Ogawa Lab

Imaging and monitoring of crustal fluids

Multidisciplinary Resilience Research Center

https://sites.google.com/view/yasuoogawatitech

- Imaging active volcano and seismogenic zones
- Precisely-Controlled electromagnetic exploration method

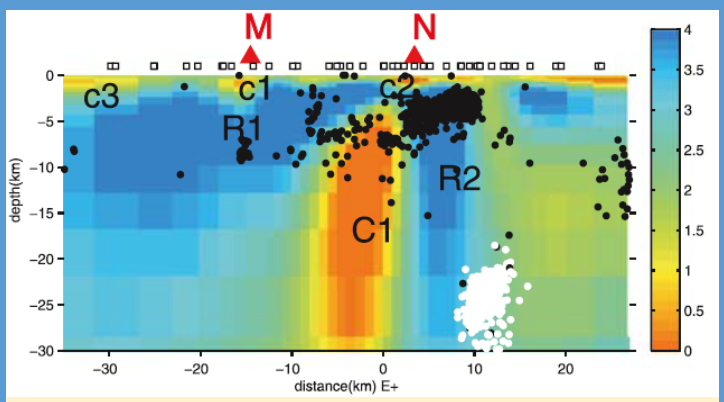
Imaging fluids and melts deep in the crust is essential for understanding the dynamics of active volcanoes and seismogenic zones. Resistivity is a physical quantity sensitive to the distribution and connection of small amounts of fluids and melts. It can be remotely probed from the surface using electromagnetic waves.

We have used natural electromagnetic fields to probe volcanic and seismogenic sites in Japan and abroad.

We are also developing a new system using precisely-controlled artificial current transmission signals for 4D monitoring of volcanos in Japan and New Zealand.

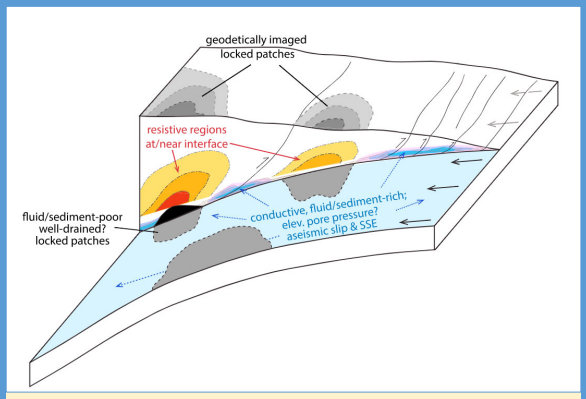
Precisely controlled electromagnetic exploration system

High precision and long-term stability of the transmitted waveform by GPS control enables deep exploration and monitoring despite the small power of the transmitter. Applicable even in areas with high ambient electromagnetic noise.



Fluid distribution under volcanos

Fluid distribution around inland seismogenic zones are being clarified in three dimensions by dense broadband observations (1mHz-100Hz). The figure shows resistivity distribution in an east-west section through Naruko volcano (N) in the central Tohoku region (Ogawa et al., 2014). Deep crustal fluids sealed by silica minerals exist at the brittle-ductile boundary. Fluids are trapped under the seal. Fluids flush through the silica seal, leading to the generation of inland earthquakes.



Fluid distribution and mechanical coupling at plate boundaries

The degree to which a subducting plate adheres or slides with its upper surface can be observed in detail by GPS. We show from natural electromagnetic field observations that this is governed by the fluid distribution between the plates in three dimensions. The observations were made in the Hikurangi subduction zone on the North Island of New Zealand (Heise et al., 2017)