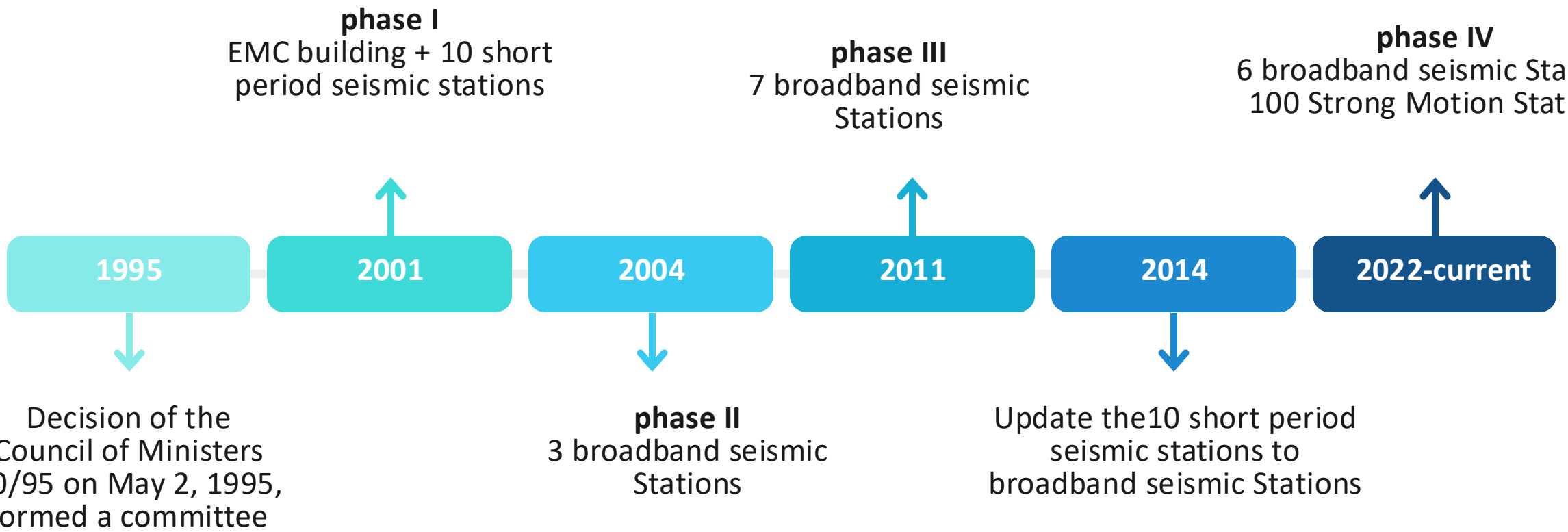


Development of the Oman Seismological Network

Yousuf Al Shijbi
Earthquake Monitoring Center
Sultan Qaboos University

brief history of Earthquake Monitoring Program of Oman

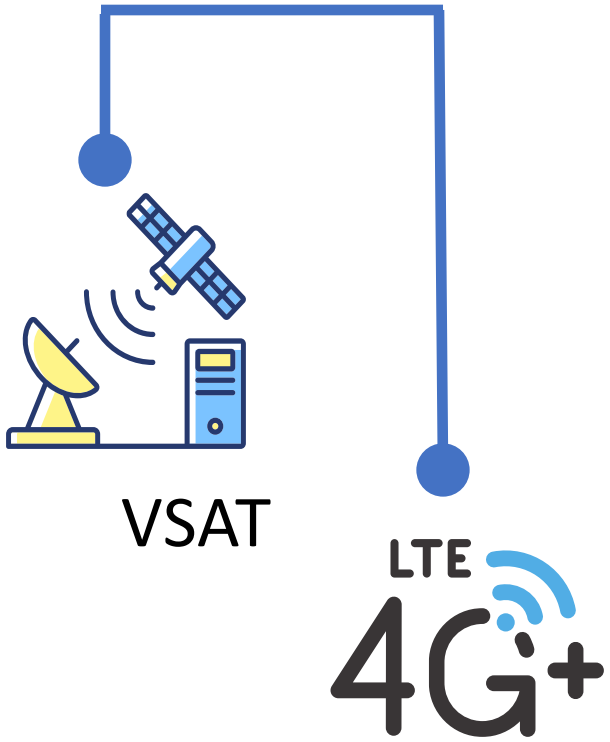


Oman Seismic Network components

(1) Central Data Acquisition System (CDAS)



The communication link

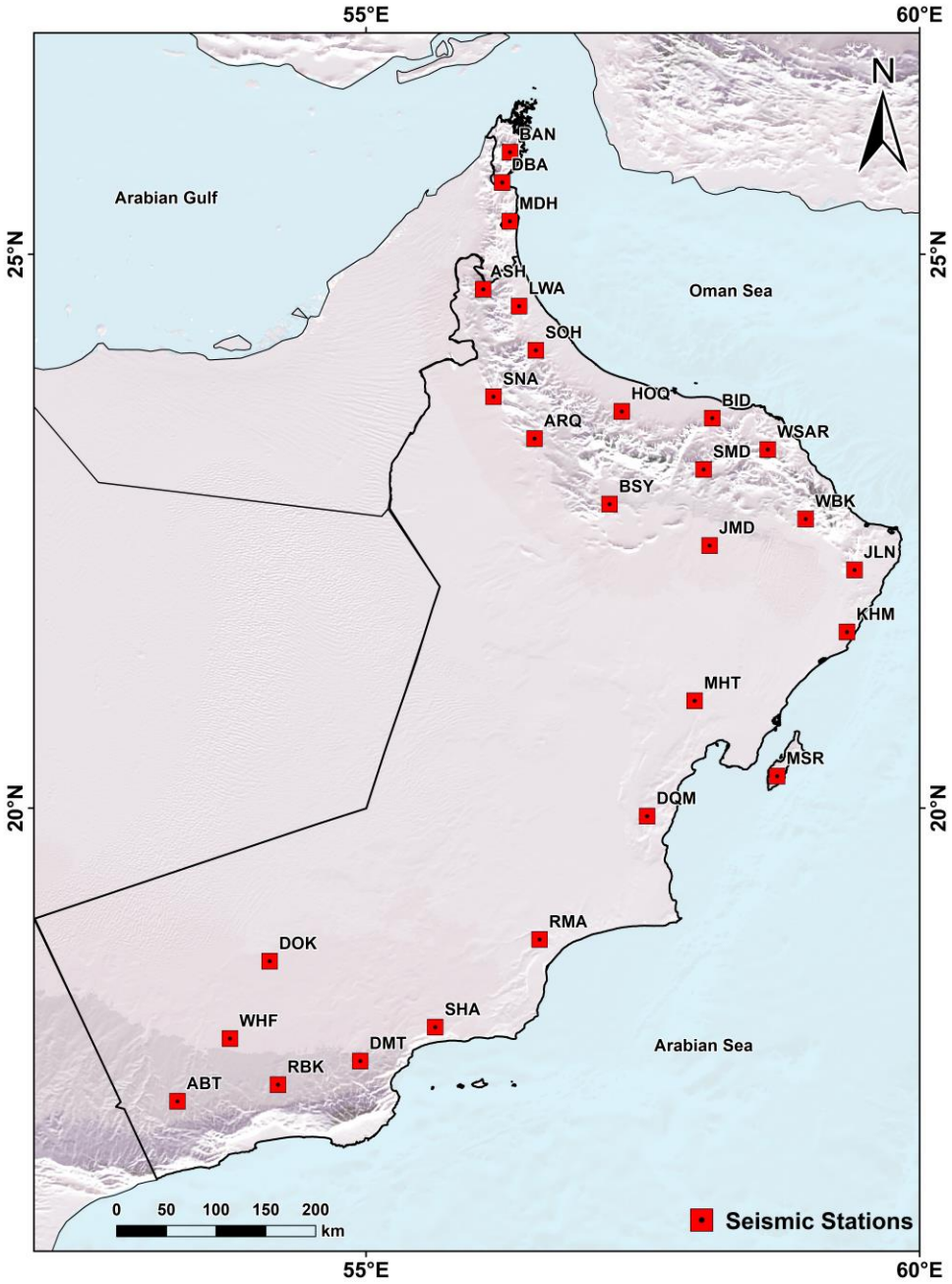


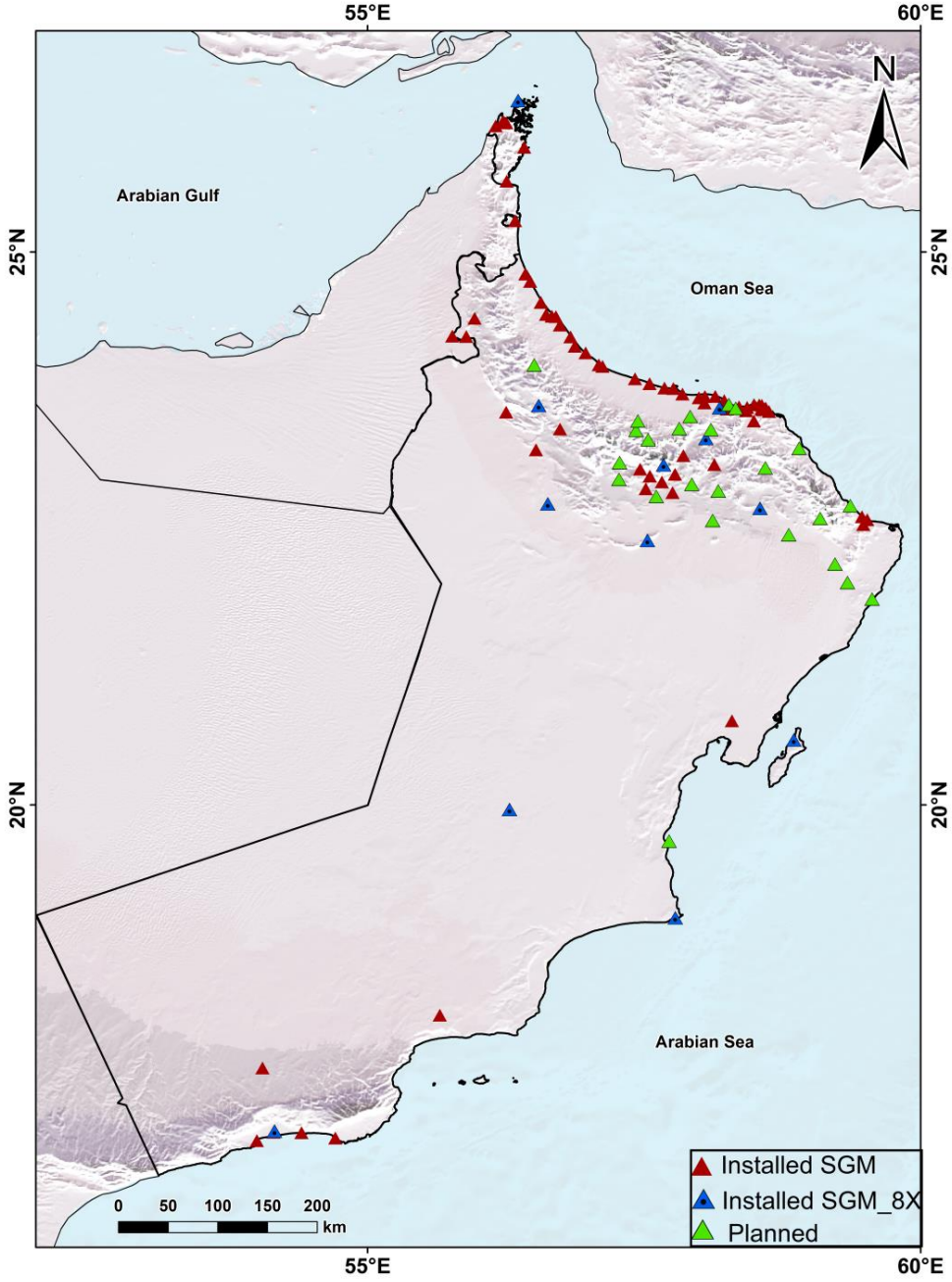
(26) Remote seismic stations
(109) Strong Motion Stations





