20.123	27.76	0.26	4.39
2020	7	23	23	20	11.43	34.1897	36.2677	8.54	0.28	3.79
2020	7	23	23	20	16.89	34.1107	35.7564	9.98	0.07	3.81
2020	7	25	1	38	20.53	36.7947	21.2316	9.72	0.06	4.29
2020	7	25	17	2	28.54	35.3926	31.2792	26.11	0.35	3.94
2020	7	25	18	23	10.97	34.2419	26.0863	10.66	0.36	3.5
2020	7	26	3	37	54.84	34.5175	28.6438	27.84	0.17	3.03
2020	7	26	12	42	20.09	34.259	25.8731	22.72	0.31	3.65
2020	7	26	15	59	25.53	34.2381	25.8988	26.03	0.29	3.24
2020	7	27	0	48	26.28	35.0635	25.4721	5.28	0.38	3.24
2020	7	27	8	20	16.27	35.2208	26.4878	1.02	0.5	3.03
2020	7	28	12	11	43.96	35.2067	25.0001	30.96	0.5	3.39
2020	7	30	2	31	4.86	34.9531	32.9208	24.61	0.35	3.62
2020	7	30	23	40	51.94	34.9194	27.3121	15.71	0.41	3.33

Year	Mon.	Day	Hour	Min.	Sec	Lat.	Long.	Depth	RMS	Xmag
2020	7	31	2	13	33.68	33.7596	25.1656	9.7	0.2	2.69
2020	8	1	3	43	38.43	34.3842	26.0784	2.59	0.19	3.53
2020	8	1	6	47	35.66	34.3965	25.9548	4.56	0.39	3.45
2020	8	8	11	8	13.06	36.6463	27.1759	8.46	0.34	3.33
2020	8	10	1	53	33.98	35.0338	26.3667	25.56	0.28	3.68
2020	8	14	13	46	23.88	34.848	26.5208	2	0.38	4.23
2020	8	14	13	46	24.74	34.8707	26.4827	13.62	0.57	4.24
2020	8	14	16	39	26.47	34.3011	25.9757	0.95	0.5	3.66
2020	8	14	17	48	53.33	34.3153	25.9456	21.84	0.53	4.04
2020	8	15	19	46	52.72	30.2416	34.9458	6.15	0.15	2.67
2020	8	16	0	40	30.08	34.2515	26.0005	18.47	0.28	3.81
2020	8	17	7	27	2.19	36.9412	23.7361	105.2	0.39	5.33
2020	8	19	9	49	16.7	33.8831	25.9129	14.18	0.32	4.57
2020	8	19	18	36	20.73	36.5263	28.3156	22.35	0.29	3.86
2020	8	20	9	19	31.71	33.8749	25.9896	16.75	0.23	4.37
2020	8	20	16	18	38.35	32.8629	33.7129	30.99	0.22	3.03
2020	8	22	6	40	15.73	33.572	28.1254	28.73	0.11	3.42
2020	8	25	22	52	12.68	33.9475	25.8446	21.78	0.38	3.21
2020	8	26	2	12	50.25	34.1248	25.3091	16.95	0.47	3.09
2020	8	27	20	14	45.91	34.3012	32.0431	40	0.15	3.57
2020	8	29	0	18	30.78	40.0144	20.6242	30	0.02	4.3
2020	8	31	19	58	39.57	34.4577	25.6668	17.98	0.14	3.73
2020	9	3	22	41	14.12	35.4532	27.7136	1.72	0.4	4.07
2020	9	4	22	59	14.68	28.205	35.1447	4.95	0	2.17
2020	9	10	10	30	27.92	34.2804	25.2984	2.58	0.4	4.11
2020	9	12	7	20	24.01	34.3761	32.0524	3.55	0.16	3.54
2020	9	14	18	25	34.34	34.4295	25.1015	24.46	0.27	3.56
2020	9	15	9	24	0.66	32.5436	35.4413	9.17	0.56	3.25
2020	9	17	21	13	6.76	35.328	31.1506	30.51	0.28	3.61
2020	9	17	23	32	54.88	35.738	22.224	28.5	0.21	4.11
2020	9	18	16	28	11.62	35.1719	25.2468	29.49	0.33	5.61
2020	9	20	6	1	21.73	35.1172	23.2171	10.67	0.41	3.65
2020	9	20	6	31	3.39	34.9337	26.6645	21.49	0.39	4.26
2020	9	20	8	15	56.77	34.1991	23.7563	22.9	0.44	3.69
2020	9	20	14	40	30.38	34.5047	32.6867	9.26	0.12	3.36
2020	9	21	16	56	49.04	36.9633	30.6918	74.97	0.14	3.96
2020	9	24	18	52	14.05	35.3049	25.8792	5.95	0.41	3.93
2020	9	25	9	50	41.32	34.7731	25.1257	6.44	0.23	3.57
2020	10	1	11	5	37.4	36.5196	26.9857	20.55	0.34	5.05
2020	10	2	15	28	15.13	34.4464	23.9194	19.41	0.2	3.53
2020	10	4	2	44	55.63	35.2745	26.9933	27.02	0.34	3.39
2020	10	4	22	20	19.01	34.3883	25.1762	11.83	0.23	3.21

Year	Mon.	Day	Hour	Min.	Sec	Lat.	Long.	Depth	RMS	Xmag
2020	10	4	22	38	5.94	34.3004	26.0148	16.79	0.42	3.54
2020	10	5	5	3	26.1	34.7285	24.8607	9.28	0.28	3.11
2020	10	5	20	50	26.15	34.3318	25.2965	13.27	0.21	3.65
2020	10	6	17	21	28.31	35.3928	22.3394	20.16	0.44	4.16
2020	10	7	18	32	0.2	34.2912	25.2413	2.95	0.51	3.53
2020	10	11	14	55	26.95	34.7151	24.2815	7.73	0.42	3.81
2020	10	12	0	30	43.18	35.5912	26.4495	30.16	0.28	5.18
2020	10	12	0	44	27.96	35.6017	26.5104	23.9	0.32	4.42
2020	10	12	1	11	58.71	35.6699	26.3229	9.64	0.32	3.93
2020	10	12	2	38	53.8	35.6344	26.2882	9.97	0.24	4.07
2020	10	12	4	11	29.18	35.6145	26.3434	23.45	0.47	5.29
2020	10	12	5	0	33.05	35.6074	26.238	4.5	0.3	4
2020	10	12	8	53	18.89	35.6033	26.223	4.39	0.3	3.75
2020	10	14	1	52	16.34	36.0029	26.268	31.05	0.34	3.5
2020	10	14	10	58	31.32	35.6083	26.2664	8.38	0.29	3.98
2020	10	14	15	31	18.75	34.54	25.6645	13.1	0.18	3.11
2020	10	14	18	25	53.51	35.7465	26.3354	26.27	0.36	3.35
2020	10	14	22	22	51.26	35.6362	26.345	19.66	0.49	4.07
2020	10	18	1	41	49.03	34.4456	26.7207	16.17	0.15	3.49
2020	10	19	7	31	8.4	35.143	26.5332	10.11	0.34	3.26
2020	10	19	12	6	18.25	34.4001	26.7837	14.33	0.2	3.51
2020	10	20	22	0	38.25	34.2519	25.4672	26.62	0.41	3.79
2020	10	21	6	48	49.09	34.0397	25.6191	9.67	0.36	4.03
2020	10	21	20	14	8.23	36.8178	30.7752	11.86	0.48	3.69
2020	10	21	23	0	57.31	37.0705	20.6909	27.57	2.08	5.09
2020	10	24	2	6	47.58	35.5586	26.2413	31.71	0.55	3.63
2020	10	24	7	50	41.79	35.9878	22.0091	26.02	0.26	3.8
2020	10	26	6	13	11.97	34.315	25.4835	21.6	0.39	3.64
2020	10	30	11	51	27.7	37.6555	26.9404	6.78	0.47	6.23
2020	10	30	13	0	43.73	37.8866	26.8379	9.29	0.17	4.75
2020	10	30	15	14	59.16	37.7491	26.7872	29.24	0.22	4.81
2020	10	30	23	56	13.02	28.6923	34.8741	3.15	0.45	2.99
2020	10	31	0	28	14.66	28.689	34.9804	4.13	0.12	1.59
2020	10	31	5	31	27.79	37.9206	26.8666	4.53	0.09	4.51
2020	11	2	12	11	51.62	35.8234	27.9568	40	0.17	3.78
2020	11	7	3	42	9.37	33.7082	29.2791	31.11	0.26	3.27
2020	11	9	20	31	14.63	36.7338	27.6432	11.21	0.32	3.41
2020	11	11	6	49	46.66	37.815	26.905	14.93	0.25	4.18
2020	11	13	2	38	8.38	34.1868	26.3345	10.04	0.47	3.6
2020	11	18	23	11	0.72	36.9556	21.4232	27.66	1.17	4.09
2020	11	20	11	32	44.96	36.3633	25.4782	31.99	0.49	3.37
2020	11	20	19	45	0.24	35.0904	27.9538	23.74	0.27	3.27

