[EE] Evening Poster | S (Solid Earth Sciences) | S-IT Science of the Earth's Interior & Tectonophysics

# [S-IT21]Do plumes exist?

convener:Hidehisa Mashima(Center for Obsidian and Lithic Studies, Meiji University), Gillian R Foulger (Durham University), Dapeng Zhao(東北大学大学院理学研究科附属地震・噴火予知研究観測センター)
Sun. May 20, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)
The debate regarding whether anomalous volcanic areas on Earth's surface are fed by deep-mantle plumes is widely considered to be the most significant debate currently ongoing in Earth science. Not only does the debate touch on a fundamental aspect of how Earth works dynamically, but the subject is extraordinarily cross-disciplinary to an extent that probably few scientists fully realize. Sub-disciplines that can contribute to efforts to resolve the debate include sedimentology, palaeontology, tectonophysics, geochronology, volcanology, petrology, geochemistry, geothermal research, seismology, geodesy, electromagnetics and many others.

In addition to the disciplines of Earth science, the plume debate provides a remarkable and thought-provoking subject for scientific philosophy and reflections on correct scientific methodology: (1) What exactly is a plume? People often change their definition of a plume a posteriori in order to fit their observations. (2) How can the plume- or the plate hypothesis be falsified? (3) Do Earth scientists tend to present only one possible interpretation of their data, or do papers reflect all possible interpretations? Unfortunately, the former is often the case. (4) Are published interpretations consistent with other data from the subject field area? Often they are not, and the inconsistencies are not sufficiently highlighted nor discussed. These issues are particularly useful for inducting students into correct scientific working. In summary, the debate provides enormously fertile ground for new, fundamental questions and cross-disciplinary research.

This session welcomes studies of melting anomalies on Earth from the point of view of any sub-discipline. We also welcomes studies of geological phenomena which are attributed to mantle plumes, such as back-arc extension, plate motion, sedimentary basin formation and lithospheric uplift, and any other work that bears on this fascinating and challenging geological debate.

# [SIT21-P03]Pull-apart opening of the Japan Sea inferred from the body of geological evidene

*Hidehisa Mashima[1] (1.Center for Obsidian and Lithic Studies, Meiji University)
Keywords:Japan Sea, pull-apart, Tsushima-Goto Fault

Back-arc basin opening is generally considered to be due to a regional stress field caused by shallow mantle processes such as slab-pull, corner flow and extrusion. Opposite to these hypotheses, the Japan Sea is considered to be opened by plume-like mantle upwelling. The double-door opening model based on paleomagnetic declinations observed in Japan led researchers to this hypothesis. Various scale of rotation, however, could have caused paleomagnetic declination. Paleomagnetic declinations therefore, could not be regarded as an independent constraint of the opening tectonics of the Japan Sea. Examinations based on geological relationships between Japan and marginal areas are needed to discuss the opening tectonics of the Japan Sea.

There is only one Precambrian Belt, the Oki-Hida Belt, is developed in Japan. On the other hand, three Precambrian systems, the Yeongnam Massif, Gyeonggi Massif and Nangrim Massif, are distributed from

south to north in the Korean Peninsula. Therefore the interpretation that the Oki-Hidea regards as the extension of the Yeongnam is the northern maximum of the paleo-position of Japan before the Japan Sea opening. Sedimentary basins subsided from the late Cretaceous to early Miocene are developed from northern Kyushu to the East China Sea. These sedimentary basins are characterized by the development of faults oriented to NW – SE to NNW –SSE directions, which indicates that northern Kyushu would not significantly rotated during the Japan Sea opening. Alignments of pre-Tertiary systems oriented ENE-WSW also continues from northeastern Kyushu to the western Chugoku district of Honshu, which indicates that Honshu would not rotated with respect the East China Sea. These observations indicate that the Japan Sea would have opened with a pull-apart matter.

At the west of northern Kyushu, the Tsushima-Goto Fault, the tectonic domain boundary between the Japan Sea and the East China Sea strikes with an NNE-SSW direction. The Tsushima-Goto extends as the western margin fault of the Tsushima Basin at the east of Korean Peninsula. Geological structure developed along the fault, such as rapid sedimentation of the Nojima Group in northwestern Kyushu, indicates that the Tsushima-Goto would have carried out strike-slip activities during the Japan Sea opening. The metamorphic folded belt developed along the southern margin of the Tertiary sedimentary basins is disconnected by the Tsushima-Goto and the Goto Canyon. These observations indicate that the Tsushima-Goto would have been the western master fault of the Japan Sea opening. In northeast Japan arc, a sinistral alignment of faults originally formed in Paleogene is developed. The activities of the Kuroko rift and the Joban forearc basin indicate that sinistral strike-slip movements would have occurred there during the Japan Sea opening. The Japan Trench terminates the sinistral fault system, which indicates that the trench would have been the eastern master fault of the Japan Sea opening.

In conclusion, body of geological evidence indicates that the Japan Sea would have opened as a pull-apart mater. The Tsushima-Goto Fault and the Japan Trench would have been the western and eastern master faults. The body of evidence also indicates that paleomagnetic declinations observed Japan would have been results of some kind of block rotations, such as ball bearing-type rotation, rather than coherent arc rotations. Plume-like active mantle upwelling therefore is not required to explain the opening tectonics of the Japan Sea.