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Coeval volcanic activity and compressional deformation, Tromen volcano, Neuquén province, Argentina

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On planet Earth, magmatic activity concentrates at tectonic plate boundaries. Prime examples are subduction zones at convergent margins. At those of Andean type, deformation and current stresses tend to be compressional. In such a context, are volcanoes subject to horizontal compression? If so, how does magma reach the surface?

We have studied the structure and development of Tromen volcano, in the foothills of the Southern Andes of Argentina. On Tromen, as on other volcanoes in the Neuquén Basin, volcanic rocks form only a thin cover. Mesozoic sedimentary rocks account for most of the edifice. The strata have been tectonically uplifted in a fold-and-thrust belt, which trends broadly N-S, but bends around the foot of the volcano. The deep-seated shortening is of Tertiary and Quaternary age. However, the volcanic cover of the Tromen has also been shortened. Open folds in lava flows and thrust faults crosscutting feeder dykes, all trend N-S. Faulted conglomerates contain blocks of volcanic origin.

We have dated magmatic rocks by the ^{40}Ar-^{39}Ar method. The ages of faulted dykes are about 2 Ma; of volcanic conglomerates, less than 1.81 $\pm$ 0.06 Ma; and of folded lava flows, 2.00 $\pm$ 0.06 to 0.99 $\pm$ 0.15 Ma. Historic eruptions occurred in the XIXth century. Thus, Tromen volcano has been active since 2 Ma.

Although most of the deep-seated shortening accumulated before 2 Ma, a significant amount was coeval with volcanic activity. We conclude that Tromen volcano formed and developed in a tectonic context of E-W compression.