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### 3-D magnetotelluric imaging of the Phayao Fault Zone, Northern Thailand: evidence for saline fluid in the source region of the 2014 Chiang Rai earthquake

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#### Abstract

Seismicity in Thailand had been relatively low for decades prior to the Mw 6.5 earthquake of 5 May 2014 which came as a surprise and was followed by thousands of aftershocks. Most of the epicenters were located in the transition region between the Mae Lao Segment (MLS) and the Pan Segment (PS) of the Phayao Fault Zone (PFZ). We conducted a 3-D magnetotelluric (MT) survey (31 sites) to image the deep PFZ structure. The shallow 3-D resistivity structure matches very well with the surface geology, while the deeper structures disclose many interesting resistive and conductive anomalies. However, the most interesting feature of this study is the large conductive anomaly (ML) located at a depth of 4 km to the mid-crust beneath the MLS near the seismogenic zone. Our current hypothesis is that the ML conductor has a highly interconnected aqueous fluid content and also plays crucial role in the earthquake sequence of the 5 May 2014 event. As our previous seismic waveform study revealed that the MLS has a relatively high fault plane instability, the fluid within the fractured fault would further reduce the fault strength. The accumulated pre-existing tectonic stress from the north can therefore overcome the maximum frictional strength of the MLS, and hence cause it to slip and produce the main shock. With the local structural heterogeneities and fluid in the fractured fault zones,

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