Stations Locations





Timeline: Seismic Station Installation

1

Explore

define and propose:
needs of adding new stations
site selection





2

Build

Station Design
and
civil work construction





3

Installation

Deployment of solar power system, communication system, and earthquake monitoring equipment



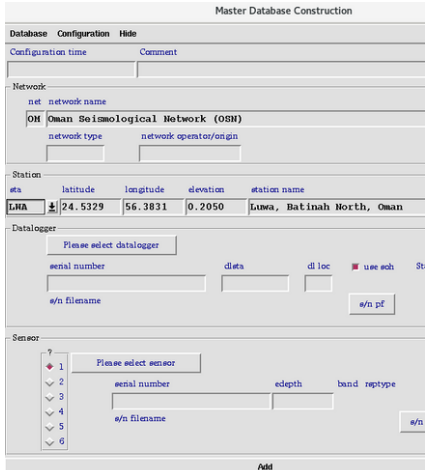




4

Launch

Add station to
Antelope software

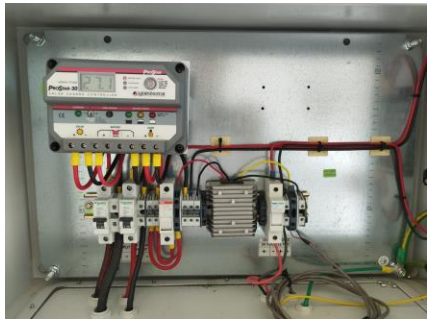


Remote Seismic Stations

remote stations are exclusively based on Quanterra 26-bit (Model Q330HRS) field data acquisition systems.

Streckeisen broadband STS-2, STS2.5, Trilliums 240 and MBB-2 seismometers as well as surface EpiSensor accelerometers.











Q330HRS Data logger



STS-2



STS-2.5



Trillium 240



MBB-2



EpiSensor ES-T



Timeline: Strong Motion Station Installation

Explore

1

site selection

setup

2

Create Certificate and Key
Modem Registration and Setup
Obsidian Setup

Installation

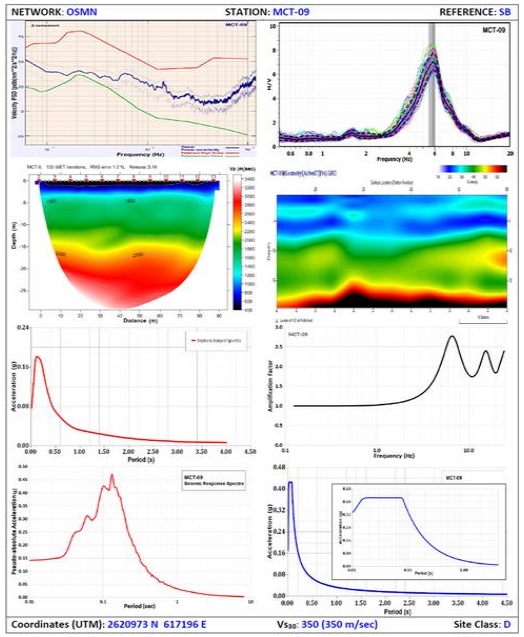
3

Deployment of communication system, Obsidian and Sensor

Launch

4

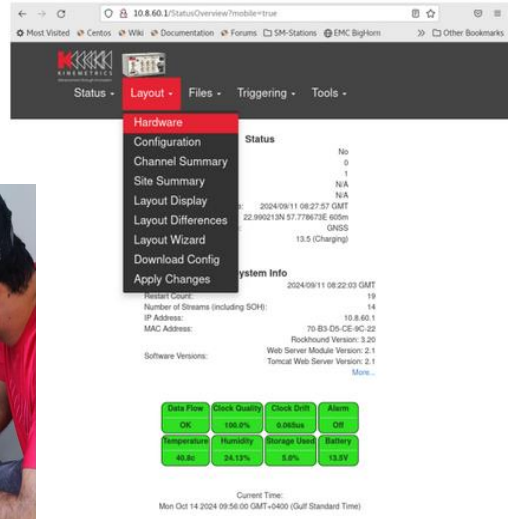
Add station to Bighorn software











Strong Motion Stations

strong-motion stations are equipped with the Kinematics EpiSensor accelerometers and Obsidian, Etna-2 field data acquisition systems.



ETNA-2





OBSIDIAN 4X



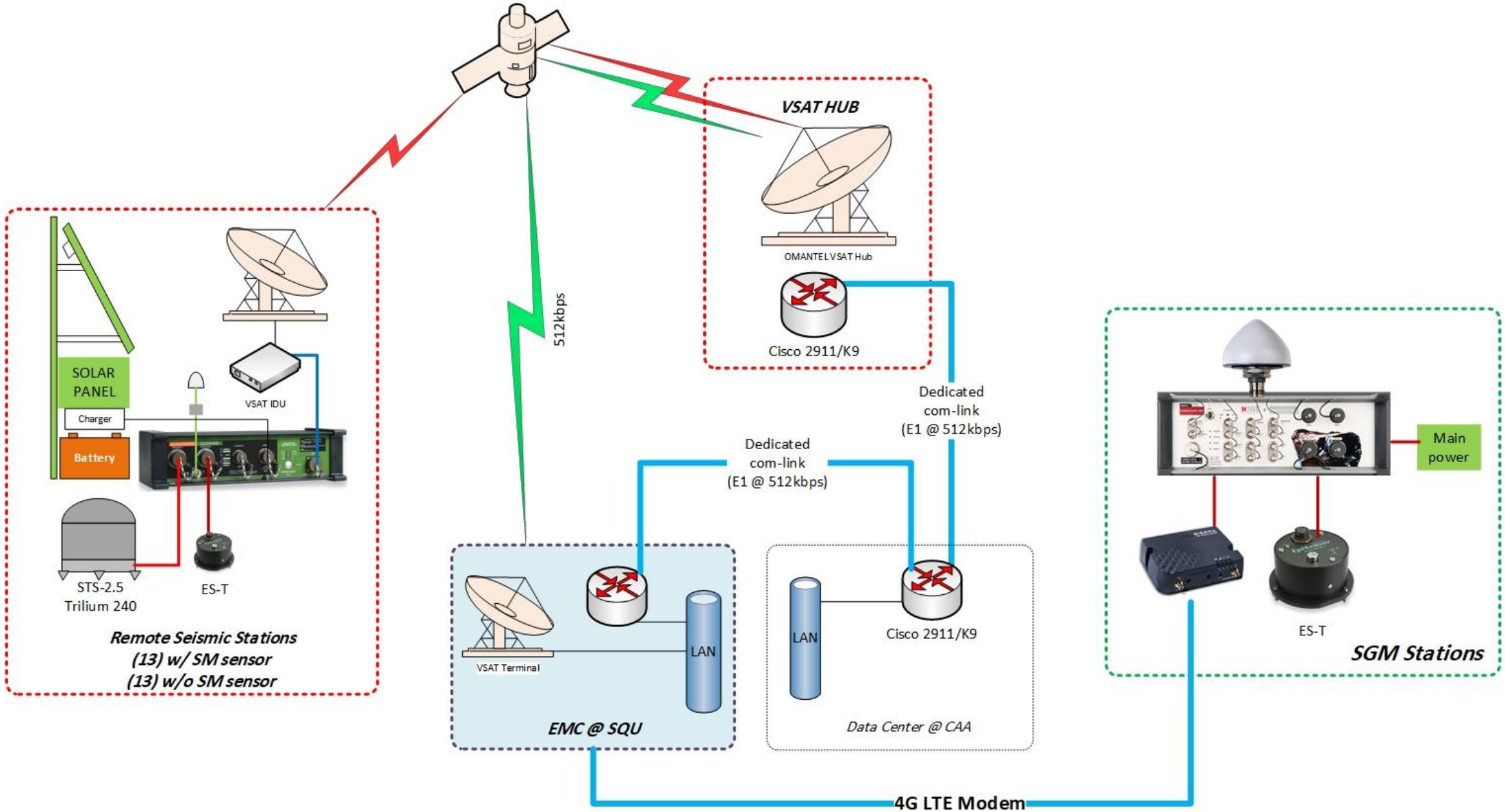
OBSIDIAN 8X







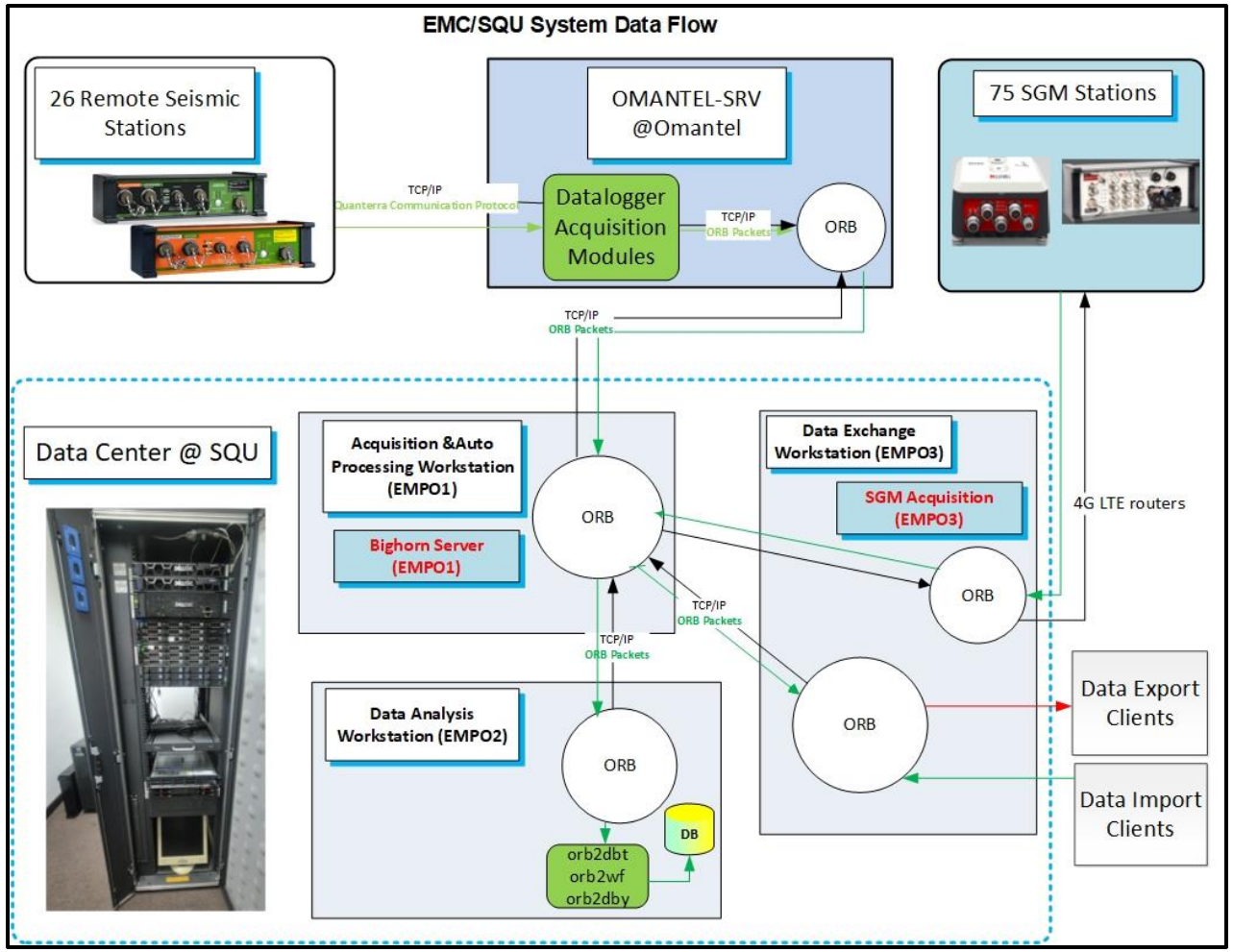
Earthquake Monitoring System
Communication Links /Failover



