

Volcano-tectonic evolution from Cretaceous to Paleogene time in SW Japan

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The eastern margin of the Eurasian continent during the latest Cretaceous to Paleogene is characterized by the volcanism associated with cauldron swarms and the related plutonism. The SW Japan block was a part of the Eurasian continental margin in this age. The igneous activity is divided into 4 stages, i.e., stage I (>100Ma), stage II (100-90Ma), stage III (90-80Ma), stage IV (75-50Ma) and stage V (44-30Ma). The cauldrons in stages I - IV is likely to make some clusters along the volcanic front in these stages, while the cauldrons in stage V show an echelon arrangement along the continental margin. This suggests the change of regional stresses during the hiatus of the igneous activity in the early Paleogene (50-44Ma).

The clustering of cauldrons in stages I - IV may indicate a plume head beneath the cauldron swarm along the volcanic front. The accretionary prism along the outer zone of SW Japan shows that the subducted slab lay beneath SW Japan in that time. A volcanic front ran concordantly with this accretion zone through SW Japan during stage I - IV, and then migrated northward in stage V.

Each cauldron in stage V exhibits an elliptical or elongated polygonal outline. The long and short axes of a cauldron represent the directions of horizontal maximum and minimum compressive regional stresses, respectively. The elongated shape of a collapse caldera, which is topographic expression of a cauldron, presumably reflects regional stresses in the lithosphere as well as the geometry of the magma body.

The cauldrons in stage V show a set of right-handed en echelon arrays oriented at an angle of 18 - 20° to the direction of the volcanic front in this stage. The long axes of some cauldrons, representing the directions of the horizontal maximum compressive stresses, trend to 20° or more anticlockwise to the cauldron array. This orientation indicates that SW Japan in stage V was under left-handed Reidel shearing.

Tectonic regime during stage I - IV was probably characterized by the normal subduction followed by plume ascending along the subducting slab, whereas that in stage V was identified as the oblique subduction yielding the left-handed lateral movement in the overlain lithosphere.