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片状組織を有するアンチゴライト蛇紋岩の強度
Strength of foliated antigorite serpentinite

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The trench parallel seismic anisotropy is demonstrated by recent seismological data. This phenomenon is tried to be explained by lattice preferred orientation (LPO) of plastically deformed antigorite serpentinite potentially existed in the mantle wedge and along the subducting oceanic plate. The rocks with LPO have generally well-developed foliation and lineation. In fact, naturally deformed antigorite serpentinites normally have such structure with LPO. The foliated rocks show a great amount of anisotropy of mechanical behavior. In this research, the anisotropic strength behavior of foliated antigorite serpentinite is studied through deformation experiment. In addition we observe the microstructures of recovered samples to clarify the plasticity of antigorite serpentinite.

We have conducted constant strain rate experiments on foliated antigorite serpentinite, collected from Happo ultramafic complex. This foliated antigorite serpentinite has a LPO characterized by [010] and (001) density maximum subparallel to lineation and foliation, respectively. The starting samples were cylinder with ca. 5 mm in diameter and ca. 8 mm in length. They were grouped in three types, as that the foliations were oriented at 0, 30 and 90 degrees with respect to the axial stress. The angle between the axial stress direction and foliation is named as orientation angles, B. The direction of lineation in the cylinders of B = 0 and 30 degrees was oriented parallel to maximum shear stress. Experimental conditions were 500 C of temperature and 1 GPa of confining pressure with a constant strain rate of ca. 1.7 x 10^{-5} /s.

Our mechanical data demonstrate that the strength of foliated antigorite serpentinite exhibits significant anisotropic behavior. Based on the microstructural observations of the recovered samples, the plastic deformation of antigorite serpentinite is proceeded probably by (001)[010] slip. We do not now get any evidence of the other slip systems rather than (001)[010]. This fact suggests that the deformation of antigorite serpentinite can not satisfy the von Mises criterion for creep. If this is true, the antigorite serpentinite can not be deformed to large strain by dislocation creep, which means that LPO does not develop during deformation. Therefore the idea of antigorite serpentinite with LPO existed in the mantle wedge and along the subducting oceanic plate can not be explained by deformation origin.

Keywords: foliated serpentinite, antigorite, anisotropy, plasticity

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Structural Constraints on the Evolution of the Neoproterozoic Jabal Gerf Nappe Complex (Southeastern Egypt), Arabian-Nub

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The Jabal Gerf mafic-ultramafic complex (? 40 km diameter) is the largest Neoproterozoic thin-skinned stacked ophiolitic nappe in the entire Arabian-Nubian Shield (ANS). It is situated in Gerf (Southeastern Desert/Aswan) tectonic terrane near the intersection between the NNE-trending Hamizana Shear Zone and the Allaqi-Heiani ophiolitic belt which decorates a segment of the Allaqi-Heiani-Sol Hamed-Onib-Yanbu Suture Zone. The complex comprises metaultramafic melange (locally highly sheared), island arc assemblage (mafic metavolcanics and volcaniclastic metasediments) and layered gabbros. This college is separated along WSW- (SW-) propagated thrust sheets and intruded by syn-to post-tectonic granitoids (sheared tonalite and granodiorite) and dykes. Superimposed and overprinting relations between structural fabrics encountered within this college reveal the effect of at least three phases of Neoproterozoic deformations (D1-D3). D1 formed very tight, intrafolial and transposed folds F1, with NW-SE (NNW-SSE) axial surfaces and NW-moderately-plunging axes (25o-35o N40o-60oW), non-penetrative axial planar foliations S1 (//So) and mineral lineation L1, which resulted from early NW- to NNW- oriented shearing and thrusting. D2 progressively overprinted D1 and was dominated by top-to-the-WSW thrusting and thrust-related folds F2, and penetrative crenulation foliations S2, which are mostly coincident with shearing planes of thrusts (i.e. S2=Sth), as well as mineral-, stretched-, pencil-like-lineations L2. F2 folding axes and L2 lineations are nearly coaxial plunging with axes (38o-42o N20o-25oW). D3 was attenuated phase, producing symmetric open folds with steeply plunging NE- (NNE-) axes F3, non-penetrative foliation S3 and kink axes L3. F3 and L3 are also coaxial, plunging 50o-55o N 25o-35oE. Following the D3, the Jabal Gerf mafic-ultramafic complex and granitoids were affected by a subsequent brittle phase D4 resulted in the formation of NNW-, WNW, NE-, NNE- and E-oriented right- and left-lateral-strike-slip faults. On the strain ellipse model, these faults represent en echelon second order Reidel shear (R1), conjugate Reidel shear (R2) and secondary synthetic shear (P), reflecting an activation of a horizontal principal stress from the SSE direction, most probably due to the movement along the Hamizana Shear Zone.

キーワード: Gerf Nappe, Neoproterozoic deformations, Allaqi-Heiani belt, Southeastern Desert, Arabian-Nubian Shield
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Post-accretionary Extensional Fault-zone Evolution in Ablah Group Volcanosedimentary Sequence, Western Arabian Shield

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ABSTRACT

The N-oriented Ablah Basin, in northwestern Asir tectonic terrane in Arabia, is affiliated to the marine post-accretionary depositional basins (MPADBs) of the Arabian-Nubian Shield (ANS). In this basin, a sequence of interbedded sandstone (grading into siltstone)-mudstone-dolostone was deposited synchronized and almost immediately after the Nabitah Orogeny (680-640Ma). This sequence is intercalated with rhyolite that is persistent along strike for distances up to hundreds of meters. The whole succession displays amazing post-accretionary structures produced by an earlier E-W shortening event and encompassing shear zones and shear zone-related folds, and thrusts and thrust-related folds, as well as other transpressive structures. Besides, E-W (to ENE-WSW) striking extensional normal faults are observed. The faults formed during a latest N-S (to NNW-SSE) lengthening event affected the entire Ablah Basin near the end of the Neoproterozoic. The present study highlights results obtained from outcrop investigations of these extensional faults that dip towards the S (to SSE) direction and vary in extension from few millimeters to several meters. Remarkable competence contrast between sandstone, mudstone, dolostone and rhyolites resulted in more complicated fault zones because of the development of secondary localized zones and segmentation-induced fault boudins and host rock lenses. Faults show geometries varying from simple fault cores to complicated fault cores showing a variety of principal deformation elements, such as clay-rich gouge, clay smear, and secondary quartz and carbonate veinlets. Other elements including fault splays, overlapped structures, segmented linkages and slip zones with fault-parallel fabrics are also detectable inside fault cores. Slip zones accommodate the bulk of slip within fault cores. It is suggested that the extensional faults evolved under imposed stress by linkage of pre-existing fractures initiated and nucleated during the earlier E-W shortening event, post-dating the final assembly and suturing between Eastern and Western Gondwana.

キーワード: Ablah Group, Arabian-Nubian Shield, Volcanosedimentary Sequence, East and West Gondwana, Accretion
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