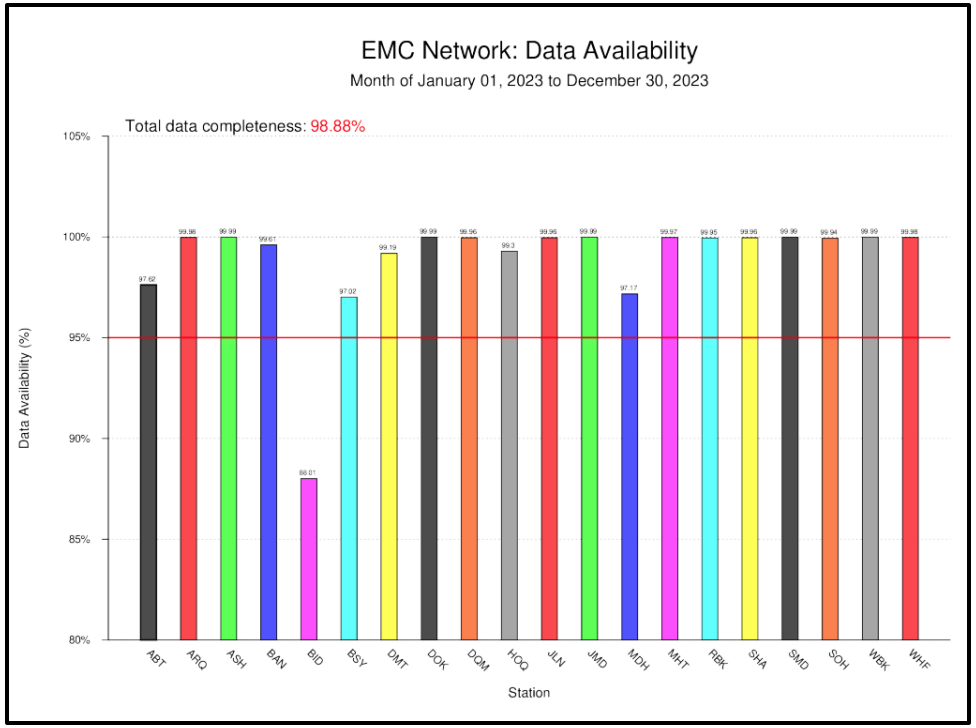
Antelope software

Antelope software performs real-time data acquisition from field digitizers, real-time automated data processing (detection, rapid event association, event location, magnitude determination), manual data analysis, data exchange, data archiving, and State-Of-Health (SOH) monitoring.

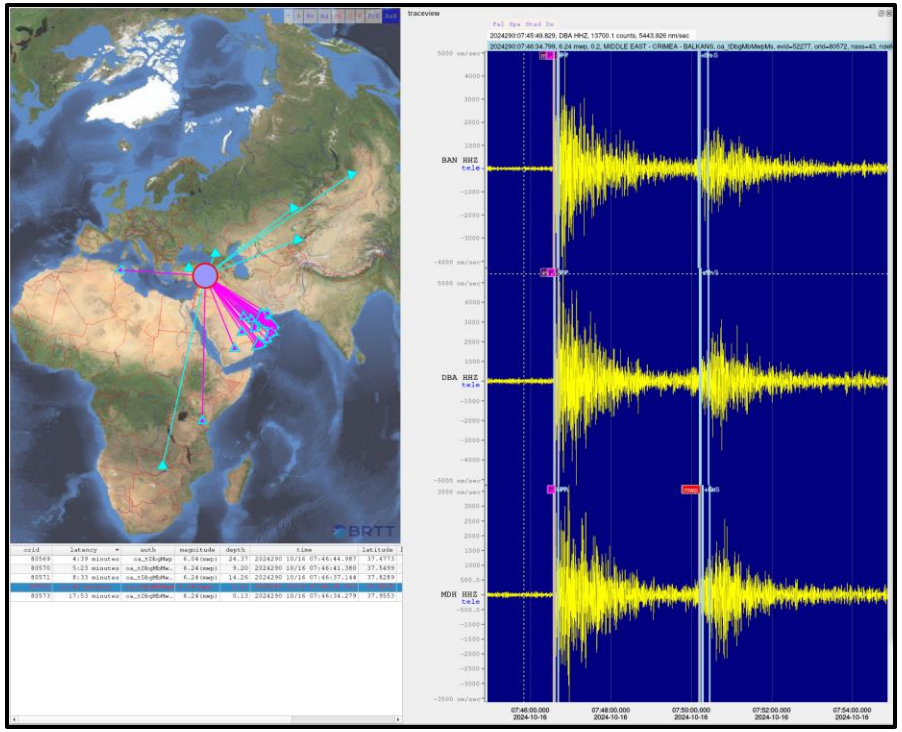
Data Flow

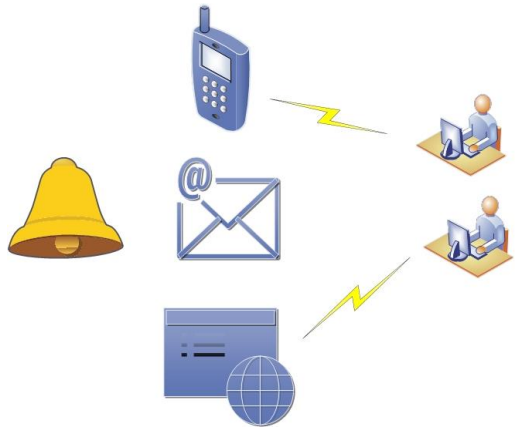


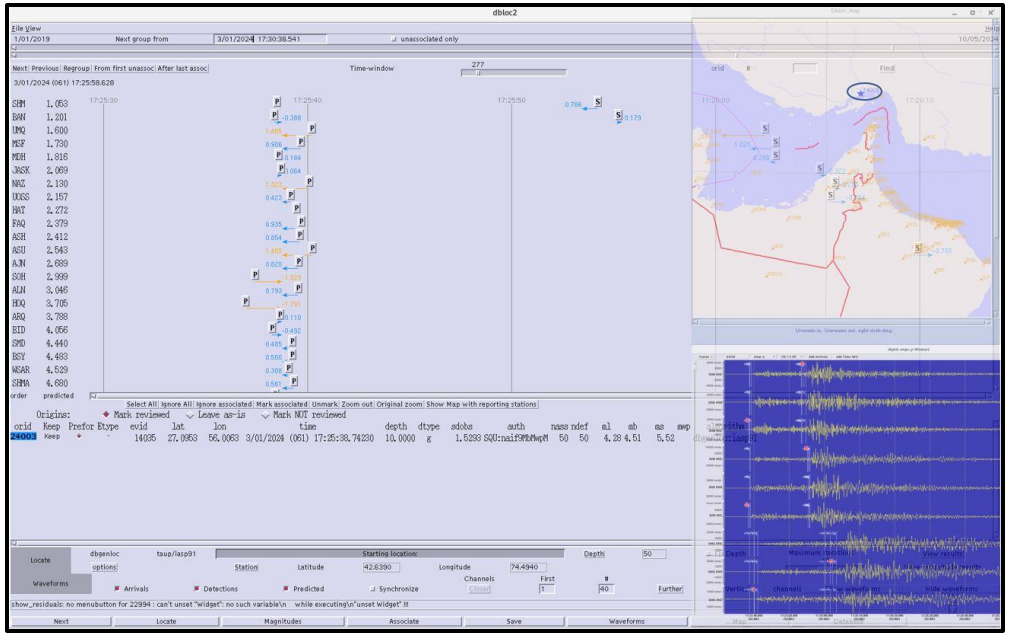
Data Return



The earthquake information obtained from the 26 stations is processed by the Antelope Software, which automatically determines preliminary earthquake parameters and alarm generation. The EMC staff then reviews and adjusts these initial location estimations, stores the events in the EMC database, and provides appropriate maps and reports.







Earthquake Reports



بسم الله الرحمن الرحيم

Sultan Qaboos University
Earthquake Monitoring Center

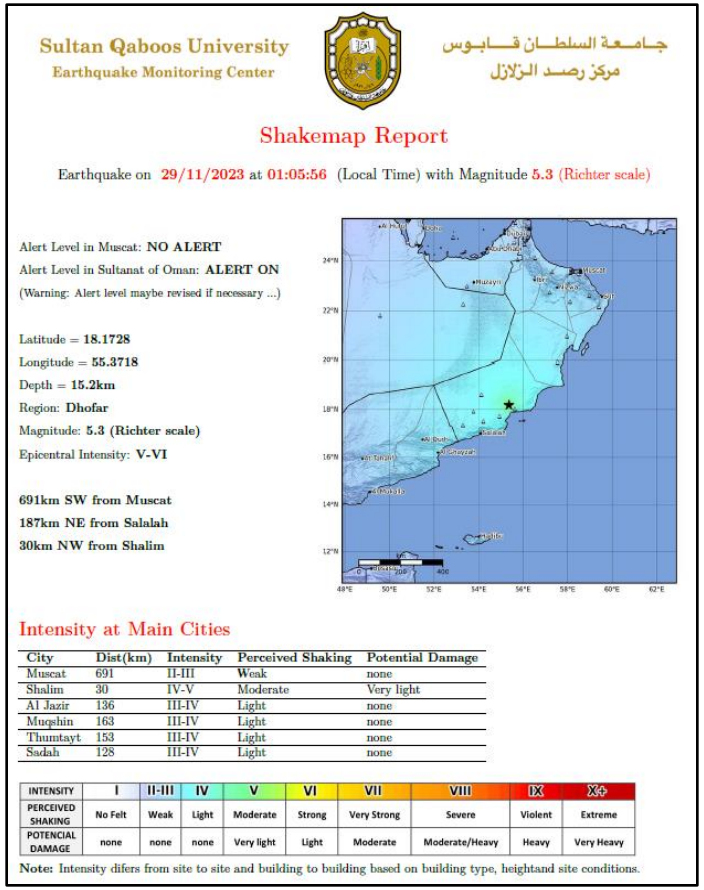
جـامـعـة السلطـان قـابـوس
مركز رصـد الـزلازل

تـقـريـر زلـزال
Earthquake Report

سجل مركز رصد الزلازل هزة أرضية متوسطة في ولاية شليم وجزر الحلانيات، محافظة ظفار بقوة 5.3 على مقياس ريختر في تمام الساعة 01:05 صباحاً. ويبعد مركز هذا الزلزال حوالي 187 كم شمال شرق مدينة صلالة.

