The Fullwaver systems: Distributed network of autonomous devices for deep 3D electrical resistivity and induced polarization survey

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Driven by needs in the mineral exploration market for ever faster and ever easier set-up of large 3D resistivity and induced polarization, autonomous and cable-less systems come to the forefront. Opposite to the traditional centralized acquisition, this new system allows a complete random distribution of receivers over the zone of interest for a full 3D deep imaging.

The Fullwaver system is composed of multiple (generally 20 to 50) autonomous boxes (V-Fullwaver) able to record continuously the electrical field on two channels between 3 electrodes (P1 - P2 and P2 - P3). The two dipoles are usually set up perpendicularly in order to be sure that a signal can always be measured. Receiver's boxes are arranged either over a regular grid or over a more irregular layout adapted to the field condition (topography, road, buildings, vegetation, etc.). With such system, all usual drawbacks induced by long cable set up over large 3D areas – time consuming, lack of accessibility, heavy weight, electromagnetic induction, etc. - disappear.

The V-Fullwavers boxes remain at the same place during the entire survey for recording the electrical field generated by the injection of current into the ground between two current electrodes. These current electrodes are moved all over the survey area to illuminate the target from all the direction ensuring a real 3D acquisition.
The Fullwaver receiver system is associated to a current receiver (I-Fullwaver) that records the current injected into the ground by the transmitter. The I and V-Fullwavers record timestamped current and voltages. The signals keep synchronized during the entire survey thanks to a synchronization on the GPS-PPS signal. A sampling of 10 ms allows for recording three months of timeseries in their internal memory. After the acquisition, the current and voltage timeseries are processed through a processing software chain specifically developed for the system.

After the acquisition campaign, resistivity and induced polarization data have to be inverted using 3D inversion software for being confronted to complementary information. The presentation will show the benefit of this system through several examples of application for deep mining exploration, huge deep seated landslide, volcanoes and geothermal systems.