Year	Mon.	Day	Hour	Min.	Sec	Lat.	Long.	Depth	RMS	Xmag
2020	11	21	21	41	35.4	37.8885	24.0897	20.78	0.04	3.5
2020	11	24	21	24	41.79	33.9763	25.9854	13.73	0.18	3.84
2020	11	24	22	18	20.5	32.7984	29.9228	23.82	0.24	4.26
2020	11	26	6	10	49	36.0889	26.3305	23.84	0.46	3.19
2020	11	26	22	8	27.31	33.8313	36.7708	8.84	0.29	4.15
2020	11	29	20	5	5.81	34.77	24.8447	7.83	0.77	3.5
2020	11	30	3	4	0.35	30.4497	35.9331	9.78	0.35	2.67
2020	12	5	12	44	38.79	36.0448	31.7954	124.72	0.93	5.67
2020	12	11	4	16	44.78	19.692	30.8993	9.61	0.38	2.71
2020	12	11	11	1	10	35.7137	26.3518	26.73	0.13	3.65
2020	12	15	1	3	32.71	34.2535	26.2977	26.34	0.3	3.46
2020	12	16	21	30	3.57	36.4581	27.1595	21.11	0.48	3.56
2020	12	17	7	19	14.3	34.8027	23.2399	10	0.27	3.72
2020	12	17	13	36	46.29	35.6529	26.431	21.79	0.63	4.73
2020	12	17	19	53	4.78	25.5449	36.7227	10	0.3	2.72
2020	12	18	5	37	9.92	36.469	27.6142	15.28	0.3	3.52
2020	12	18	9	24	10.28	36.7711	30.9677	19.14	0.25	3.65
2020	12	20	3	14	40.4	37.0347	28.7814	13.53	0.14	3.97
2020	12	23	0	22	32.28	38.2494	22.1786	10.77	0.09	3.76
2020	12	24	17	5	23.1	34.026	25.5055	2.51	0.38	3.42
2020	12	27	7	13	55.66	36.2622	28.8903	2.84	0.46	4.03
2020	12	28	22	55	28.07	36.3492	27.0018	25.77	0.4	4.04
2020	12	29	4	47	34.28	18.9939	32.5506	4.69	0.23	3.2

مشروع مراقبة المحاجر

لقد أصبح البحثُ العلمي التطبيقي الذي يشارك في حل المشاكل التي تصادفها المؤسسات والصناعة، ركيزة ومنطلقاً لكل تطور صناعي وتقدم اقتصادي في كافة الدول، بل وأضحى نشاطاً من الأنشطة الاقتصادية، ويؤدي دوراً كبيراً هاماً في تقدم الصناعة والاقتصاد ونموهما .وإن كان البحث العلمي والتعاون مع الصناعات المختلفة هاماً بالنسبة للدول المتقدمة ، فهو بالنسبة للدول النامية ومؤسساتها أكثر أهمية وإلحاحاً ، إذ بواسطته يتم وضع الخطط على أسس سليمة ومتينة، ويتم تفادي الأخطاء ودفع الخسائر وتحسين الأداء ورفع المردود الأقتصادي.

ومن هذا المنطلق، ومن منطلق التخطيط السليم لصناعة الأسمنت من حيث اختيار مواقعها والتحكم الدقيق وما قد تسببه من إزعاج للمواطنين نتيجة التفجيرات التى تُجرى للحصول على المواد الخام فضلاً عن المحافظة على البيئة، فقد ألت إلى المعهد القومي للبحوث الفلكية والجيوفيزيقية مراقبة التفجيرات التي تُجرى بمحاجر شركات الأسمنت. وذلك لما يحيوه المعهد من أجهزة ومحطات لرصد إى إهتزازت (طبيعية أو صناعية) داخل القطر المصري.

الرؤية المستقبلية

- توسيع نطاق خدماتنا لتشمل المشاريع الصناعية الأخرى.
- تنظيم وعقد دورات تدريبية في مجال تنمية (الموارد البشرية، وإدارة المشاريع، ... الخ)
- أن نصبح شركاء في المشاريع القومية.

مشروع مراقبة الزلازل والهزات الارضية حول حرم الموقع النووي بالضبعة المزمع انشاؤه

يتم رصد الزلازل لموقع الضبعة والمناطق المحيطة بها بشكل مستمر من قبل شبكة الضبعة الزلزالية المحلية (DLSN) والشبكة القومية المصرية لرصد الزلازل (ENSN).

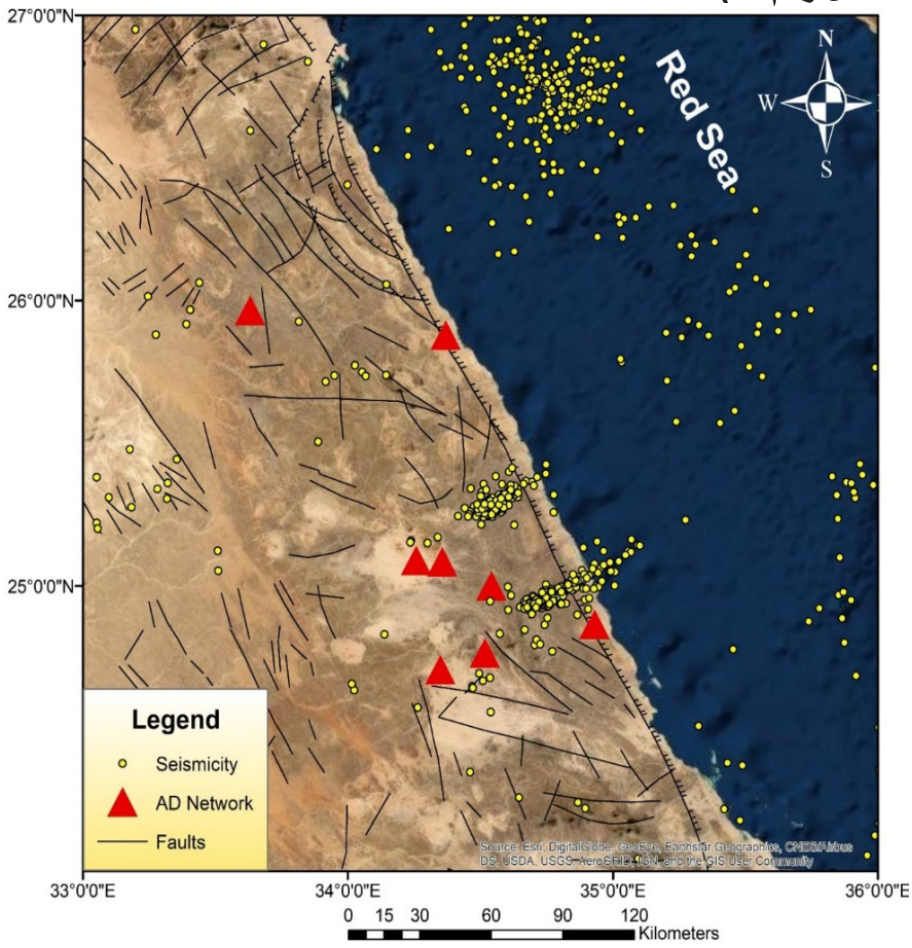
التطوير المستمر لمحطات الرصد وكذلك استمرار تحديث طرق الرصد و التحليل للبيانات المرصودة، أدى الى زيادة قدرة الشبكة المحلية المصرية بالضبعة لرصد و تُوقِيع الهزات الزلزالية الصغيرة طبيعية كانت او اصطناعية حتى البالغة من القوه ٠,٥ بمقياس القدر الزلزالي بدائرة نصف قطرها ٥٠ كم حول الحرم النووى.

تم نقل بيانات المحطات الزلزالية العاملة بشبكة الضبعة المحلية القومية عبر وصلات الاتصالات اللاسلكية إلى وحدة التسجيل الموجودة في موقع الضبعة خلال الفترة الزمنية منذ عام ٢٠٠٥م الى ٢٠١٠م. لضمان الاستحواذ على اقصى كم من البيانات تم استخدام نظام التسجيل في الموقع لكل محطة في هذه الشبكة منذ عام ٢٠١١م حتى الآن، كما تم تطوير نظام مراقبة آنيٍ للحالة الفنية للمحطات لضمان سرعة الاستجابة للأعطال.

مشروعات بحثية ومشاريع قائمة

إنشاء شبكة محلية محمولة في منطقة أبو دباب

منطقة أبو دباب هي من المصادر الزلزالية النشطة في الصحراء الشرقية بجمهورية مصر العربية، وتقع في الجزء الأوسط من الصحراء الشرقية، على طول ساحل البحر الأحمر، ولذلك تم تسميتها من قبل البدو ساكني هذه المنطقة باسم " أبو دباب"، وتتميز بالعديد من السمات الجيولوجية المميزة، ولها تاريخ زلزالي كبير ومستمر، وتحدث على شكل أسراب وحشود زلزالية متكررة. تتميز هذه المنطقة بوضع تكتوني فريد ومعقد ، مع وجود تدفق حراري وكذلك حدوث معدل عالٍ نسبيا من النشاط الزلزالي (حشود زلزالية)؛ وفى بعض الأوقات من العام قد يتراوح العدد اليومي للزلازل بهذه المنطقة من ١٥ إلى ٦٠ زلزالا معظمها صغير جدا، وتحدث على شكل حشود زلزالية. كما تعرضت هذه المنطقة إلى زلزالين متوسطين القوة في ١٢ نوفمبر ١٩٥٥م و٢ يونيو ١٩٨٤م بلغت قوتهما ٦,١ و ٥,١ على التوالي، كما تعرضت للكثير من أسراب(حشود) الزلازل، على سبيل المثال، ١٩٧٦م، ١٩٨٤م، ١٩٩٣م، يناير ٢٠٠٣م، أبريل ٢٠٠٣م، أكتوبر ٢٠٠٣م، أغسطس ٢٠٠٤م، ولذلك فقد كان من الضروري إنشاء شبكة محلية تتكون من ٨ محطات متنقلة حول هذا النشاط لدراسته تفصيلياً لتحديد مسبباته (شكل رقم ١٥)