Time (local) التوقيت (المحلي)	Magnitude القوة (ريختر)
29-11-2023 01:05 am	5.3 (ml)
Location موقع الزلزال	**Depth (km) العمق (كم)**
Dhofar Governorate 187 km NE, Salalah	4

الزلزال Earthquake ▲ محطات الرصد العمانية Oman seismic stations emc@squ.edu.om @emcsquoman



Sultan Qaboos University
Earthquake Monitoring Center

جـامـعـة السلطـان قـابـوس
مركز رصـد الـزلازل

Shakemap Report

Earthquake on **29/11/2023** at **01:05:56** (Local Time) with Magnitude **5.3** (Richter scale)

Alert Level in Muscat: **NO ALERT**
Alert Level in Sultanat of Oman: **ALERT ON**
(Warning: Alert level maybe revised if necessary ...)

Latitude = **18.1728**
Longitude = **55.3718**
Depth = **15.2km**
Region: **Dhofar**
Magnitude: **5.3 (Richter scale)**
Epicentral Intensity: **V-VI**

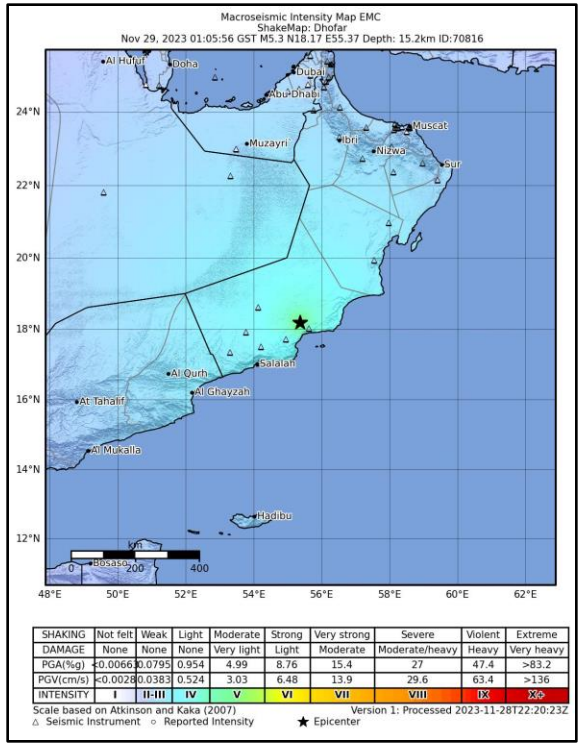
691km SW from Muscat
187km NE from Salalah
30km NW from Shalim

Intensity at Main Cities

City	Dist(km)	Intensity	Perceived Shaking	Potential Damage
Muscat	691	II-III	Weak	none
Shalim	30	IV-V	Moderate	Very light
Al Jazir	136	III-IV	Light	none
Mugshin	163	III-IV	Light	none
Thumtayt	153	III-IV	Light	none
Sadah	128	III-IV	Light	none

INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+
PERCEIVED SHAKING	No Felt	Weak	Light	Moderate	Strong	Very Strong	Severe	Violent	Extreme
POTENCIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy

Note: Intensity difers from site to site and building to building based on building type, heightand site conditions.



SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
DAMAGE	None	None	None	Very light	Light	Moderate	Moderate/heavy	Heavy	Very heavy
PGA(%g)	<0.0066	0.0795	0.954	4.99	8.76	15.4	27	47.4	>83.2
PGV(cm/s)	<0.0028	0.0383	0.524	3.03	6.48	13.9	29.6	63.4	>136
INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Scale based on Atkinson and Kaka (2007) Version 1: Processed 2023-11-28T22:20:23Z
△ Seismic Instrument ○ Reported Intensity ★ Epicenter



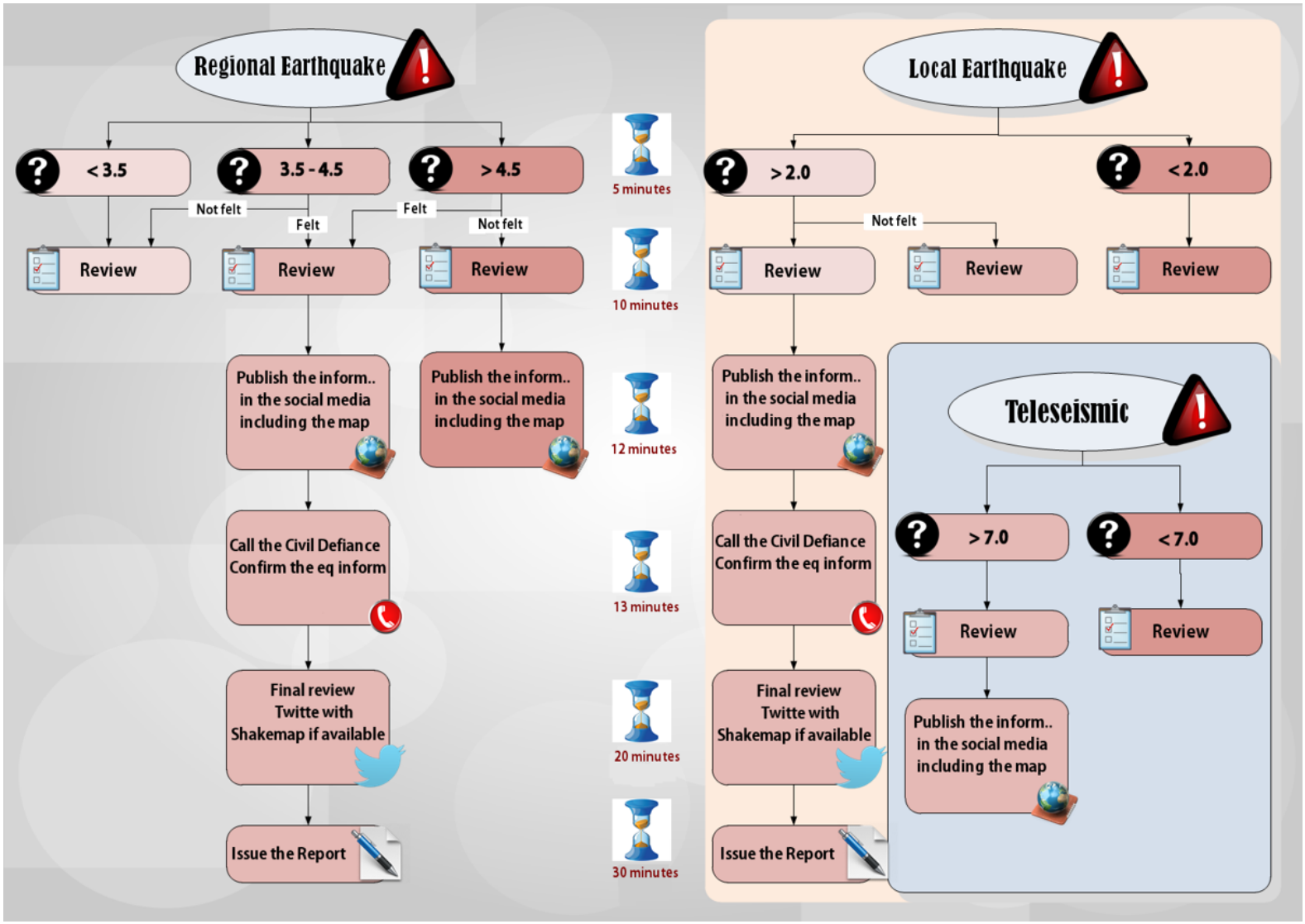
Report:

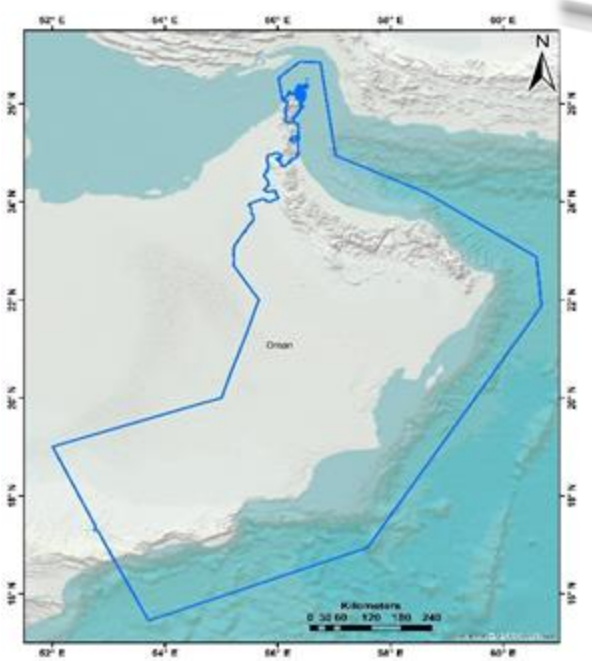
Report File	62038.pdf

Maps:

	Instrumental Intensity	Peak Ground Motion		Spectral Response		
		Acceleration	Velocity	0.3 sec	1.0 sec	3.0 sec
JPEG	intensity.jpg	pga.jpg	pgv.jpg	psa03.jpg	psa10.jpg	psa30.jpg

Standard Operation Procedure (SOP)







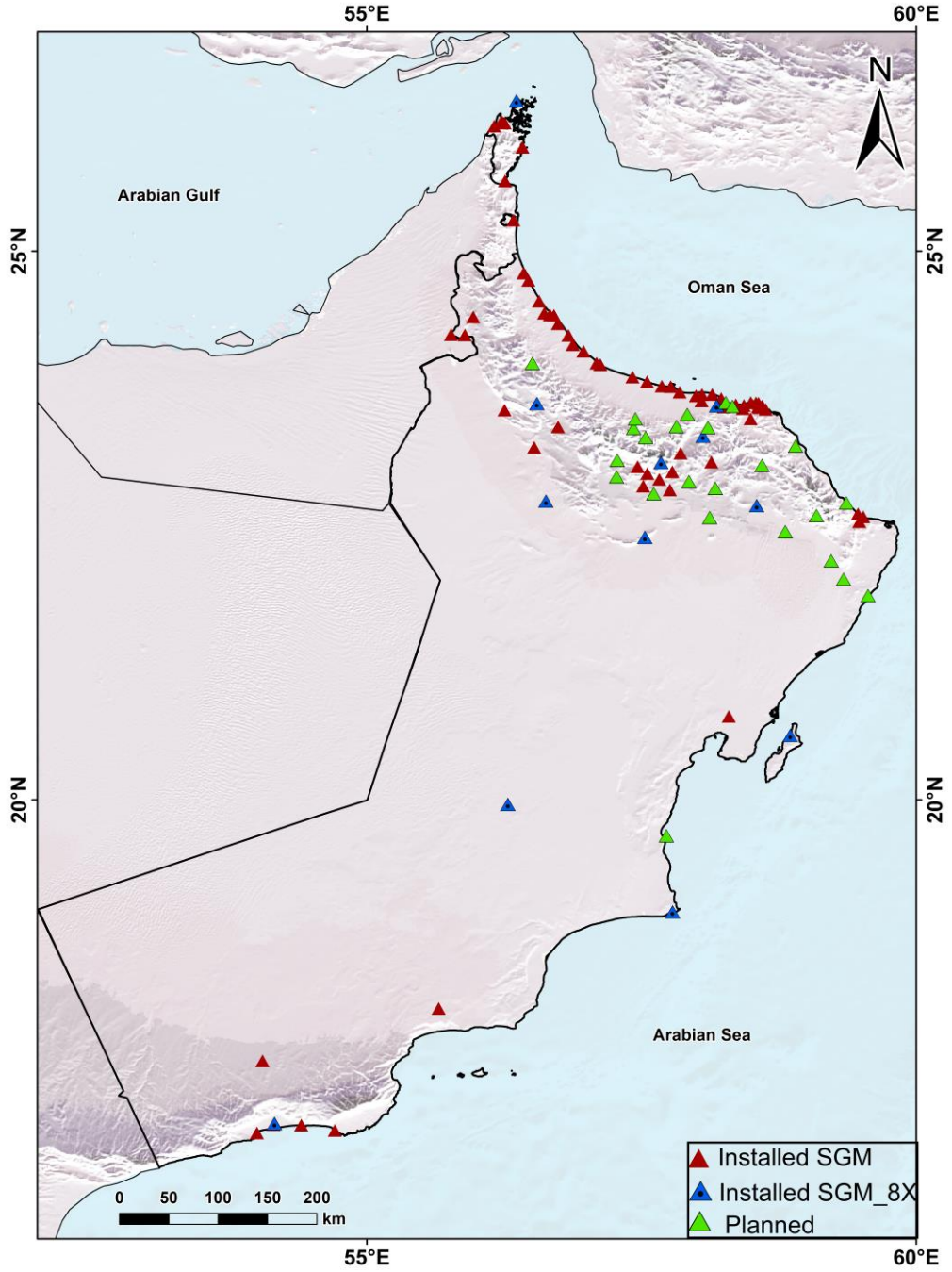
Oman Strong Motion Network

EMC at SQU launched an important project for settling a strong motion network consisting of 100 strong motion stations to cover the urban regions within Oman.

