



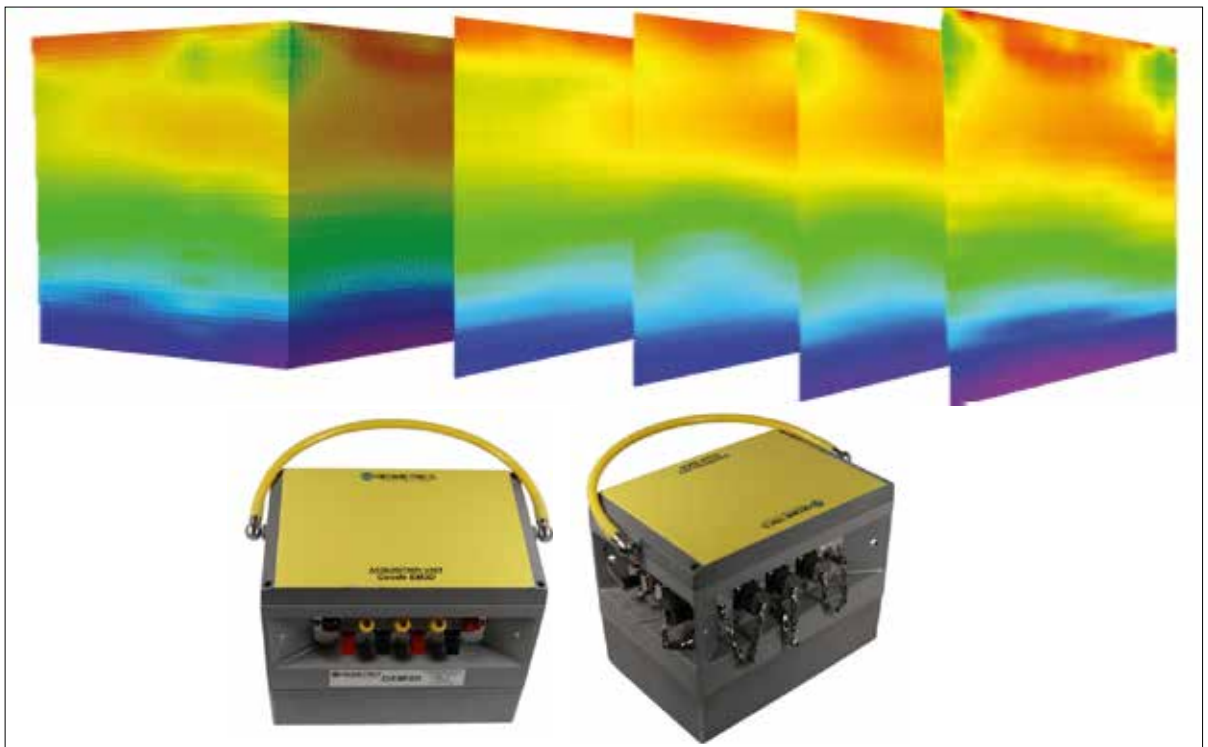
CODEVINTEC

Tecnologie per le Scienze della Terra e del Mare

45° 27' 39.384" N
9° 07' 30.145" E

Geode EM3D 2D and 3D Full-tensor AMT/CSAMT/HSAMT

3D resistivity
cube acquired
with the Geode
EM3D



**Geode EM3D, the only EM
device capable of high-
resolution measurements
at 1000+ meters**

Applications

- > Mining Exploration
- > Shallow Oil and Gas Exploration
- > Seismic Static Correction
- > Academic Research
- > Ground Water
- > Deep Engineering
- > Geologic Structure Mapping



Geode EM3D 2D and 3D Full-tensor AMT/CSAMT/HSAMT

Modern exploration for minerals, shallow oil and gas, and groundwater requires more high-quality data acquired and pro-cessed faster and at a lower cost than traditional EM techniques.

Now you can do distributed EM surveys with confidence. The multi-channel Geode EM3D allows simultaneous soundings at up to 160 locations, greatly improving field efficiency. Based on our tried-and-true Geode seismic technology, the Geode EM3D truly revolutionizes AMT data acquisition.

The system uses a controlled-source transmitter for CSAMT or natural field signals for AMT, or a combination of both (HSAMT). The defining characteristic of a distributed, networked system is that it is flexible in size. There can be numerous network nodes, each making its own measurements and sending the results back to a central controller computer. The definition of a network node in the Geode EM3D is a single receiver box with up to six channels.

Every node communicates to the other nodes and the Master Node by way of a hardwired Ethernet cable. A single node can be configured to have up to three magnetic coils or up to six electric field dipoles.

The Geode EM 3D is scalable from 6 to 240 channels, so the system can grow with your business.

Features & Benefits

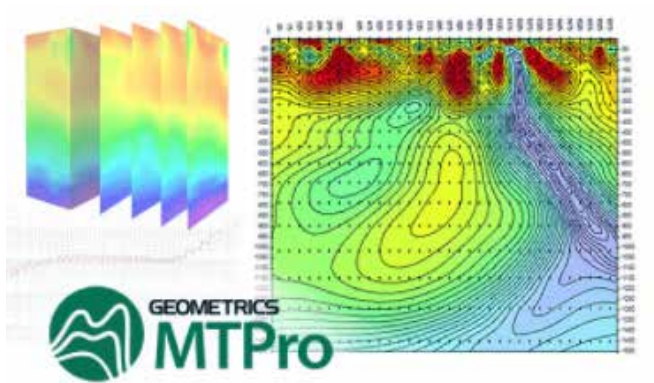
- > **Reliable wired Ethernet network** – no problems with GPS dropouts or lost satellites, line of sight communications failures, radio or WiFi communication failures, blocked antennas.
- > **Up to 160 simultaneous soundings in a single setup** – Allows economically-feasible high-density sampling.
- > **Full-tensor AMT, HSAMT and CSAMT** – Yields a much more accurate model of the subsurface than typical scalar AMT/CSAMT.
- > **Ultra-low-noise, low-distortion front end electronics** – Much higher data quality.
- > **Real-time on-screen display of impedance, phase curves, and other MT parameters** – Detect any acquisition problems as they happen.

