Spatial and temporal variations of volatile budgets in northern Japan

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Influx of volatiles from the subducted slab is one of the driving engines of arc magma generation. The composition and the P-T path of the subducted slab affects the dehydration metamorphic reactions that controls the quantity, composition and depth of the released fluid, which plays a preponderant role in the final composition of the primary arc magma. Changes of these subduction parameters should produce shifts in the volatile compositions of the volcanic products in an arc. The aim of this study is to identify spatial and temporal variations in primary magma volatile compositions and relate them to spatial and temporal variations in the subduction parameters.

Tohoku and Hokkaido, Japan, where the NE Japan and Kuril arcs meet, constitute one of the best-studied subduction settings in the world. Olivine-hosted melt inclusions collected from eight volcanoes distributed in this area were analysed to assess spatial and temporal variations in volatile budgets (H, C, S, Cl and F). Preliminary results show that the Kuril arc melt inclusions have higher volatile contents (1.1 – 3.3 wt% H_2O, 360 – 1730 ppm S, 630 – 1330 ppm Cl, 310 – 630 F) than the NE Japan arc magmas (1.4 – 4.3 wt% H_2O, 320 – 1220 ppm S, 300 – 690 ppm Cl, 180 – 340 F), with increasing volatile contents towards the arc-arc junction in both arcs, associated with the bending of the slab. Back-arc samples show the highest volatile contents (1.7 – 5.8 wt% H_2O, 900 – 1940 ppm S, 1300 – 3820 ppm Cl, 440 – 1380 ppm F), which may be related to lower degrees of partial melting there.