Crustal Fluids Responsible for **Diffusional Characteristics** of **Deep Volcanic Long-Period Earthquake**

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We observe **deep volcanic long-period earthquakes (DLPs)** in Eastern Shimane, which are not only very active but also particularly **swarm-like** [e.g., Aso et al., 2013; Kurihara and Obara, 2021]. Usually, swarm-like seismicity shows spatial migrations, implying crustal fluids involved in diffusional processes. However, such migration is difficult to confirm for DLPs, whose spatial spread is as tiny as their hypocentral accuracy, and DLPs in Eastern Shimane are no exception.
In this study, I updated ETAS model [Ogata, 1988] to extract diffusional characteristics even from a stationary cluster. Specifically, I considered **exponential functions representing diffusional processes** in the time function of source interactions, in addition to the classic power function as Omori law. Based on AIC indices, our **modified ETAS model** performed better than the traditional ETAS model. In addition, simulated seismicity following the modified ETAS model reproduced characteristic inter-event statistics as observed. These results imply the **existence of crustal fluid** at the source of swarm-like volcanic DLPs, though they do not show diffusional migrations.

Keywords: Deep Long-Period Events, Modified ETAS model

