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Felsic volcanism flare-up since 0.3 Ma at the back-arc side of NE Japan: characteristics of space-time distribution and chemical compositions

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The NE Japan arc is a typical island arc having subduction-related volcanism. The volcanic front is marked by andesite stratovolcanoes standing along the back-bone range of this arc, and has seldom migrated since Late Miocene. On the other hand, the back-arc side volcanism has been changing in its space and time distribution during Quaternary. In the southern part of the Tohoku region, the back arc volcanism had stopped from 0.8 to 0.3 Ma. New felsic volcanoes, however, have appeared in the back-arc region since 0.3 Ma; these are Sunagohara caldera at 0.29 Ma, Kinunuma volcano at 0.22 Ma, Iiji volcano at 0.20 Ma, Hiuchigatake volcano at 0.16 Ma, and Numazawa volcano at 0.11 Ma. All of them started by explosive eruptions of about 1 to several 10 DRE km^3 felsic magma with Plinian falls and pyroclastic flows. The largest Sunagohara caldera eruption formed a 4 by 6 km diameter depression. The chemical compositions of individual volcanoes are various and show distinct trends. For example, the youngest Numazawa volcano consists of 110, 70, 45, 40, 20 and 4.3 ka eruptions. This volcano erupted 1 DRE km^3 rhyolitic magma during the first 60 thousands years, but 4 DRE km^3 dacitic magma in the last 50 thousands years. The whole rock compositions of the Numazawa ejecta have gradually decreased in SiO_2 and K_2O with the increasing rate of eruption. The decreasing variation of incompatible elements suggests that increasing degree of partial melting caused the chemical trend of the Numazawa ejecta. This is consistent with the observed change of the eruption rate, and both results suggest heating of the magma source. The chemical variety of the other back arc volcanoes may reflect the difference of their sources. Tomographic images of the seismic velocity structure have revealed low-velocity-zones beneath the back arc volcanoes. The observed time and space distribution of these volcanoes implies the past growth processes of the present low-velocity-zones under the NE Japan arc.