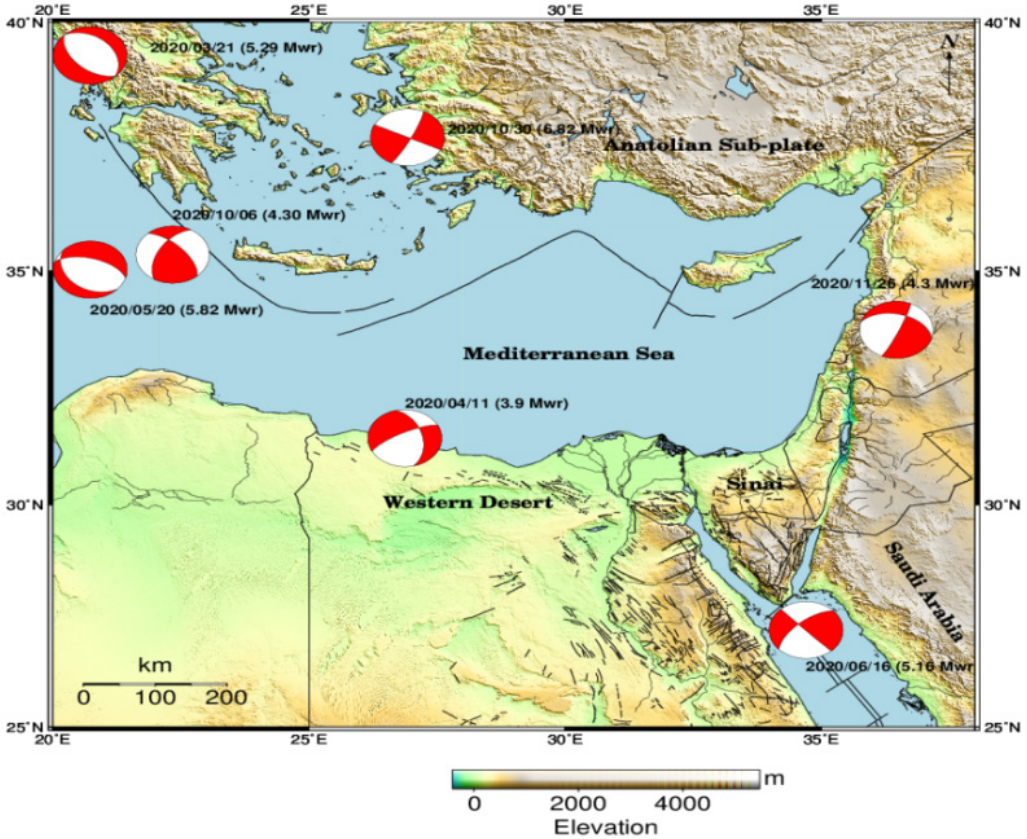


شكل رقم ١٥. يبين توزيع شبكة محطات أبو دباب المحلية النشاط الزلزالى.

الزلازل التي تم الإحساس بها خلال عام ٢٠٢٠م في مصر :

يوضح الشكل رقم (١٤)، ميكانيكية أهم الزلازل التي حدثت خلال عام ٢٠٢٠م. ومن أهم الزلازل التي حدثت خلال عام ٢٠٢٠م وشعر بها المواطنون هي:

١. ١١ أبريل ٢٠٢٠م، وقع زلزال مع (Ml, 4) غرب مدينة مرسى مطروح على عمق ٢ كم.
٢. ٢٨ يونيو ٢٠٢٠م وقع زلزال مع (Ml 5.4)على بعد ٦٠٠ كم شمال شرق مرسى مطروح ، تم الاحساس بهذا الزلزال من قبل سكان مدينة القاهرة وبعض المدن الأخرى.
٣. ١٨ سبتمبر ٢٠٢٠م، وقع زلزال مع (Ml 5.8) في جزيرة كريت، وشعر به سكان الإسكندرية والساحل الشمالي.
٤. ٢٥ سبتمبر ٢٠٢٠م، وقع زلزال في منطقة البحر الأحمر، على بعد ٣٣ كم شمال شرق الغردقة، مل (Ml 3.9).
٥. يوم الأحد، ٢٢ نوفمبر ٢٠٢٠م، وقع زلزال في منطقة الدلتا، (Ml 3.5)
٦. الخامس من ديسمبر ٢٠٢٠م، وقع زلزال على بعد ٥٠٠ كم شمال دمياط، (Ml 5.6)، شعر به المواطنون في مدن القاهرة والدلتا.
٧. ١١ ديسمبر ٢٠٢٠م، زلزال (Ml 3.2)، على بعد ١٩ كم غرب مدينة ٦ أكتوبر، شعر به العديد من المواطنين.
٨. ١٥ ديسمبر ٢٠٢٠م, وقع زلزال مع (Ml 5.4) في جنوب البحر الأبيض المتوسط .



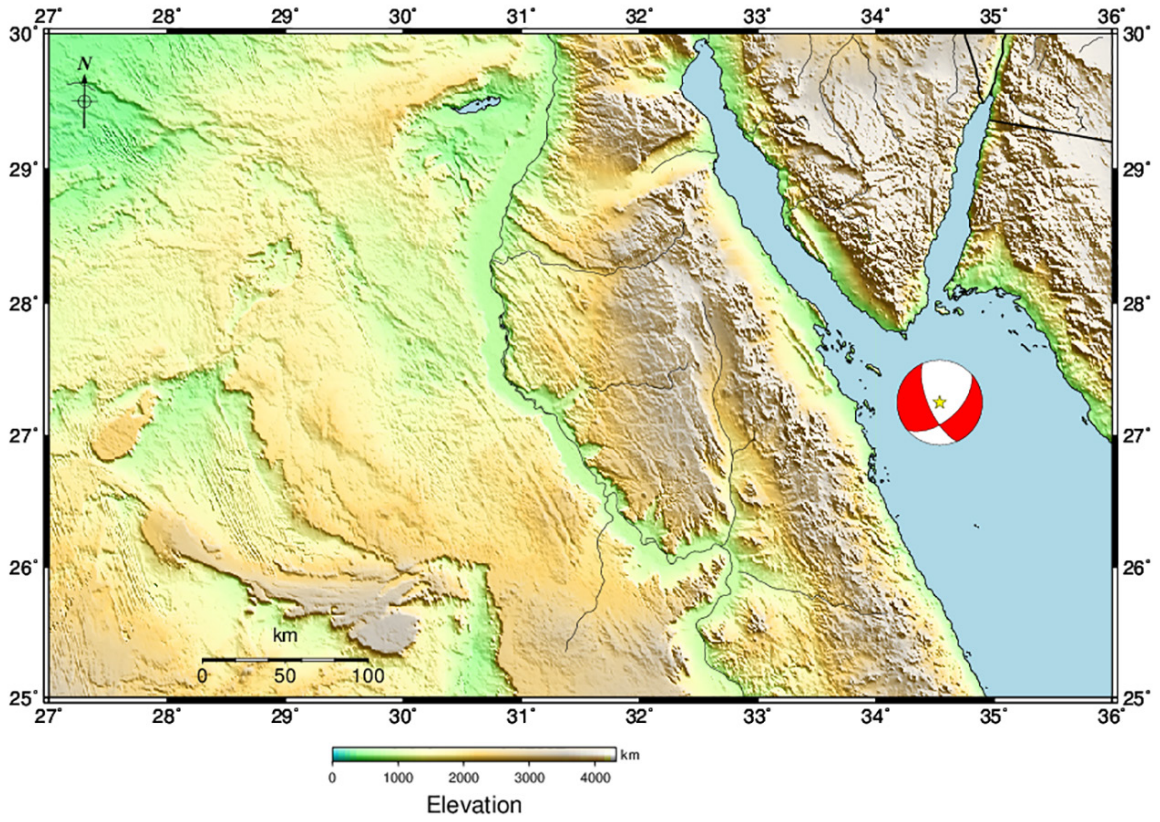
شكل رقم ١٤. ميكانيكية حدوث الزلازل الكبيرة داخل مصر وما حولها

أمثلة لبعض الزلازل المسجلة خلال عام ٢٠٢٠م.

زلزال البحر الأحمر

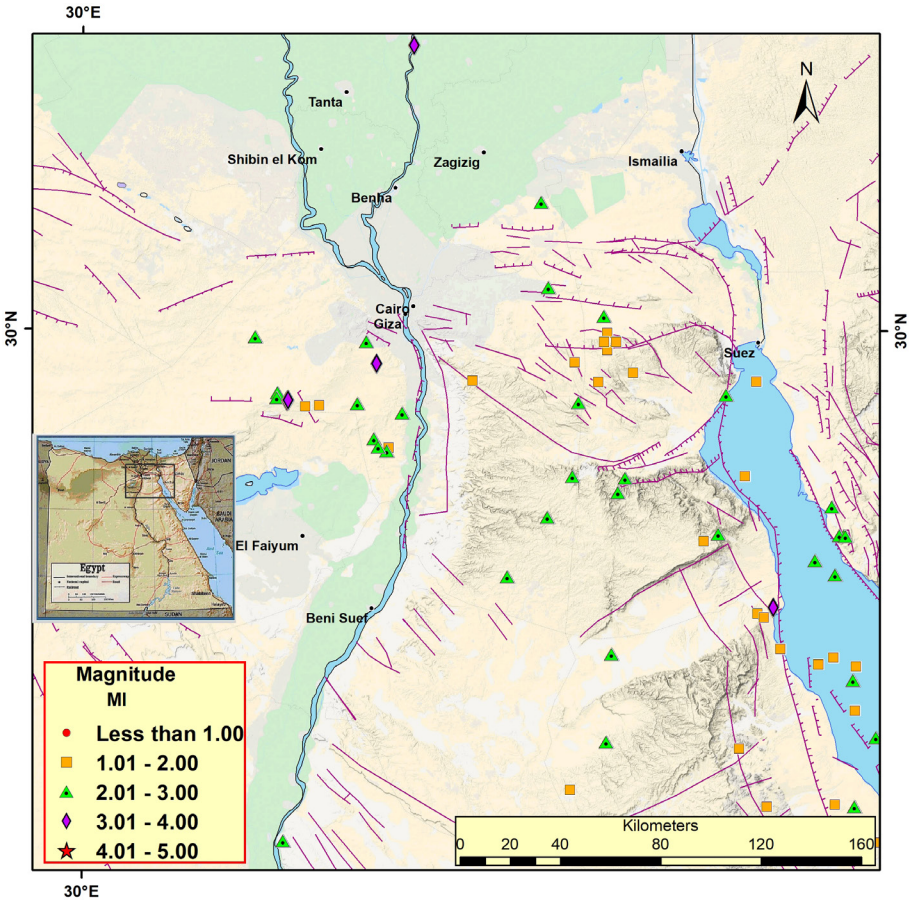
يعتبر البحر الأحمر من أهم المناطق الزلزالية النشطة في مصر، ويمكن أن يعزى نشاطه إلى حركة الصفيحة المتباينة بين الصفيحة العربية والصفيحة الأفريقية. وفي ١٦ يونيو ٢٠٢٠م، في الساعة ١٤:٣٠:٢٣ (بتوقيت جرينتش) وقع زلزال قوته (٥,٤٠ درجة على مقياس ريختر) في شمال البحر الأحمر، على بعد ٨٦ كم شرق الغردقة. وقد شعر السكان بهذا الزلزال على نطاق واسع فى مصر بينما لم ترد أنباء عن وقوع ضحايا . يقع مركز الزلزال عند ٢٧,٢٠٨٧ درجة شمالا ، ٣٤,٧٠٤٤ درجة شرقاً ويوضح الشكل رقم (١٣) ميكانيكية حدوث الهزة والذي يشير إلى أنه الصدع المسبب للهزة عبارة عن صدع طبيعي رأسي مع نسبة صغيرة لإزاحة جانبية أفقية تتفق بالتوازي مع الاتجاه الرئيسي لصدع البحر الأحمر .

