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Interaction between central volcanoes and regional tectonics along divergent plate boundaries: an example from Askja, Iceland.

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Interaction between regional tectonics and central volcanoes is crucial for understanding rifting events, since it plays a relevant role in shaping divergent plate boundaries, nature of magma intrusion and triggering eruptions. The Askja volcanic complex, located at the centre of the active divergent plate boundary of North Iceland, is an ideal for investigation of such interaction. Askja features three overlapping calderas (including the 1875-1930 Öskjuvatn caldera) located in the centre of Dyngjufjöll massif. We investigated the volcano-tectonic features of Askja by collecting structural field measurements on faults, dikes, eruptive fissures and extension fractures, in conjunction with a remote-sensing-based structural analysis.

These data reveal interactions between the regional tectonics (i.e. rift-related structures) and the local tectonics produced by the faulting associated with the growth of the calderas. On one hand, regional structures register a progressive influence of the central volcano (i.e. topography and caldera related faults) upon approaching Askja. In the same way, magma activity focuses along the regional trend away from volcano but concentrates along the ring faults within the calderas. On the other hand, an important imprint of rift-related deformation affects the volcanic complex, reactivating regional faults during caldera collapse. Moreover, the Dyngjufjöll massif is dissected by regional faults, focusing the magma intrusions along the regional trend.

In conclusion, the Askja central volcano (i.e. Dyngjufjöll massif) appears to have a balanced amount of regional and local structure opposite to that of volcanoes dominated by the regional ones, such as Krafla volcano to the north, and those dominated by local structures, such as Grímsvötn to the south. This may represent a controlling factor in determining the nature of the subsurface magma pathway, as well as the nature of the ensuing eruptions.