

古海洋プレートリソスフェア最上部マンツルの結晶方位異方性と地震波特性 Possible lateral variation of seismic anisotropies in the oceanic lithosphere due to an active mantle flow

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Crystal-preferred orientation (CPO) is a common feature of peridotites and is developed during intense homogeneous plastic deformation of peridotitic minerals with a dominant slip system. Whereas an olivine CPO classification (A, B, C, D and E types) has been proposed by Karato and co-workers to illustrate the roles of stress and water content as controlling factors of olivine slip systems (e.g., Karato et al., 2008 *Annu. Rev. Earth Planet. Sci.*), an additional CPO type (AG) has also been proposed in recognition of its common occurrence in nature (Mainprice, 2007 *Treatise on Geophysics*). AG-type has been experimentally formed in sheared partially-molten samples, in which a-axes of olivine grains are aligned predominantly normal to the shear direction, rather than parallel to it (Kohlstedt & Holtzman, 2008 *Annu. Rev. Earth Planet. Sci.*). Thus, we can expect the development of AG-type olivine fabrics to be related to the occurrence of melt during deformation, most likely in the vicinity of mid-ocean ridges, where strong upflow is related to active mantle ascent (Nicolas et al., 2000 *Marine Geophysical Researches*; Michibayashi et al., 2000 *MGR*). Results from our analysis of peridotites from the Hilti mantle section of the Oman ophiolite show that olivine in that section is dominated more commonly by AG-Type than A-type CPO. This section preserves subhorizontal uppermost mantle lithosphere (Michibayashi & Mainprice, 2004 *Jour. Petrology*; Onoue & Michibayashi, 2013 *JpGU abstract*). Since olivine contains intrinsic elastic anisotropies, the development of CPO within peridotite during plastic deformation at mid-ocean ridges gives rise to seismic anisotropy in the upper mantle. Seismic properties of AG-type olivine fabrics reveal that whereas V_p velocity is maximum parallel to the flow direction (X) and minimum normal to the flow plane (Z), the intermediate direction (Y) has relatively higher V_p velocity than the median velocity. This feature of AG-type fabric is different from that of A-type, which occurs commonly under melt-free conditions, resulting in the different degrees of seismic anisotropies between AG-type and A-type. Thus, we propose, based on our results for the Oman ophiolite, that the intensity distribution of seismic anisotropy in the uppermost mantle could vary laterally depending on various strength of mantle ascent along a given segment of mid-ocean ridges in conjunction with various degree of melt impregnation.

Keywords: Olivine fabrics, Seismic anisotropy, melt, segment center, mid-ocean ridge