Structural mapping in the Hilti mantle section (Oman ophiolite): two successive plastic deformations and related magmatism

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Extensive structural mapping of the Hilti mantle section (Oman ophiolite) revealed that the mantle peridotites have recorded two successive plastic deformations: the first one related to the accretion of the lithosphere, and the second one imprinted during the emplacement of the peridotites.

The eastern part of the mantle section is mostly characterized by the first high-T deformation, where a gently undulated flat structure with a uniform east-west flow occurred.

In the western part of the mantle section, N-S to NW-SE trending shear zones occur which overprint the first high-T deformation structures and are marked by an important magmatism, synchronous with the shearing. The shear zones are in structural and kinematic continuity with the basal thrusts in the peridotites.

Extensive structural mapping of the Hilti mantle section (Oman ophiolite) revealed that the mantle peridotites have recorded two successive plastic deformations: the first one related to the accretion of the lithosphere (the "asthenospheric" shear flow), and the second one imprinted during the emplacement of the peridotites. These two events have been distinguished on the basis of microstructural criteria.

The eastern part of the mantle section is mostly characterized by the first high-T deformation, where a gently undulated flat structure with a uniform east-west flow occurred. When it is related to the vertical, N-S to NNW-SSE trending, sheeted dike complex located to the East, this mantle flow is parallel to the spreading direction.

The kinematic analysis shows that the shear direction is generally changed from top-to-the west at the upper level, to top-to the east at the lower level with respect to the Moho. This shear sense inversion is explained by a model of forceful flow due to an active mantle uprise and it is not compatible with a passive mantle uprise. In the plan section, the boundary of the shear sense inversion is subparallel to the flow direction and subperpendicular to the spreading axis. In the cross section, the boundary appears to occur at various depth in the range of 200m to 500m. It shows that the active mantle uprise in the diapir center resulted in a channelled horizontal flow.

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