ومن الواضح أن قوى الشد تأخذ إتجاه شمال غرب- جنوب شرق، وقوى الضغط تأخذ إتجاه شمال شرق — جنوب غرب، وهي تتفق مع القوى العامة والمؤثرة في انفتاح البحر الأحمر، وعلى العكس من ذلك، تتميز الحافة القارية في شمال مصر بالنشاط الزلزالي المعتدل، وقد تاثر شمال مصر ببعض الزلازل متوسطة الحجم (مأمون وآخرون، ١٩٨٤ و أمبراس وآخرون، ١٩٩٤).

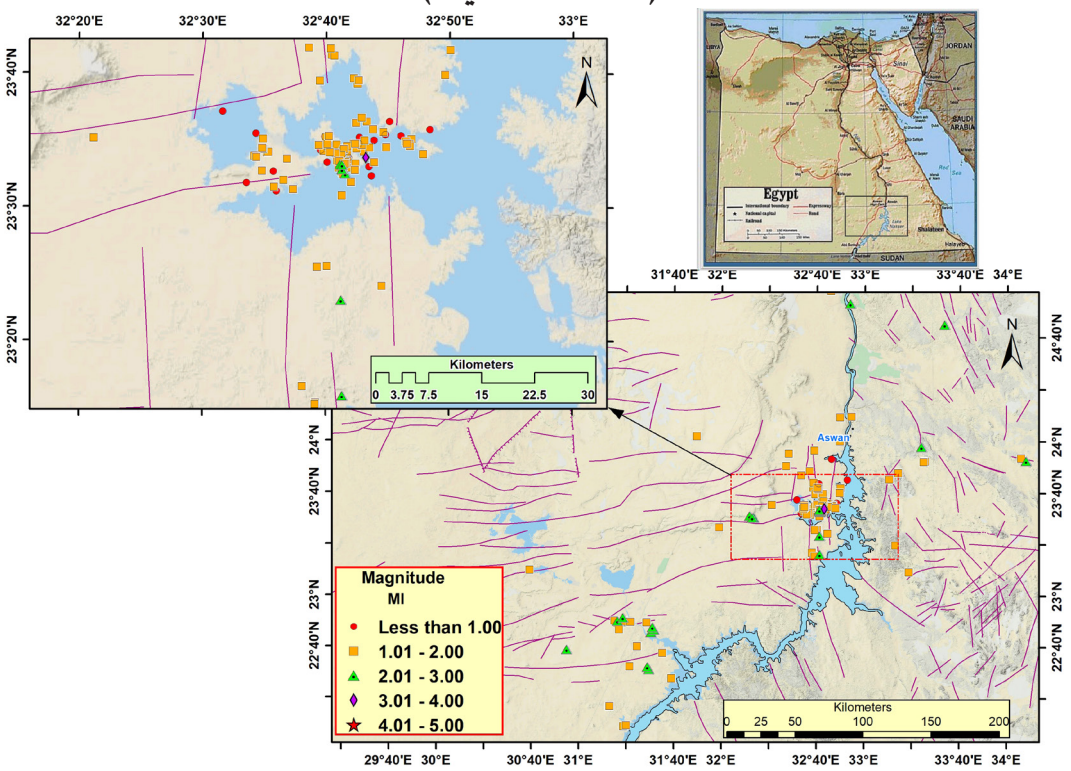


شكل رقم ١٣. يوضح نوع الصدع الزلزالي المسبب له (صدع طبيعي رأسي مع نسبة صغيرة لإزاحة جانبية أفقية) والذى بلغت قوته ٥,٤ وقع يوم ١٦ يونيو ٢٠٢٠م في شمال البحر الأحمر، على بعد ٨٦ كم شرق الغردقة، مصر.

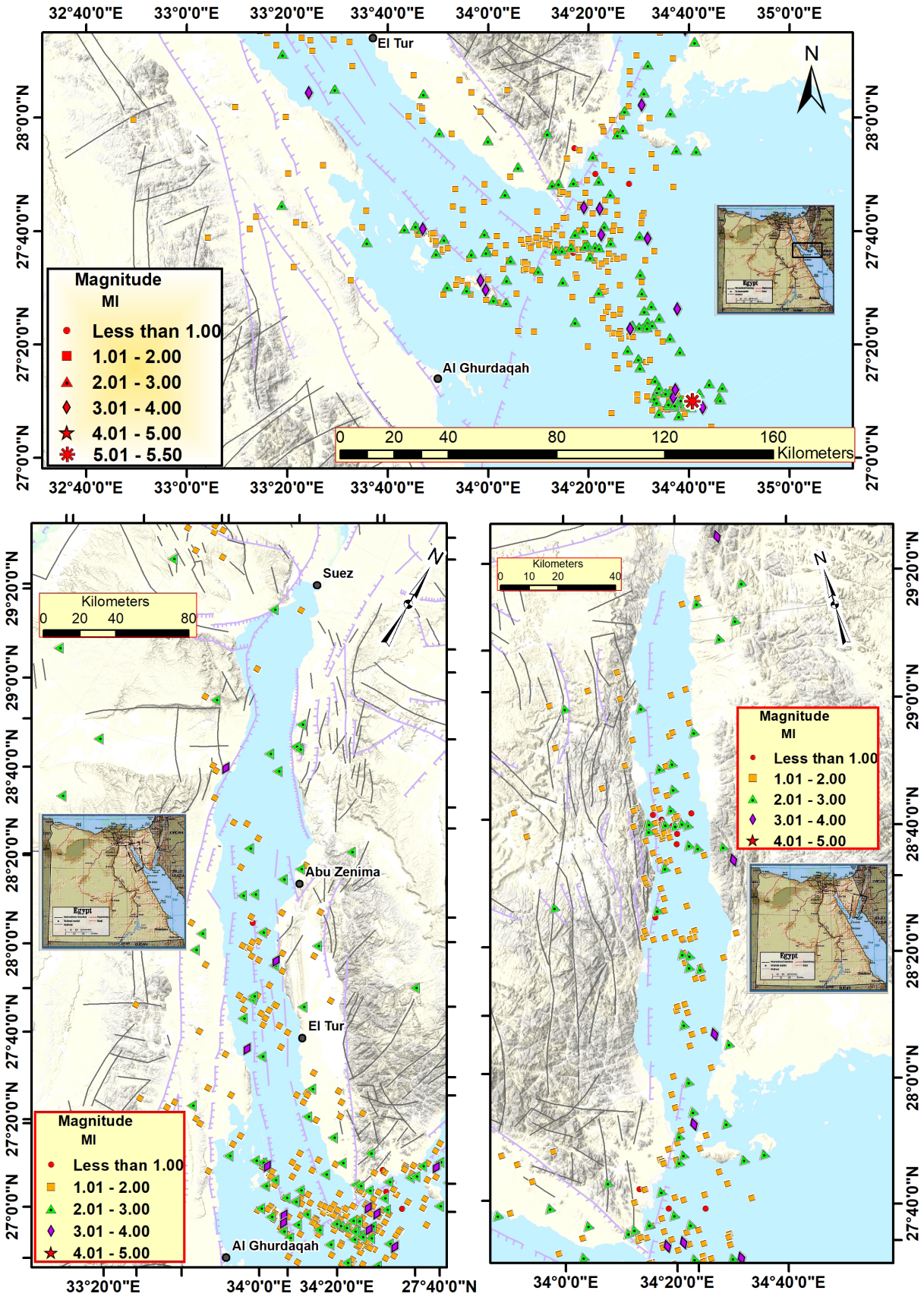
شكل رقم ١٢. تسجيلات محطات العجلة الزلزالية لعام ٢٠٢٠م لبعض الزلازل المحسوسة.



شكل رقم ١٠. النشاط الزلزالي المحلي داخل جمهورية مصر العربية والمسجل خلال عام ٢٠٢٠م، (القاهرة – السويس)،



شكل رقم ١١. النشاط الزلزالي المحلي داخل جمهورية مصر العربية والمسجل خلال عام ٢٠٢٠م، بمنطقة أسوان وبحيرة السد العالى

