Sumatra Fault Zone in Sumatra Island, Indonesia is an active fault as a result of strike-slip component of Indo-Australian oblique convergence. Several multidisciplinary studies have been undertaken in Sumatran fault especially on GPS and Seismology studies, but these observations cannot resolve many detail of the fault structure yet. In this research, we have imaged the Sumatran Fault inform of resistivity distribution combining with geological, GPS and seismological studies to explain the earthquake generation and deformation process.

In 2009, two lines coast to coast broadband MT measurements were carried out in Aceh crossing the Sumatran fault using five components of electric and magnetic sensors in frequency range between 320 Hz to 0,01 Hz at 27 sites. Interpretation of the resistivity structure was made using 2D inversion (Uchida and Ogawa’s code) and 3D MT inversion provided by Weerachai’s code with the resistivity of sea water included as fixed parameter. Based on these results, Sumatra fault is clearly detected that is characterized by contrast resistivity just beneath the fault at shallow part until 10 Km of the depth. While in the deeper part, a vertical conductor exist in the middle of the profile at the depth starting from 20 Km form the surface that can be interpreted as melting zone. The earthquake distribution shows that seismicity distributed in the boundary between resistive and conductive zone indicating that boundary between ductile and brittle region and pore pressure of the fluid are a significant role in earthquake generation process.