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Structural control on Mio-Quaternary volcanism in NE Honshu, Japan

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NE Honshu (Japan) is characterized by a N-S trending volcanic arc related to the westward subduction of the Pacific plate, developed since Late Miocene. Volcanological, remote sensing and structural field data are used to define the tectonic control on volcanism in NE Honshu. Late Miocene and Pliocene rhyolite calderas are mostly aligned and elongated with NE-SW and ~N-S directions. The Quaternary andesite stratovolcanoes are mostly aligned and elongated with ~E-W and ~N-S directions. In Mio-Pliocene, predominant N-S dextral faults, subordinate NE-SW normal faults and ENE-WSW sinistral faults, and rare NW-SE thrust faults suggest an overall NE-SW maximum compression. In Quaternary, similar proportions of N-S thrust faults, ENE-WSW dextral faults, ESE-WNW sinistral faults and E-W normal faults suggest an overall ~E-W maximum compression. The data suggest that the Miocene-Pliocene tectonic setting, induced by the NE-SW indentation of the Kuril sliver undergoing oblique convergence, was characterized by N-S dextral faults in NE Honshu, as the inland expression of a possible Mio-Pliocene slip-partitioning. Magma rise and emplacement occurred in such a context, along areas of localized extension related to the N-S dextral faults. The ~E-W Quaternary compression results from orthogonal convergence. The widespread strike-slip and normal faults, consistent with this setting, require local variations in the vertical component of the stress, possibly magma-induced. These mostly occur through ~E-W trending areas of extension, possibly the surface expression of ~E-W trending fingers of hot mantle material. The different tectonic and magmatic context in Mio-Pliocene and Quaternary is also reflected by the different amount of extruded volcanics, showing larger values in the Mio-Pliocene period, whereas restricted extrusion occurred during Quaternary.