It is the first of its kind seismic network to be established in the country.

It’s took into account the densely populated areas, infrastructures, locations of active faults, and geologic site conditions.

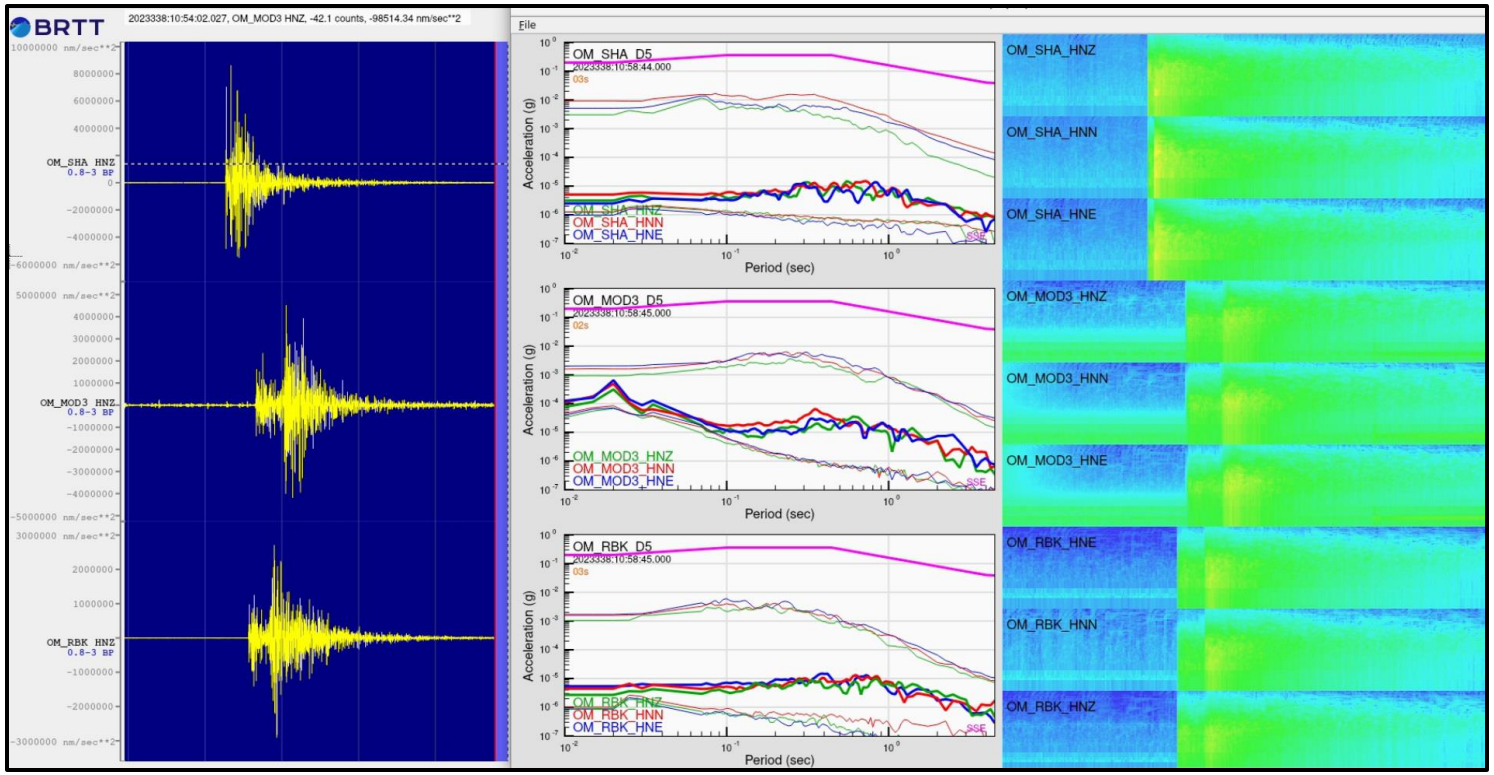
Currently **100 SM stations** are installed at important facilities (e.g. schools, health centers, universities, and public parks).

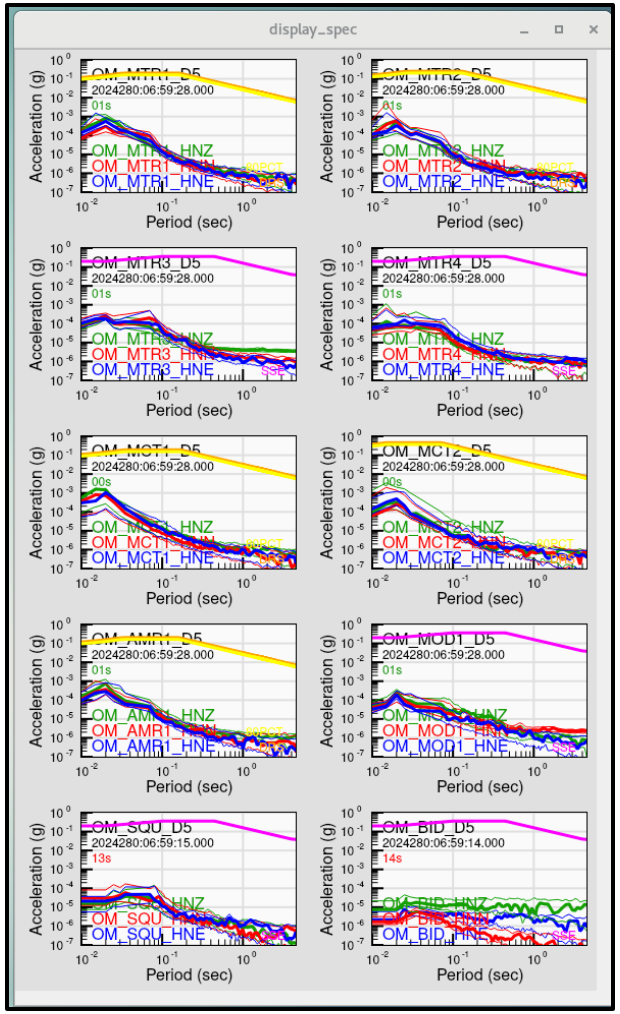


Oman Strong Motion Network

Oman strong motion network linked with **Bighorn software**, that comes with the latest Antelope module to use the real-time strong-motion data, calculating continuous real time response spectra for abundant of channels.

Bighorn continuously compares the calculated real response spectra with the design response spectrum, giving an alarm if the response spectrum approached or exceeded the design one.

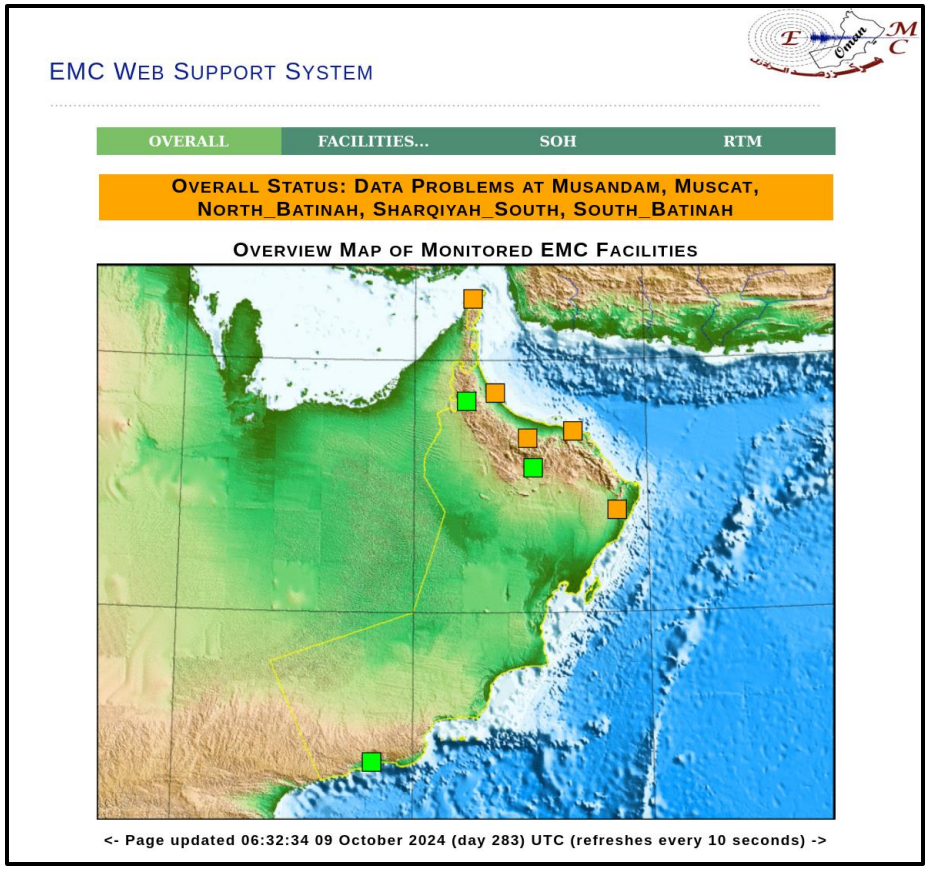




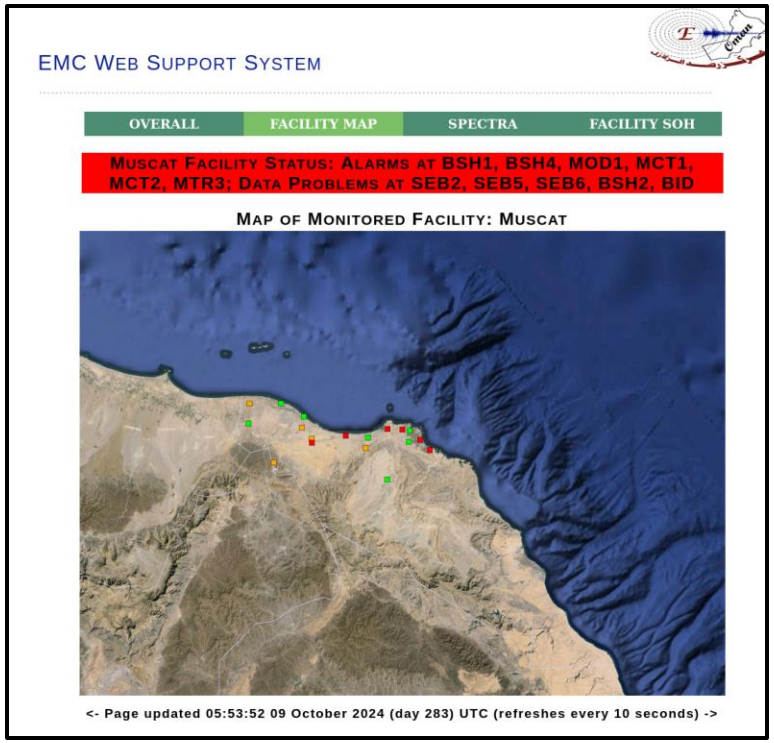
Time histories and comparison of the real time response spectra with the design response spectrum of ML 5.3 on 28 November 2023 earthquake at three strong motion stations in Southern Oman.