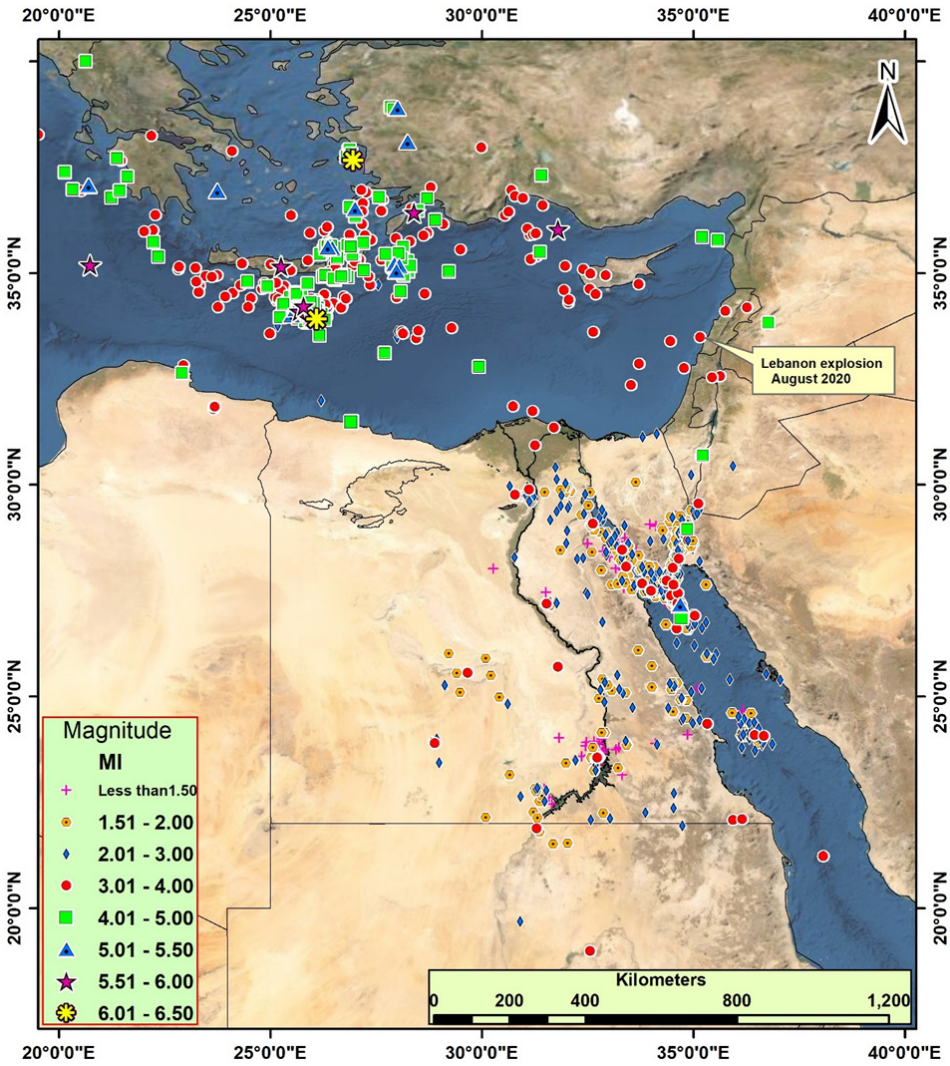


شكل رقم ٩. النشاط الزلزالي المحلي خلال عام ٢٠٢٠م في كل من خليج السويس وخليج العقبة وشمال البحر الأحمر

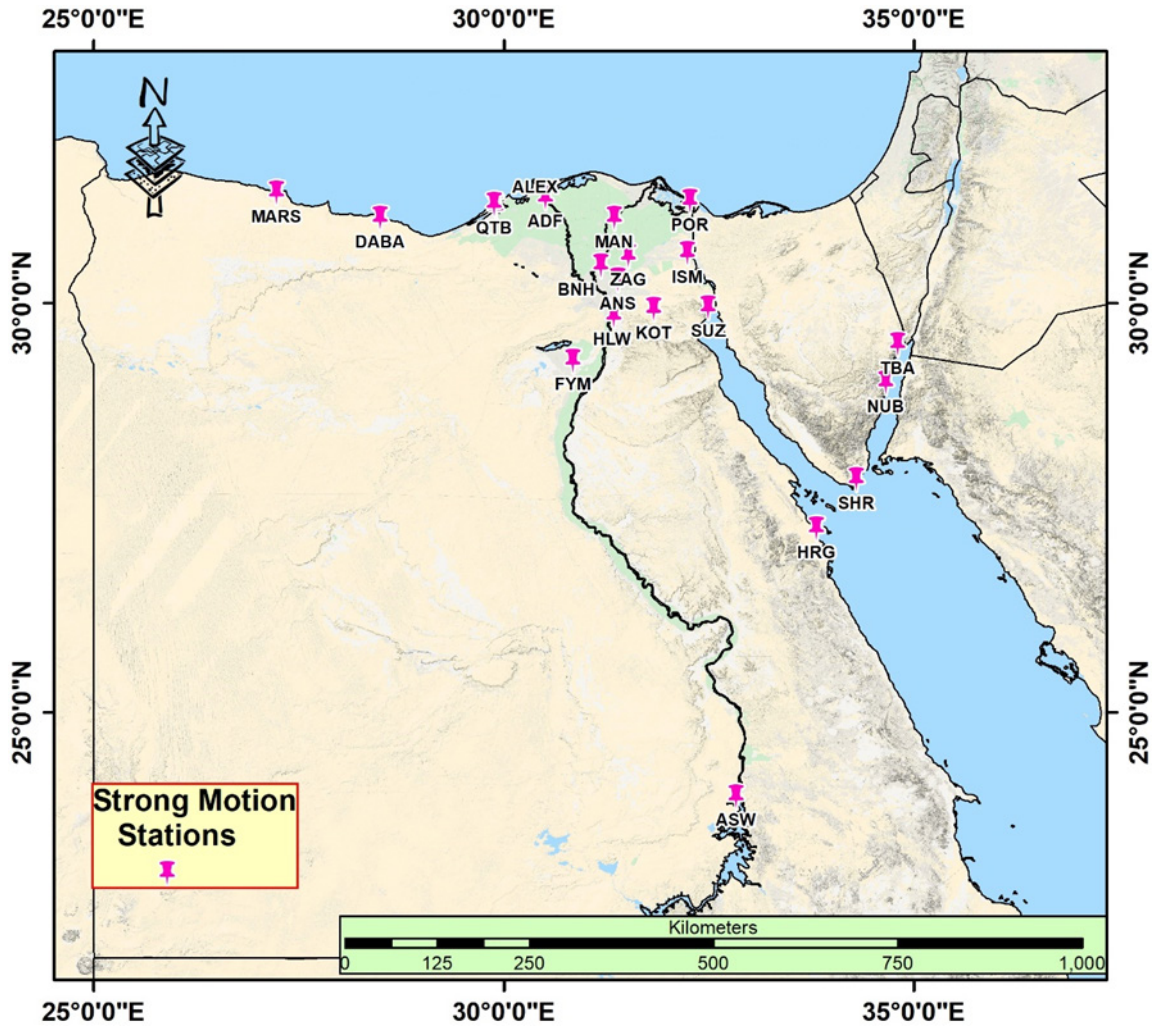
ملخص النشاط الزلزالي خلال ٢٠٢٠

يتضح من خرائط النشاط الزلزالي وجود زيادة نسبية في معدل النشاط الزلزالي خلال عام ٢٠٢٠م في مصر وما حولها (الشكل ٨) . علما بان تلك الأنشطة الزلزالية المحلية تتوافق مع المناطق الزلزالية النشطة المحددة سابقاً خلال السنوات السابقة. وتوضح الاشكال ٩ و١٠ و ١١ تكبيرًا (zoom in) لبعض المناطق الزلزالية المختارة في مصر فوق الفوالق السطحية.

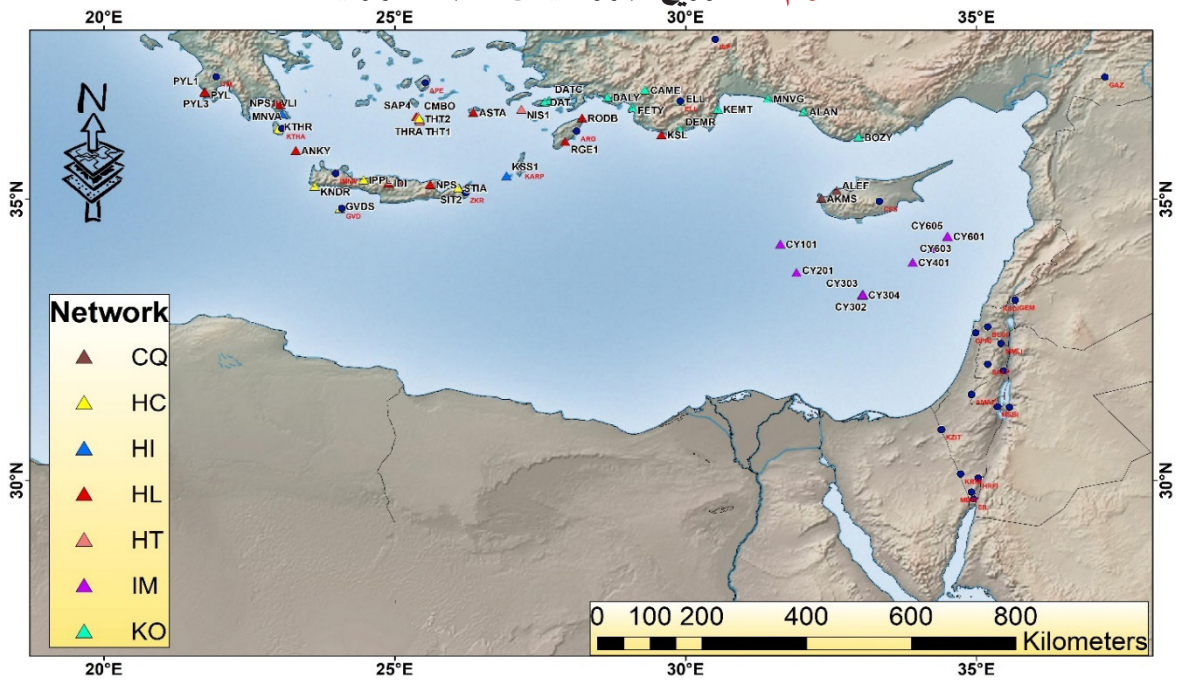
كما يوضح الشكل رقم (٨) الأنشطة الزلزالية الإقليمية ممثلة في مجموعة من النشاط الزلزالي إلى الجزء الجنوبي من الأقواس اليونانية والقبرصية. ويمتد النشاط الزلزالي شمالاً إلى الجزء الجنوبي من اليونان وتركيا. كما تقع زلازل قليلة جنبا إلى جنب مع جنوب الأردن، شمال السودان، البحر الأحمر، وعلى طول نظام صدع البحر الميت وتسجيل تفجير لبنان المؤسف الشهير الذى حدث في مرفأ بيروت في شهر أغسطس. ويمثل الشكل رقم ١٢ تسجيلات محطات العجلة الزلزالية لعام ٢٠٢٠م لبعض الزلازل المحسوسة.



