Does GIA link Antarctic magmatism influenced by climate change to MORs activities?

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Many studies show links between glacial retreat and timing of magmatism. For example, post glacial rebound after the Last glacial maximun (LGM) enhanced volcanic activities in Icelandic volcanoes (e.g. Maclennan et al, 2002). Modeling by Nakada and Yokose (1992) shows that crustal stress change during glaciation-deglaciation cycle affects way of crustal evolution. On the other hand, sea-floor topography around mid ocaen ridge likely records the Milankovic cycle (e.g. Crowley et al., 2015; Tolstoy, 2015). This means that Glacial Isostatic Adjustment (GIA) implies that the post-glacial rebound possibly affect world-wide magmatism, not only subareal volcanoes but also submarine volcanoes and mid-ocean ridges (MORs), with various degree of time lag because of relatively slow propagation of crust and mantle deformation derived from post glacial rebound. Thus, we are now planning to investigate links between regional volcanic activity and GIA. High resolution dating and petrological penetration from crustal and mantle-derived substance over latitudinal extent must help to understand it. As for Antarctica, region of our interests are hotspot volcanoes on the Ross Sea and Victoria Land, East Antarctica. Alkali elements rich volcanic rocks of Mt. Erebus and Mt. Melbourne are suitable for high resolution Ar-Ar dating. Abundant content of mantle and crustal xenolith included in the rocks of these volcanoes must bring us much information from deep. Combination of the volcanological and petrological investigation for these volcanoes and results of geophysical mapping and deep-tow magnetics during of circum-Antarctic mid-ocean ridges by research vessels can lead us to new insight into global climate-magmatism interaction.

References

Crowley, J.W., Katz, R.F., Huybers, P., Langmuir, C.H. and Park, S., Glacial cycles drive variations in the production of oceanic crust. 2015, Science, doi: 10.1126/science.1261508.

Maclennan, J., Jull, M., Mckenzie, D.,Slater, L.and Grönvold, K, The link between volcanism and deglaciation in Iceland, G^3, 2002. DOI:10.1029/2001GC000282.

Nakada,M. and Yokose,H., Ice age as a trigger of active Quaternary volcanism and tectonism. Tectonophysics, 1992, 212, 321-329.

Tolstoy, M., Mid-ocean ridge eruptions as a climate valve, 2015, Geophysical Research Letters, DOI: 10.1002/2014GL063015.