Magmatism in the northern Sredinny Range, Northern Kamchatka

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The Kamchatka Peninsula located on the north side of the Kuril arc is one of the largest volcanic arcs in the world, which corresponds to subduction of the northeastern part of the Pacific Plate. Associated with transition from the Kamchatka arc to the Aleutian arc, a trench-transform-transform type triple junction consisting of the Pacific Plate, the North American Plate and the Okhotsk Plate is formed. At the slab edge of the Pacific Plate, the mantle wedge opens to the north (Yogodzinski et al., 2001; Portnyagin and Manea, 2008). Furthermore, the Emperor Seamount Chain is subducting beneath the northern Kamchatka from near the triple junction (Davaille and Lees, 2007), which influences the deformation of the subducting Pacific Plate; in the north of 55˚N, the dip angle decreases to ~35˚, which is shallower than a constant dip angle ~55˚ observed in the south (Gorbatov et al., 1997).
This arc is characterized by the wide volcanic zone in the across-arc direction, which consists of three volcanic chains; the Eastern Volcanic Front (EVF), the Central Kamchatka Depression (CKD) and the Sredinny Range (SR). The volcanic front is continuous from the Kurile Arc to EVF and bent toward the Klyuchevskoy Volcanic Group (KVG) in CKD at around 55˚N along the 100–180 km slab-depth contour. The offset of the volcanic front corresponds to shallowing of the slab dip angle. KVG is the world-most active and largest volcanic group. On the other hand, SR constitutes the backarc volcanic zone and a few active volcanoes are only located in the southern part of Sredinny Range (S-SR) (Pevzner, 2006). The northern Sredinny Range (N-SR) is located 100 km north beyond the northernmost active volcano in SR corresponding to the north edge of the subducting Pacific Plate (slab edge). However, we found many young volcanic features and possible magmatic products in the area. In order to characterize the magmatism in N-SR, we have conducted geochemical studies for the N-SR lavas.
The following characteristics of the magmatism in N-SR were found. The magmatism started after the Lower Pliocene and continues to the Holocene. Lava plateaus were dominant during the Neogene, while monogenetic cones and/or stratovolcanoes are dominant during the Quaternary, with different volumes, rock textures, modal mineral compositions and bulk rock major and trace element compositions between the two stages. The N-SR lavas were estimated to have derived from flux melting of water-saturated mantle under a similar genetic pressure-temperature condition. The fluids contributed to the arc magmatism were derived from the subducting Pacific Plate or derived from the subducted Bering Plate, and/or the forearc slivers beneath the northern Kamchatka. The arc lavas exhibit high HFSE concentrations (~18 ppm Nb and ~1.2 ppm Ta) compared to the lavas from KVG and are similar to the lavas of the S-SR (Volynets et al., 2010), most of which were likely caused by the deep dehydration. These results suggest that the slab-derived fluids play an important role in the arc magmatism even in N-SR which is located north beyond the slab edge.

Keywords: Kamchatka, Pacific Plate, slab edge, subduction zone, arc magma