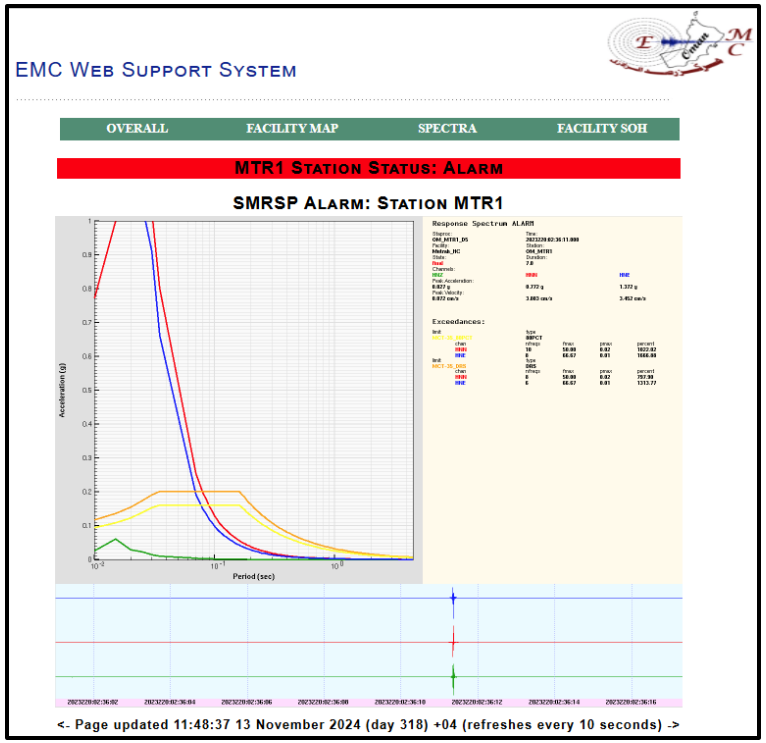
Oman Strong Motion Network

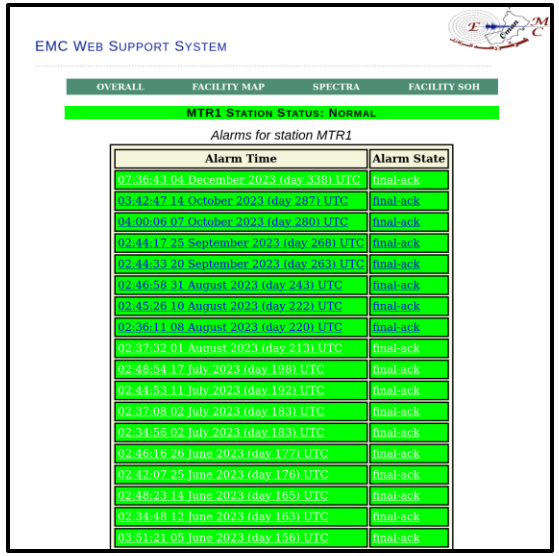
All information and alarms are shown in a web user interface managed by EMC/SQU.

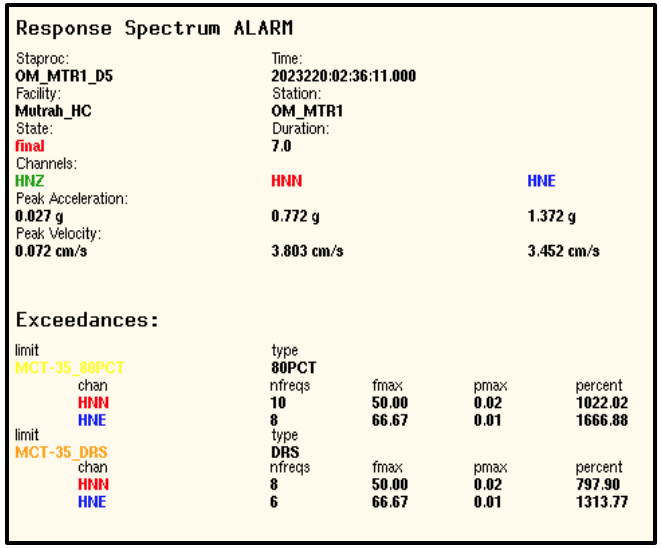


the primary display is map-based where different localities are shown as colored icons representing the current alarm status.