Typical Users

- > Mapping of geology to 1,000 meters and more for mining and minerals exploration
- > Mapping of hydro-geologic features for groundwater exploration
- > Geothermal reservoir mapping to 2,000 meters depth
- > Shallow oil and gas exploration to 2,000 meters depth
- > Deep geotechnical and engineering application such as mapping of deep structure for future dam sites, characterizing potential nuclear waste deposit integrity, view geology structure for deep mountain tunneling, etc
- > Excellent tool for academic research and teaching



MTPro – Analysis Software



MTPro is a magnetotellurics data processing program used to convert raw Geode EM3D time series into MT and AMT (audio magnetotelluric) parameters.

The program can be licensed for either single-receiver, stand-alone Geode EM3D systems or for multi-receiver, networked systems. It is tightly integrated with the Geode EM3D interface and acquisition software and can export the processed data in multiple formats.

MTPro is used to process data acquired with the Geode EM3D, and SCS2D (an MR, AMT, and CSAMT inversion program) can use the pre-processed apparent resistivity and phase data (along with location and other metadata) to invert the data to 1-D models and 2-D depth sections.

Features and benefits

- > Fast data processing of large data sets for many simultaneous AMT soundings – produces results in the field within seconds.
- > View all data processing results such as resistivity curves, phase curves, Bostick resistivity-depth curves, tipper parameters, and many other AMT parameters in the field – even while data acquisition is still going on.
- > Ability to export GPS coordinates for all stations in Google Earth KMZ files for plotting the survey line on Google Earth.
- > Will export Bostick transform data for 2-D sections in Surfer or other data contouring programs.
- > Export data as EDI files to be read into Geotools, WinGLink, or other commercial and academic MT inversion programs.
- > Remove Erroneous Data with Despiking, Destriping and “Remove Dropouts” features
- > MTPro can export data to Zonge SCS2D data inversion software.
- > Easy to navigate user interface and built on understandable graphic displays.
- > Multiple built-in ways to view the processed data.



Specifications Geode EM3D 2D and 3D Full-tensor AMT/CSAMT/HSAMT

Operating Principle	Controlled-source audio-frequency magnetotellurics (CSAMT) is a high-resolution electromagnetic sounding technique that uses a fixed, grounded dipole or horizontal loop transmitter. Audio magnetotellurics (AMT) uses naturally-occurring electrical sources in the atmosphere. Hybrid-source audio-magnetotellurics (HSAMT) uses both natural and man-made signals	Distance from receiver	250 m between receivers, 100 m first receiver to PC
Frequency Range	0.1 Hz to 20 kHz	Analog Receiver Input Impedance	> 2.0 MOhm (W/Analog Front end)
Electrical Sensors	Choice of either porous pot non-polarizing or stainless steel stakes	Power source and consumption	Geode EM3D Receiver 12V external battery, 9 Watts for 6 channels
Magnetic Sensors	Model G20K (0.1 Hz to 20 kHz) magnetic field sensor with 20 meter cables	Operating Temperature	-20°C to +70°C (-4°F to +158°F)
Data Format	ASCII columnar	Physical Dimensions	GEM3D receiver L: 24 cm; W: 16 cm; H: 19 cm; Weight: 5.2 kg (6.5x6.5x3.25 in; 183 oz)
Data Collection Station GEM3D Receiver	Channels: up to 6 channels per station (Ex1, Ex2, Ey1, Hx, Hy, Hz) (Ex1, Ex2, Ex3, Ey1, Hy, Hx) (Ex1, Ex2, Ex3, Ex4, Ey1, Ey2)	In-field QC	Time series, apparent resistivity and phase versus frequency sounding curves with standard deviation or error bar, component operation check, automated contact resistance measurement
Sample Interval (SI)	Automatically selected in CSAMT mode	Maximum signal input voltage	+/- 12 V peak, +/- 9 V peak before distortion increase
Maximum Record length	64 K	Clock Accuracy	0.4 ppm over temp range, +/- 2ppm/year without factory calibration
Analog to Digital Conversion	24 bits	Phase Matching	1 degree <1 kHz, 3 degrees < 10 kHz
Dynamic Range	144 dB (system), 110 dB (instantaneous, measured) at 2 ms, 24 dB	Amplitude-Phase Channel Matching	1%
Noise floor	110 nV/ $\sqrt{\text{Hz}}$ _{rms} @ 24 dB	Amplitude Accuracy	1%
Storage Memory	PC system dependent	Distributed System Parameters	Maximum Channels: 240 channels Communication Protocol: 10 Mbit Ethernet
Gain Settings	24 dB, 12 dB, 0 dB, -12 dB	GPS Synchronization	Synchronized transmitter to acquisition stations