شكل رقم ٨. النشاط الزلزالي الإقليمي والمحلي المسجل بأجهزة عجلة التسارع الأرضية خلال عام ٢٠٢٠م.



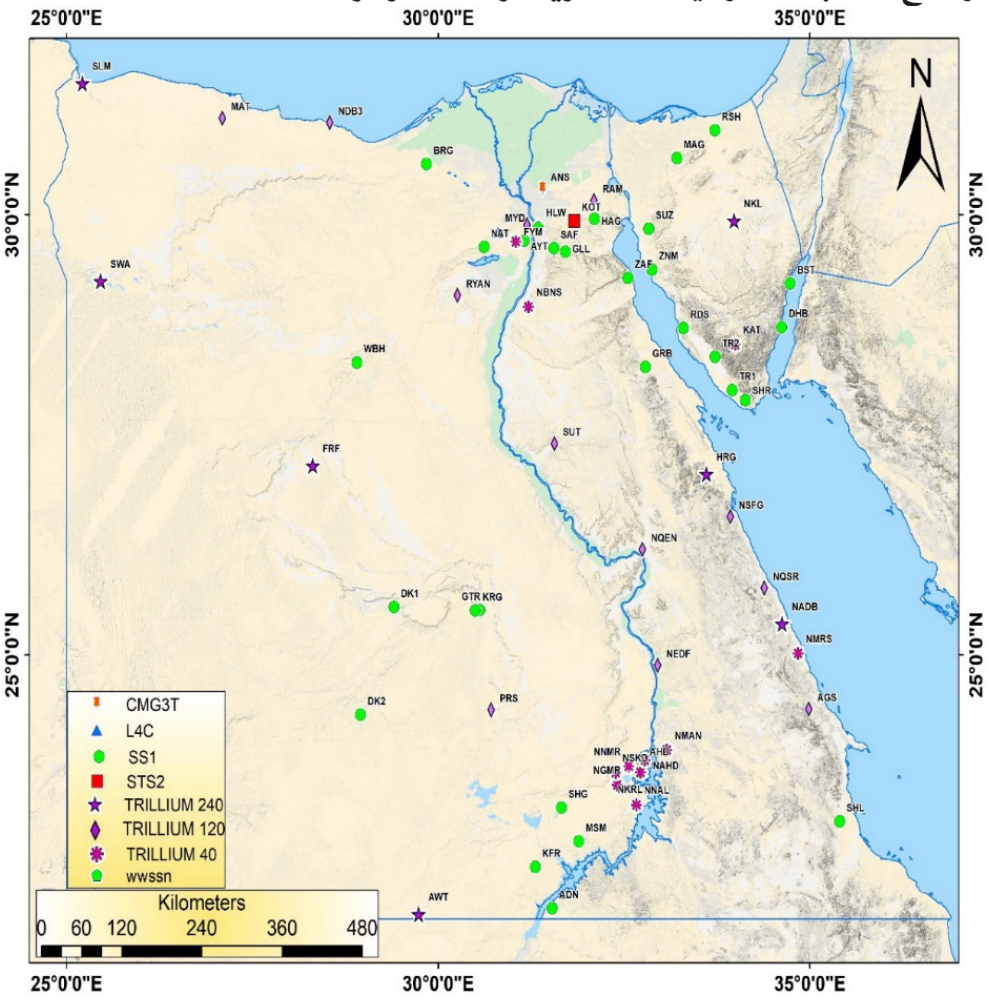
شكل رقم ٦. توزيع أجهزة قياس العجلة الزلزالية .



شكل رقم ٧. مواقع محطات الزلازل الدولية التي تستخدم في تحديد معاملات الزلازل بدقة أكبر جنبا الى جنب مع المحطات المصرية الاخرى.

الشبكة القومية المصرية للزلازل

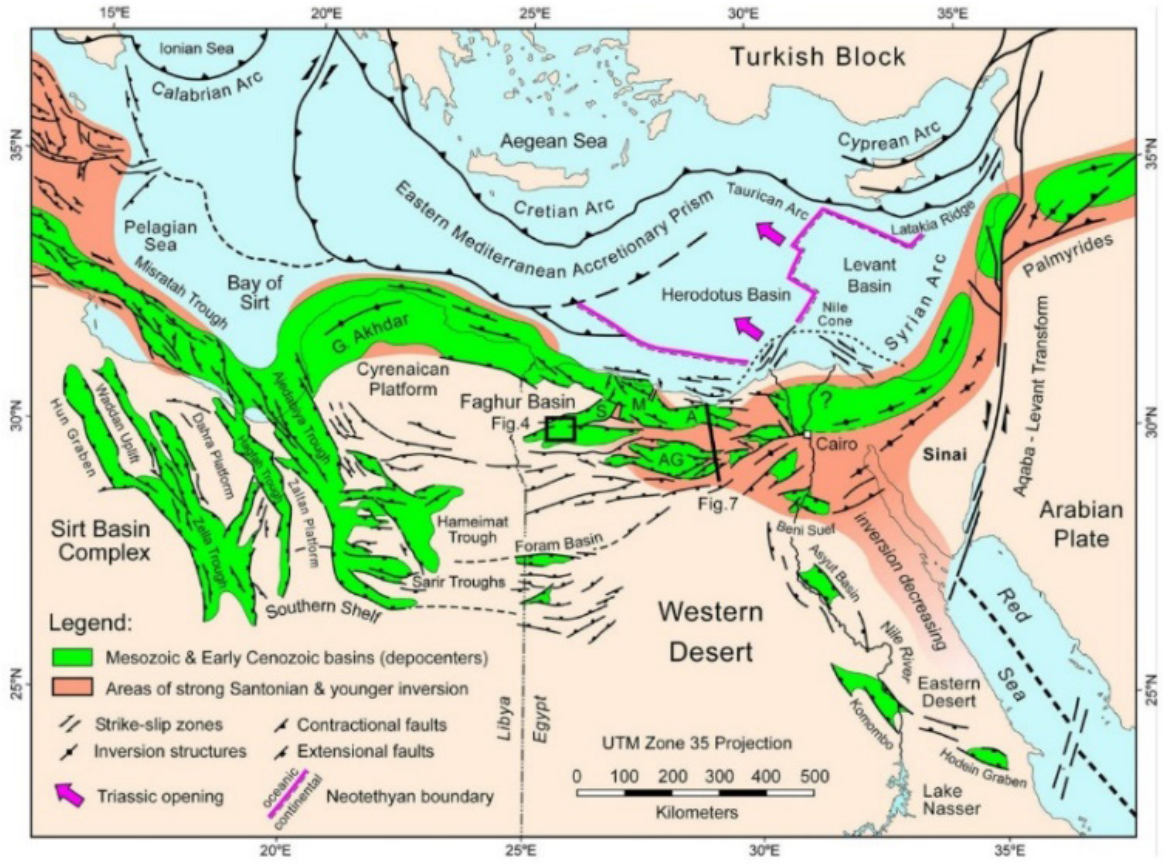
في ١٢ أكتوبر ١٩٩٢ ، حدث زلزال بقوة (٥,٩) في جنوب غرب القاهرة، وقد تسبب هذا الزلزال في وفاة ٥٦١ شخصاً وإصابة ٩٨٣٢ آخرين، وتسبب في خسائر تقدر بأكثر من ٣٥ مليون دولار أمريكي. ونتيجة لهذا الضرر، دعمت الحكومة المصرية المعهد القومي للبحوث الفلكية والجيوفيزيقية وكلفته بإنشاء وتركيب الشبكة المصرية القومية لرصد الزلازل، وتتكون من محطات قياس الزلازل العادية بأنواعها الى جانب محطات قياس عجلة التسارع الأرضية لقياس الزلازل القوية، ويتم استقبال البيانات بالمركز الرئيسي للرصد الزلزالي في حلوان، بالإضافة إلى خمسة مراكز فرعية في كل من الغردقة وبرج العرب ومرسى علم وأسوان والخارجة. يوضح (الشكل ٥) توزيع محطات الزلازل بالشبكة القومية المصرية لرصد الزلازل بأنواعها المختلفة ، و(الشكل ٦) أجهزة عجلة قياس عجلة التسارع الأرضية، ويتم اختيار هذه المواقع لتغطية المصادر الزلزالية المعروفة قدر الإمكان. كما أن هذا التوزيع يشمل بعض المناطق التي بها زلازل تاريخية معروفة مسبقاً. وتستعين الشبكة القومية ببعض محطات الرصد الدولية (شكل ٧) لتعيين حساب معاملات الزلازل بشكل ادق خصوصا عند حصول زلازل خارج نطاق مواقع الشبكة القومية المصرية لرصد الزلازل.



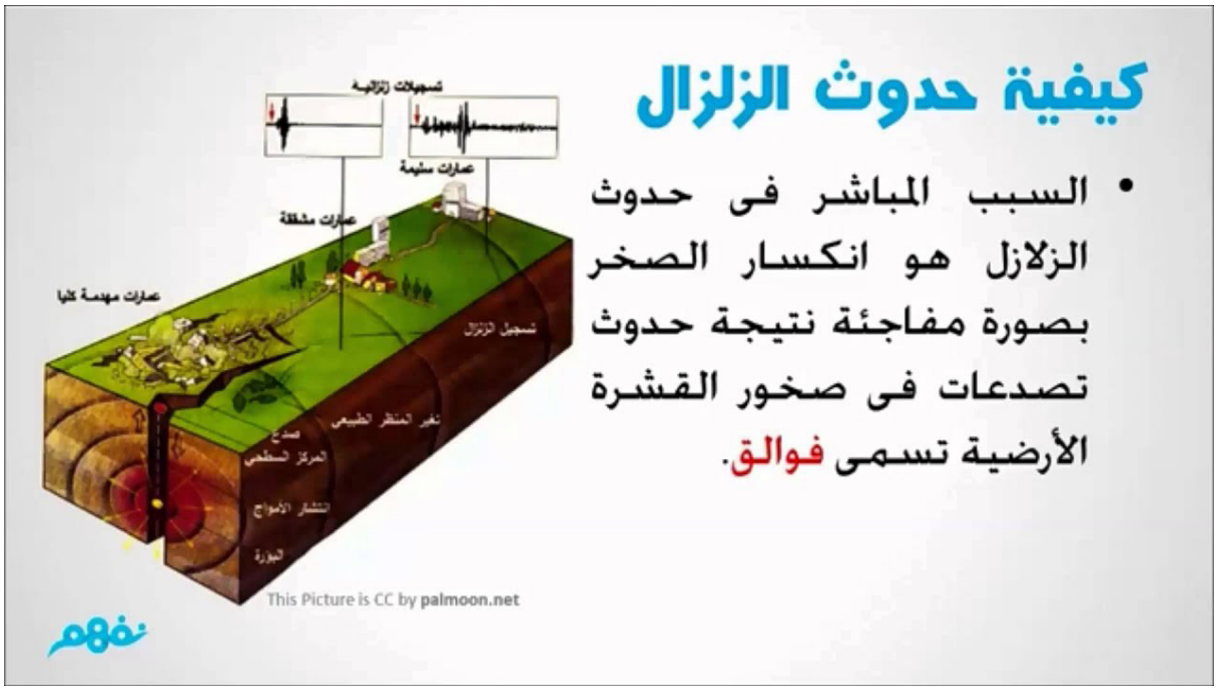
شكل رقم ٥. توزيع محطات الزلازل بالشبكة القومية المصرية لرصد الزلازل بأنواعها المختلفة.