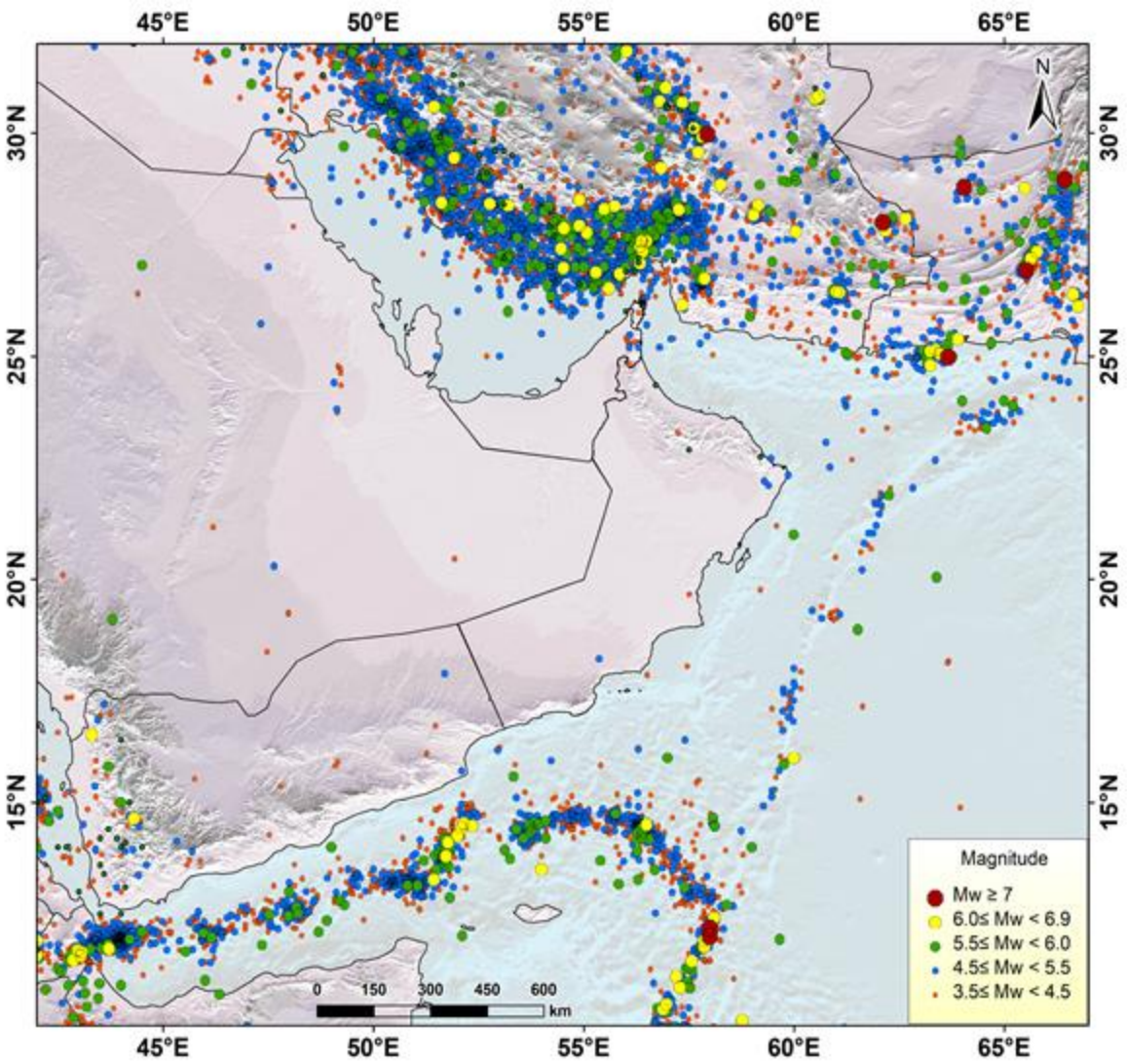


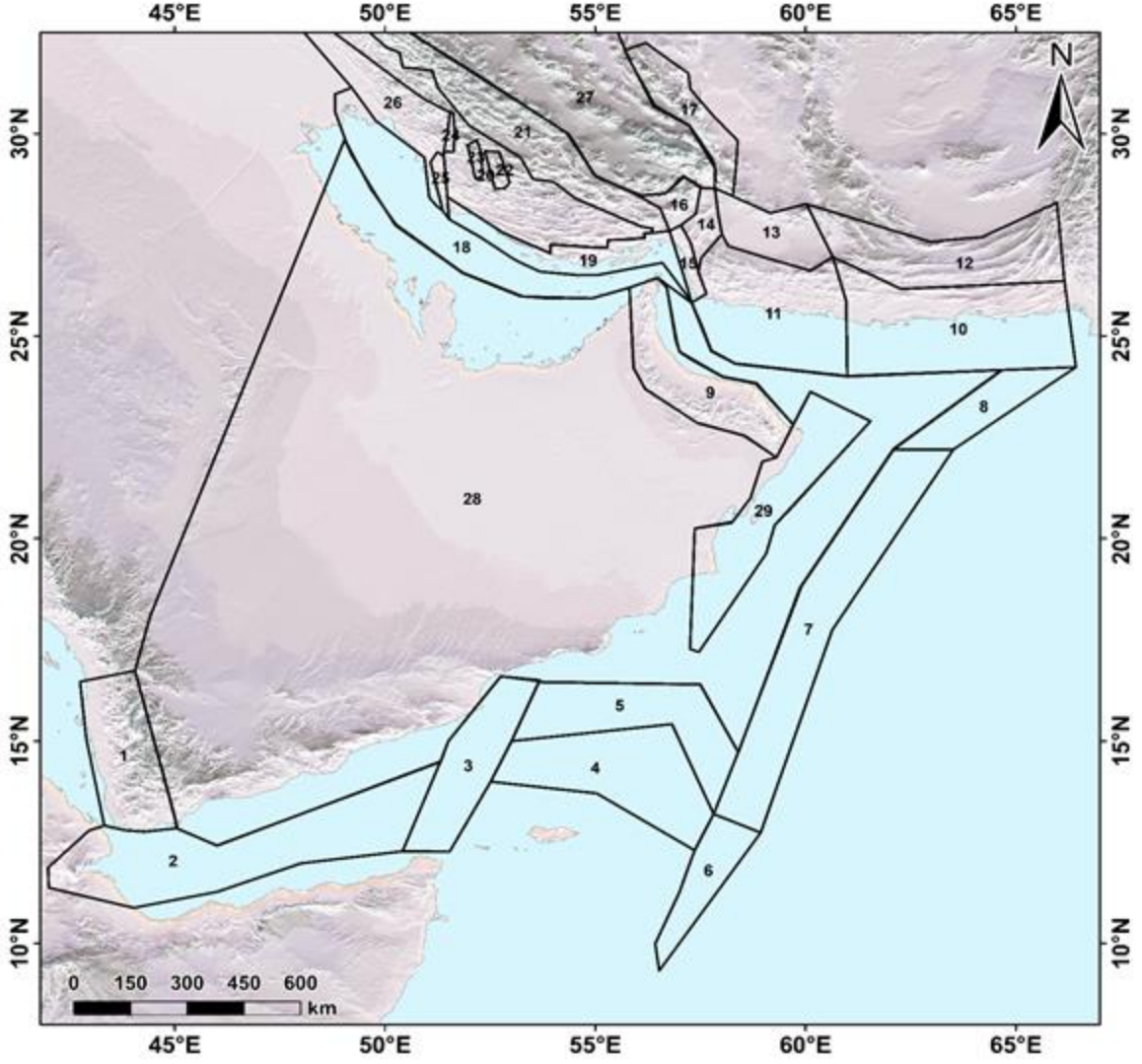




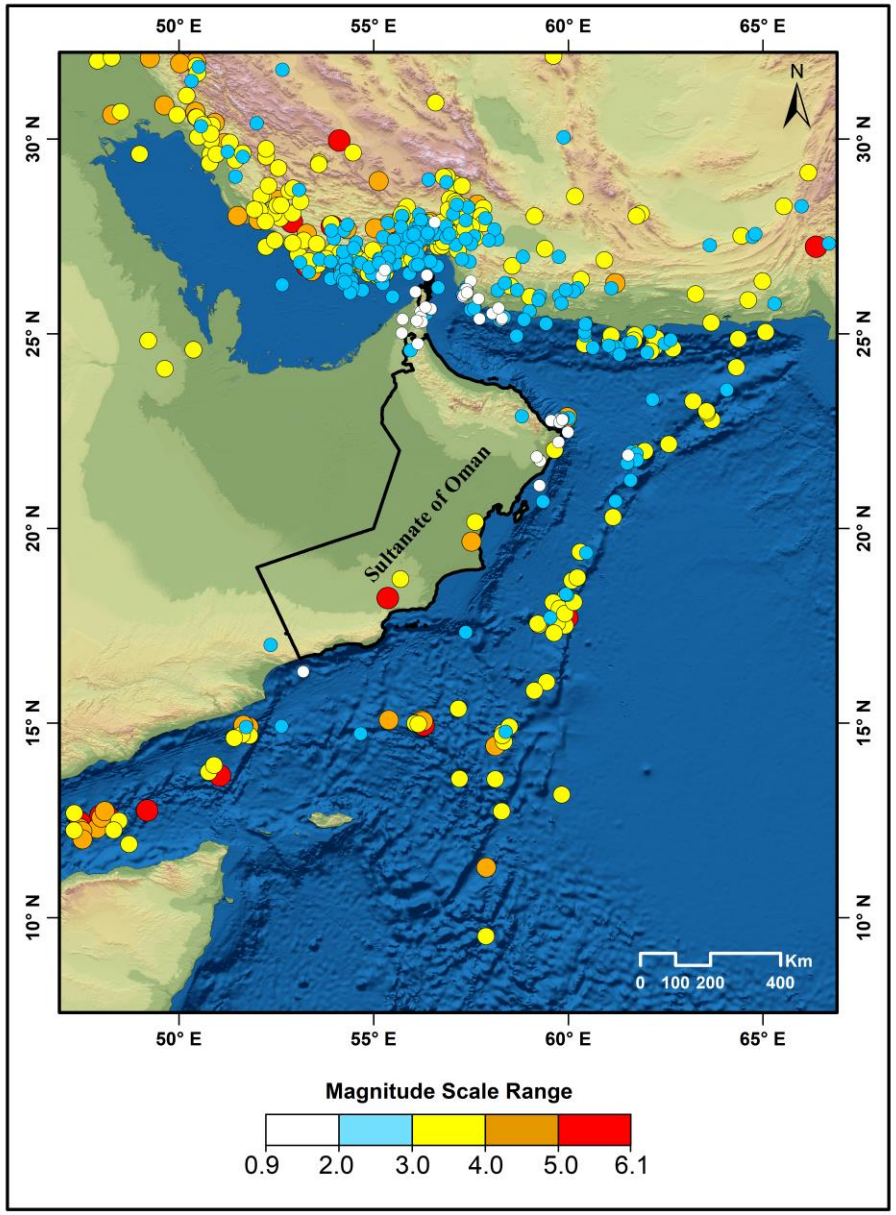


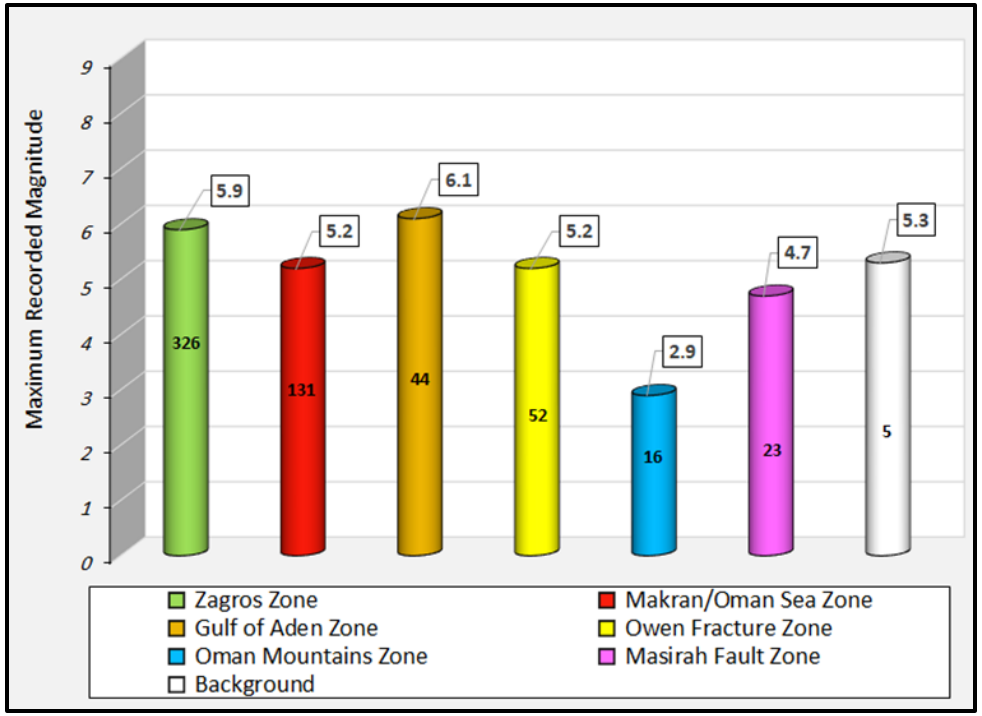
Seismicity and Seismotectonic

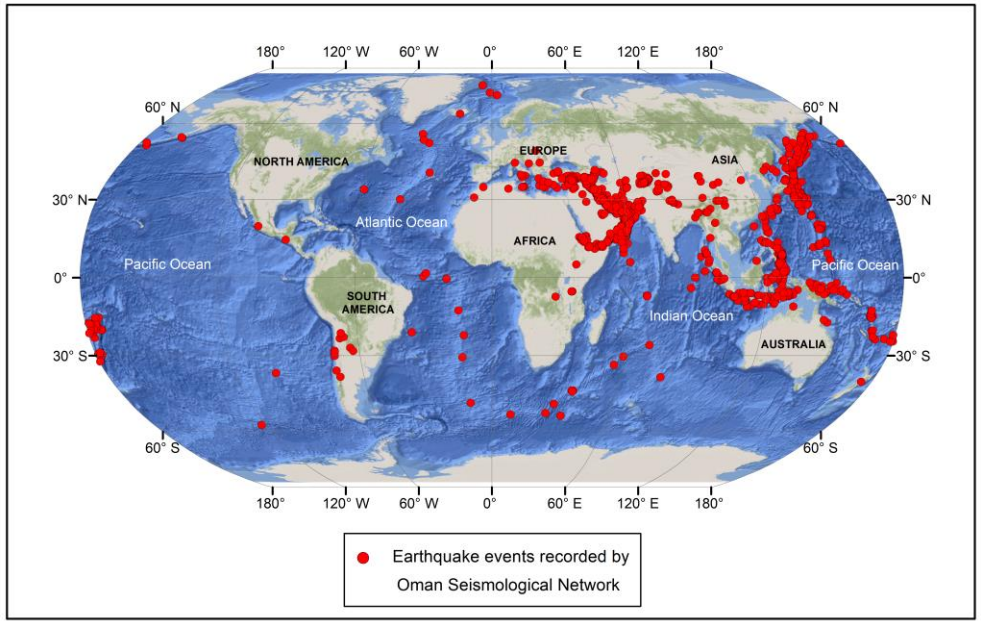




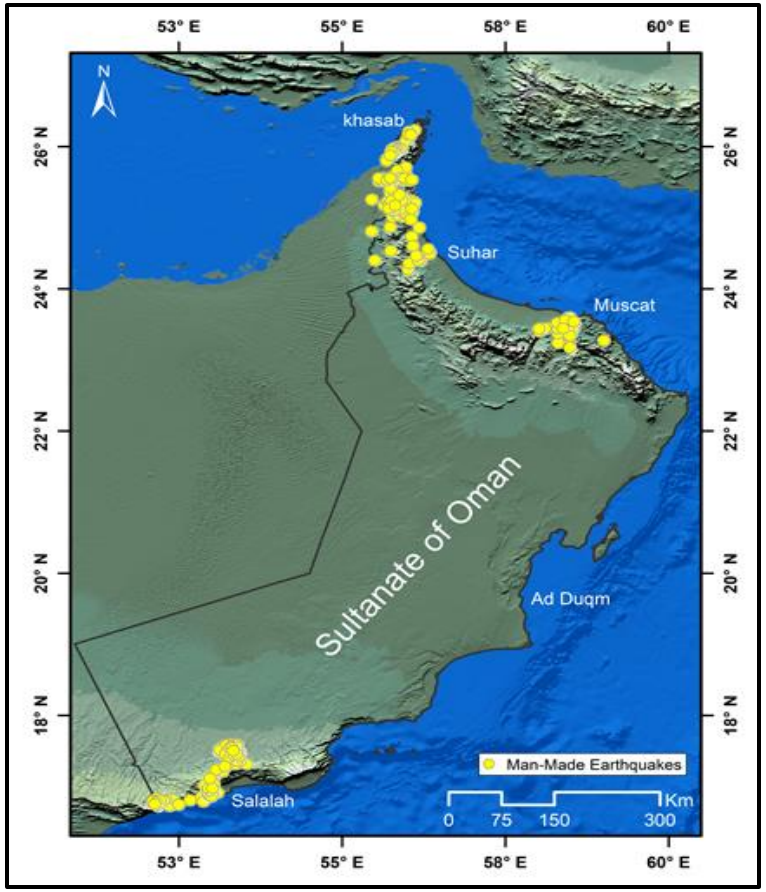
Seismicity 2023

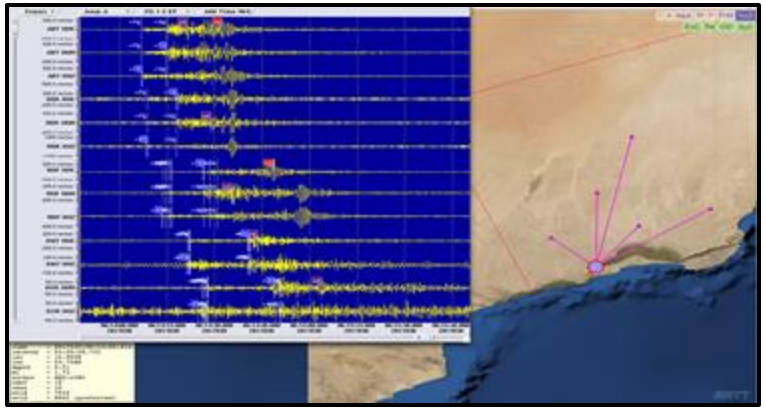




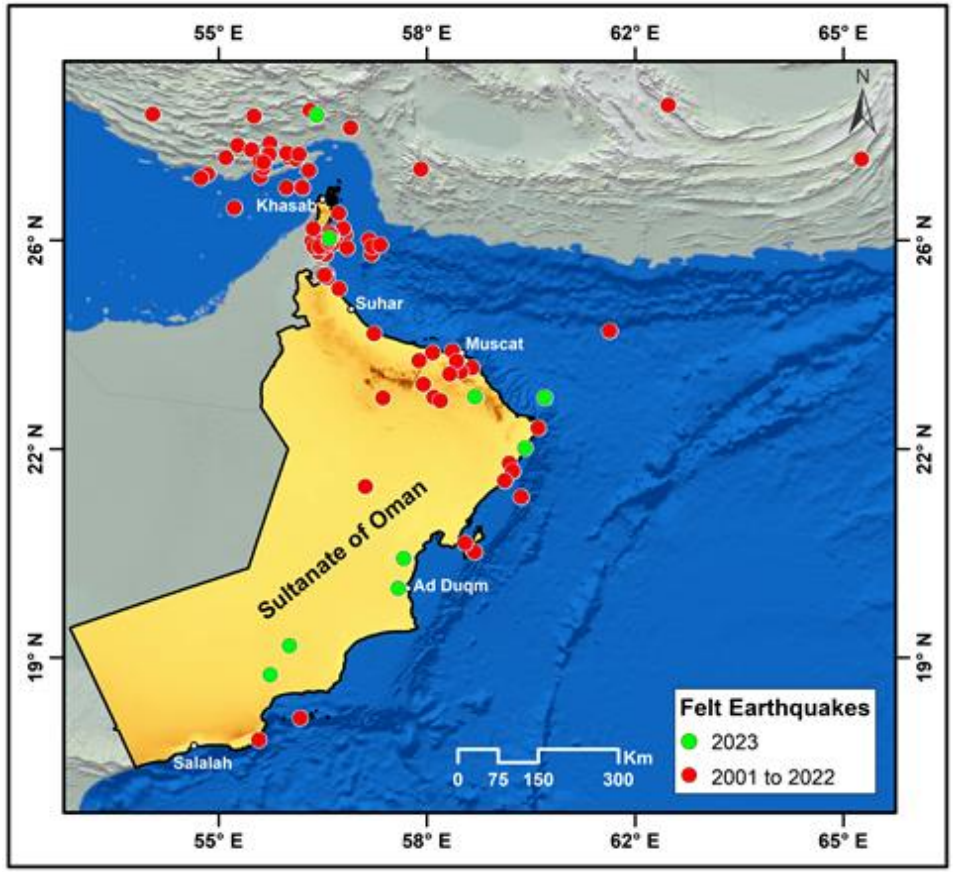


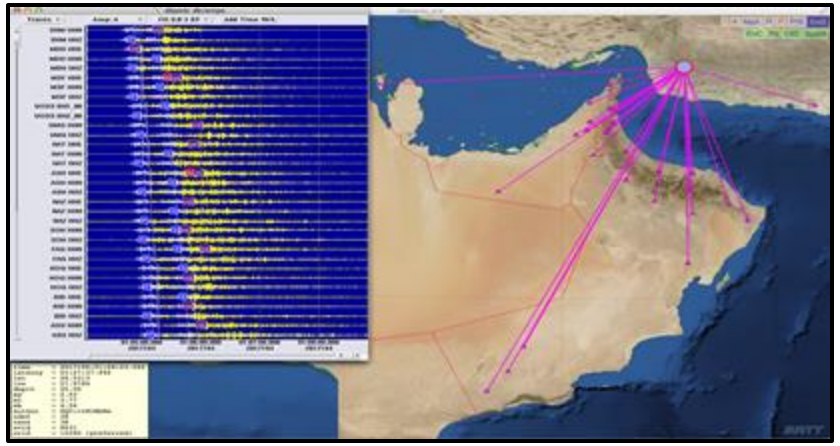
Man-Made events 2023



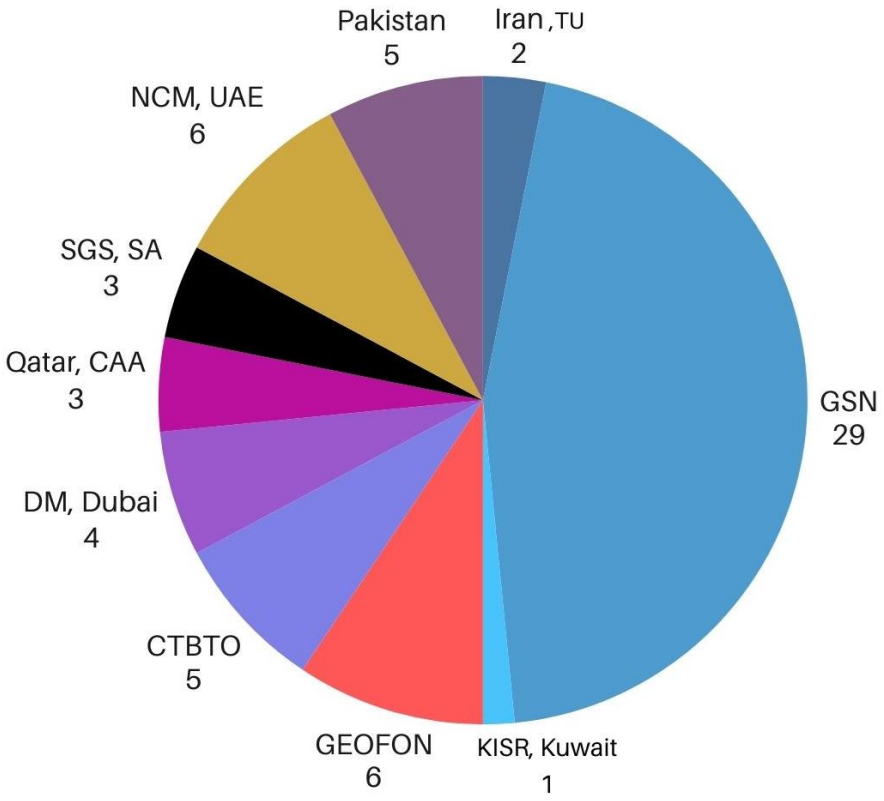


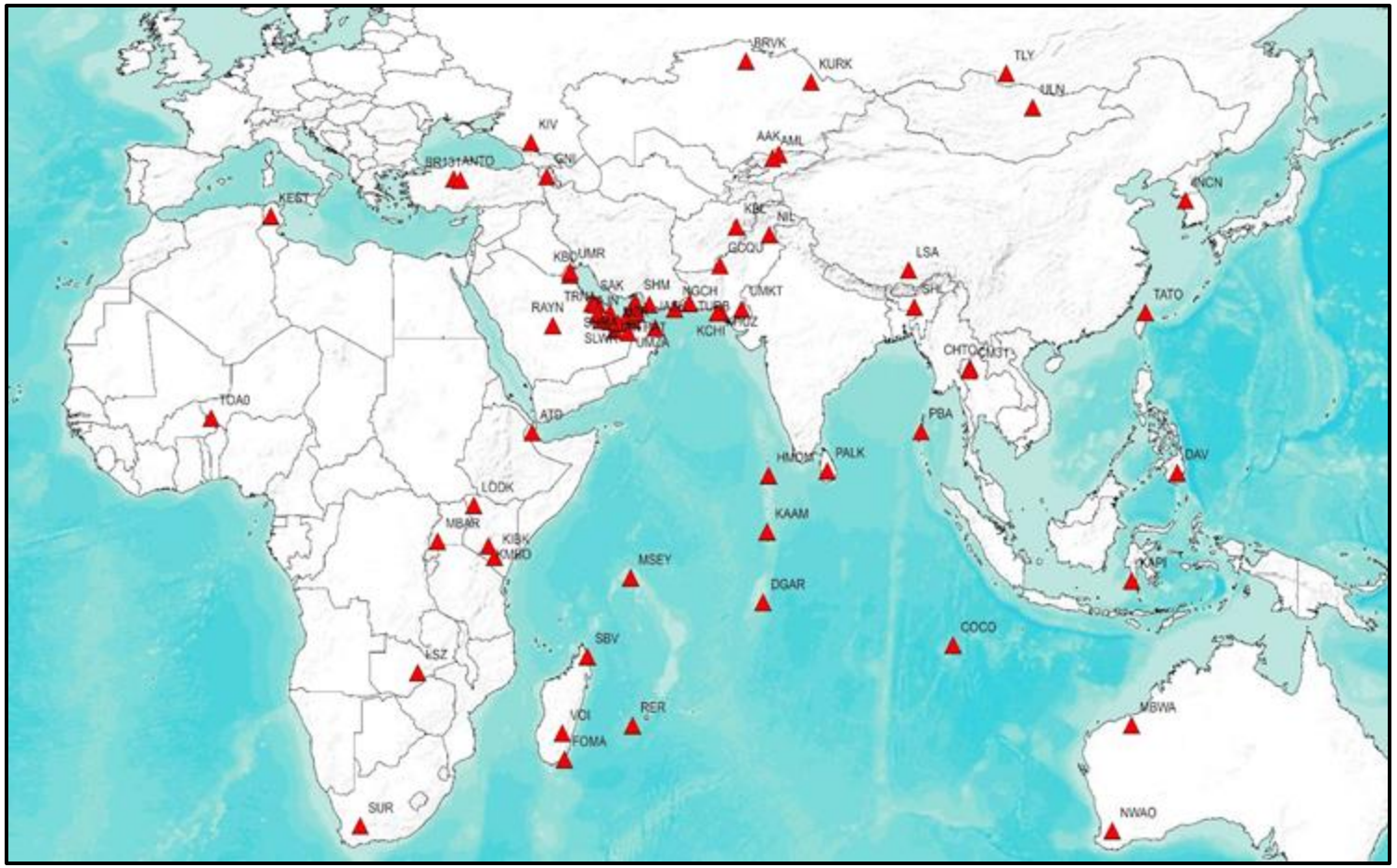
Felt events





Data Exchange





Global Station Coverage

Thank You