الاتجاهات التراكيب الجيولوجية التي تم تنشيطها في كثير من الأحيان جنباً إلى جنب مع أنظمة الصدوع القائمة، استمر النشاط البركاني والتكتوني في مصر حتى نهاية عصر الباليوزويك في العصر الترياسي ومن ثم تم ترسيب أكثر من كيلومتر من طبقات الحجر الرملي النوبى في جنوب مصر من العصر الجوراسي إلى أواخر العصر الطباشيري أو أوائل العصر الحديث. زاد النشاط التكتوني والصهاري مرة أخرى في نهاية العصر الطباشيري كما هو مبين في (الشكل ٤).

تدعم الملاحظات الجيولوجية التي تمت في جنوب مصر الأصل التكتوني لوادي النيل. كما تأثرت مصر بافتتاح البحر الأحمر (نظام منتصف المحيطات) وفرعيه (خليج السويس ونظام تحويل خليج العقبة - البحر الميت). وبالتالي ، فإن الحركة الزلزالية ترجع إلى التفاعل بين الصفائح الثلاث لأوراسيا وأفريقيا والصفائح العربية، وبالتالي، يمكن الاستنتاج أنه على الرغم من أن الزلازل المدمرة حدثت بشكل غير منتظم، إلا أنه لا يمكن تجاهل عواقبها الخطيرة.



شكل رقم ٤. توضح الوضع التكتوني (التراكيب الجيولوجية) لمصر



شكل رقم ٣. تصدعات القشرة الأرضية هي أغلب ما يسبب الزلازل.

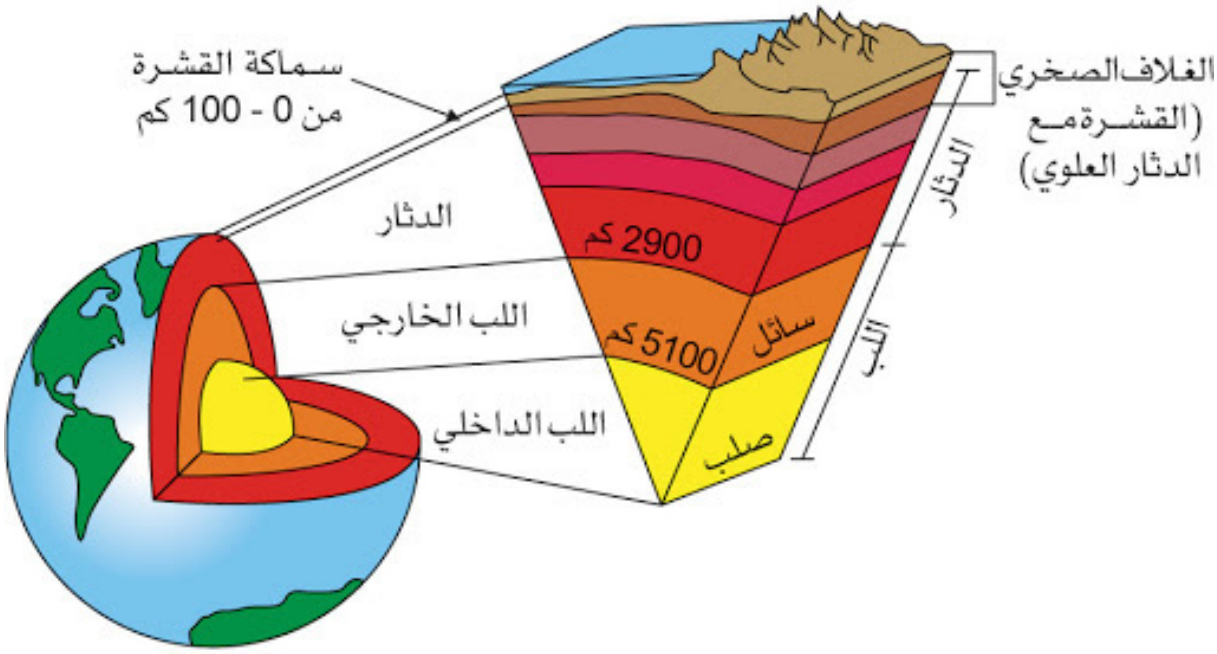
الوضع التكتوني (التراكيب الجيولوجية) في جمهورية مصر العربية:

تعتبر الزلازل الظاهرة الأكثر تأثيراً من ضمن المخاطر الطبيعية، حيث لها آثار على الحياة الطبيعية، والحياة البشرية، كما أن تقييم المخاطر الزلزالية في أي منطقة يلعب دوراً هاماً في التقليل من آثارها.

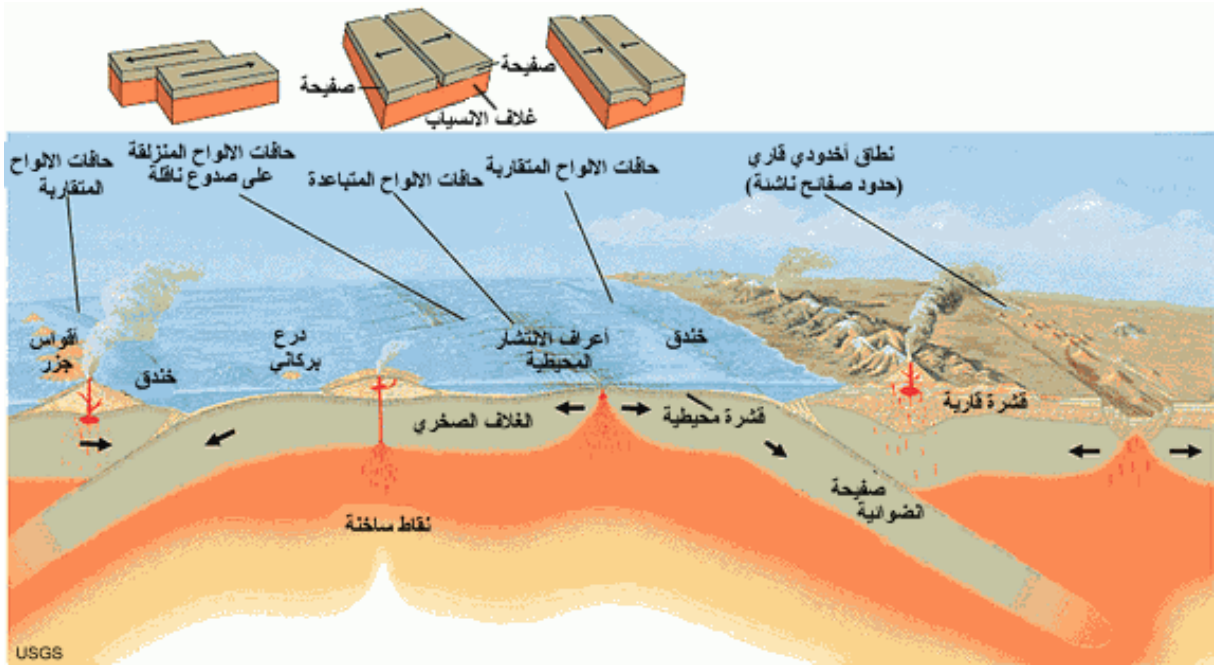
الزلازل ظاهرة جيوديناميكية، والنشاط الزلزالي الحالي والظواهر الجيوديناميكية الأخرى المتعلقة به (مثل تشوه وتمزق القشرة الأرضية، والبراكين، والظواهر الحرارية الأرضية، والسمات الطبوغرافية، وما إلى ذلك) هي نتائج لعملية جيولوجية حديثة نسبياً، والتي تسمى عادة، المناطق التكتونية النشطة .

ويمكن وصف الإطار التكتوني العام لمصر بعبارات بسيطة، بأنها تتكون من ثلاث وحدات تتحكم في التاريخ الرسوبي والتركيبي لمصر ؛ وهي الكتلة العربية النوبية، الرصيف (الجرف) المستقر، والرصيف (الجرف) غير المستقر. يغطي الجرف المستقر جزءًا كبيراً من مصر يتمثل في المحيط الكتلي العربي النوبي. وهو يعكس الاستقرار التكتوني النسبي نحو الجنوب، ينتمي جزء كبير من شمال مصر إلى الجرف غير المستقر الذي عانى من تشوهات صخرية شديدة. وفى الحدود الشمالية تقع مصر بالقرب من أحد أنظمة الكسر القارية وهو القوس الهليني (القوس اليوناني) عند حدود التقارب بين صفحتين كبيرتين من صفائح الليثوسفير (أوراسيا وأفريقيا).

يوجد أربعة أنظمة من الصدوع التي تتجه بزاويا ٥٥ درجة و٧٠ درجة و ٨٠ و ١٥٠ درجة من الشمال والتي تمثل مناطق الكسر الرئيسية الإقليمية والعابرة للقارات. والتي نشأت خلال مختلف حقبة التركيب القشري. تم التحكم عموما في تشوه حقبة الفانيروزويك داخل اللوح والعمليات ذات الصلة من التآكل والتعرية والترسيب من



شكل رقم ١. التركيب الداخلي للأرض



شكل رقم ٢. تحرك الواح الطبقات الأرضية العليا الصلبة (الليثوسفير) و تغورها في بعض الأحيان وتبدأ بالتحرك حسب اتجاه حركة طبقة الوشاح (الدثار)العلوية .

إذا راجعنا أسباب وقوع الزلازل فإننا نجدها تنحصر فيما يلي:

- **تصدعات قشرية عندما تحدث الزلازل فى القشرة الأرضية فجأة (شكل ٣) مما يسبب اهتزازات فى الأرض.**
- **نشاط زلزالي متولد عن وجود بحيرات صناعية.**
- **الضغوط العالية في باطن الأرض والتى تؤثر في الناطق الطبيعية.**
- **انهيار الكهوف الجوفية العظمى وسقوطها الذي قد يبلع مدن بأكملها**

مقدمة:

الزلازل جزء من حياة الأرض وجزء مأساوي من تاريخ البشر، ولا يمر عام إلا ونسمع بحدوث عشرات الزلازل . إن أهم ما يميز بنية الأرض الباطنية هو تباين خصائصها الفيزيائية والكيميائية وظهور الطبقات الصخرية والمعدنية المختلفة بدءا من مركز الأرض وحتى سطحها الخارجي ، ولقد تم الاعتماد على معرفة مكونات وخصائص باطن الأرض على الطرق والوسائل الجيوفيزيقية خاصة الأمواج الاهتزازية التي تطلقها الزلازل من الهزات الأرضية الطبيعية أو التفجيرات الصناعية والنووية.

وقد لوحظ تباين سرعة الأمواج الاهتزازية (السيزمية) الطولية والعرضية بالكرة الأرضية،وذلك طبقا لتباين طبيعة المواد التى تكونها وحسب درجة صلابتها وليونتها ، ومن الدراسات العلمية تم التعرف على طبقات الأرض المختلفة وقد لوحظ وجود اختلافات كبيرة فى طبيعة هذه الطبقات كيميائيا وفيزيائيا ومعدنيا، وقد ساعدت هذه الاختلافات على زيادة التفاعلات الباطنية التى انعكست بقوة على كل أنحاء الأرض. وعليه تم التعرف على ثلاثة طبقات رئيسية تنفصل عن بعضها البعض بسطوح انفصالية وانتقالية تتغير عندها سرعة الأمواج الاهتزازية بصورة واضحة مما يشير الى الانتقال من وسط فيزيائي إلى أخر ، وتتكون الأرض من ثلاث طبقات رئيسية (شكل ١) وهى:

أ. القشرة الأرضية (٣٠-٤٠ كم) في المناطق السهلية وتصل الى عمق حوالي ٥٠ كم فى المناطق الجبلية، وتصل الى عمق حوالي ٨٠ كم تحت السلاسل الجبلية العملاقة مثل الهمالايا.

ب. الوشاح أو الستاراو الدثار فينقسم الى جزء علوي يصل عمقه الى حوالي ١٠٠٠ كم، والجزء السفلي يصل عمقه الى حوالي ٢٩٠٠ كم .

ج. النواة ويصل عمق الجزء العلوي منها إلى ٥١٢٠ كم، ثم النواه الداخلية حتى مركز الأرض على عمق حوالي ٦٣٧٠ كم. ونتيجة للتحركات المستمرة في هذه الطبقات وتحرك طبقة القشرة الأرضية فتتشقق طبقات الأرض العليا الصلبة الى وحدات صخرية كبيرة (الليثوسفير) وتبدأ بالتحرك حسب اتجاه حركة طبقة الوشاح، وقد تغور أجزاء من القشرة الأرضية الصخرية تحت بعضا (الاندثار القارى) (شكل ٢).

كلمة رئيس المعهد

تعتبر مصر من أوائل الدول التي بدأت في رصد الزلازل من خلال أجهزة معيارية وذلك منذ عام ١٨٩٩ م من نوعية ميلن شاو (Milne-shaw) الذى يعتبر اول جهاز حديث في رصد الزلازل. ثم استمر تحديث الأجهزة القياسية في المطاف من نوعية ميلن شاو (Milne-shaw) إلى جاليتزن ١٩١٣ (Galitzin) ثم الى جهاز سبرنجنرز، و في عام ١٩٦٢ ، تم تركيب محطة زلزالية عيارية قياسية في حلوان كمحطة من محطات الشبكة العالمية الموحدة للزلازل. (WWSSN) هذه المحطة لا تزال تعمل حتى الآن، ومع بداية عام ١٩٧٢ ، تم تركيب أربع محطات قياسية أخرى في حلوان وأسوان وأبو سمبل ومرسى مطروح، إحدى هذه المحطات يابانية الصنع وقصيرة المدى، وباقي المحطات كانت روسية الصنع متوسطة المدى.

بعد زلزال ١٢ أكتوبر ١٩٩٢ الذي حدث في منطقة دهشور، على بعد ٣٥ كم إلى الجنوب الغربي من القاهرة، مَوّلت الحكومة المصرية آن ذاك المعهد القومي للبحوث الفلكية والجيوفيزيقية وكلفته بمهمة إنشاء الشبكة المصرية القومية للزلازل، لتغطي كافة أنحاء جمهورية مصر العربية ، ومن ثم تم تحديث نظام الاتصالات لنقل البيانات الزلزالية من خطوط الهاتف إلى الأقمار الصناعية لزيادة كفاءة ومهام الشبكة القومية للزلازل.

وبحلول منتصف عام ٢٠٠٣ ، تم الانتهاء من تركيب محطات الشبكة القومية للزلازل بأكملها لتغطي كافة أنحاء جمهورية مصر العربية، كما تم بناء وتجهيز خمسة مراكز فرعية، بالإضافة إلى ذلك، تم إنشاء مركز بيانات الحد من الكوارث الزلزالية، ودعمه بأحدث تقنية لنظم المعلومات الجغرافية. وتعد القائمة (كتالوج) الزلازل أحد أهم مخرجات الشبكة القومية للزلازل، ويحتوي على الزلازل المسجلة في مصر والمناطق المجاورة حيث تستخدم هذه المخرجات في تقييم المخاطر الزلزالية.

أ.د. جاد القاضى

رئيس المعهد القومي للبحوث الفلكية والجيوفيزيقية

إهداء إلي ذكري
الأستاذ الدكتور أحمد علي بدوي
(١٩٦٦-٢٠٢١)

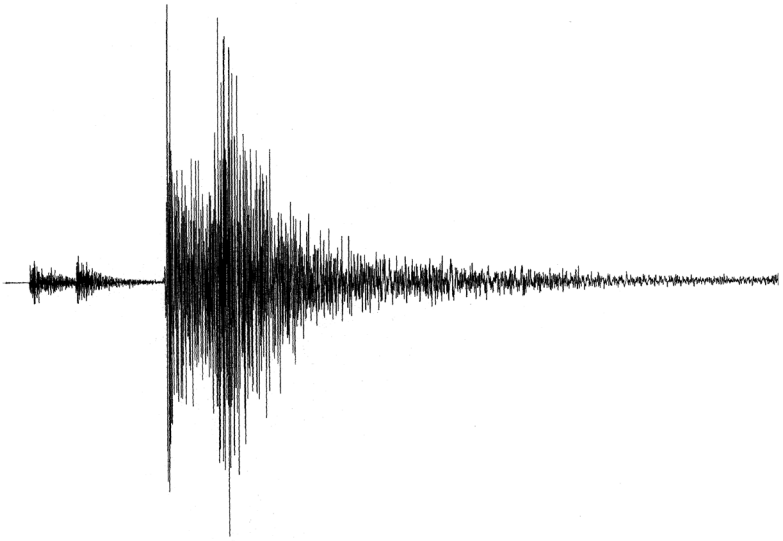
إنّما الدُنيا كَظل زائل او كَضَيف باتَ لَيلاً فَارتَحَل
أَو كَطيفٍ قَد يَراهُ نائِمٌ اَو كَبَرقٍ لاحَ في أُفْقِ الأَمَل

تخرج الأستاذ الدكتور أحمد بدوي من كلية العلوم، جامعة المنصورة، في عام ١٩٨٧م. كما حصل على درجة الماجستير سنة ١٩٩٠م من نفس الجامعة. وبعد ذلك حصل على درجة الدكتوراه من جامعة تشارلز بالمجر في عام ١٩٩٦م وقد التحق للعمل بالمعهد القومي للبحوث الفلكية والجيوفيزيقية في عام ١٩٨٨م وترقي في الدراجات العلمية حتي عين أستاذا في علم الزلازل في عام ٢٠٠٨م وخلال مسيرته العلمية تقلد عدد من المناصب أهمها مدير المركز الوطني لبيانات نزع السلاح ورئيس الشبكة القومية للزلازل و رئيس قسم الزلازل بالمعهد، كما شغل مناصب استشارية في عدد من الجهات أبرزها استشاري الازمات والمخاطر بمركز المعلومات ودعم اتخاذ القرار بمجلس الوزراء وخبير في التفتيش الموقعي بمنظمة الحظر الشامل للتجارب النووية بفينا. وله أكثر من ٤٠ بحث منشور في المجلات الدولية وأشرف علي عدد كبير من رسائل الماجستير والدكتوراة وقد حصل رحمه الله على عدة جوائز اهمها جائزة الدولة التشجيعية في مجال الجيولوجيا.

رحم الله الاستاذ الدكتور أحمد بدوي رحمة واسعة، وأدخله فسيح جناته

جمهورية مصر العربية
وزارة التعليم العالي والبحث العلمي
المعهد القومي للبحوث الفلكية والجيوفيزيقية
الشبكة القومية للزلازل

النشرة الدورية السنوية للزلازل
جمهورية مصر العربية
(٢٠٢٠)



يناير ٢٠٢١