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Stress field and seismic anisotropy around Mt. Fuji deduced from temporal consistency and spatial distribution of shear wave splitting

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Shear wave splitting (SWS) has been used not only to examine structures deduced from strain fields of deep part of Earth but also to interpret subsurface structures at shallow depths of crust as well as stress and structural interactions. We measure SWS in the Mt. Fuji volcanic region whose seismicity was low before the 2011 Tohoku-Oki earthquake, but a Mw 5.9 event on 15 March 2011, four days after the mainshock, triggered the regional seismicity. We measure SWS from seismic data between 2009 and 2013 at 16 stations near the summit. We also measure SWS from the NIED Hi-net data in 2011 at 8 stations to interpret regional seismic anisotropy. We apply an automatic shear wave splitting measurement technique (Savage et al., 2010) to process numerous data with a careful verification of the measurement results to avoid various disturbances. The measured delay times range from 0.04 to 0.09s. Both fast polarization directions and delay times do not change due to the Mw 5.9 event. In addition, SWS measurements are stable at each station. Spatial distribution of fast polarization directions has two characteristics. Fast polarization directions close to the summit follow a radial pattern from the summit. By contrast, fast polarization directions that are more than approximately 15 km away from the summit are parallel to the NW-SE regional compression although a few stations do not entirely follow this pattern. Since the delay times do not have depth dependency, the anisotropy around Mt. Fuji is presumed to locate at shallow depths less than approximately 4 km. Loading of the edifice and regional stress field is responsible for the two distinctive characteristics of the spatial distribution of fast polarization directions. After the 2011 Tohoku-Oki earthquake, change of stresses can be inferred from increase of seismicity. Since the SWS measurement shows temporal consistency, we infer that the seismic anisotropy is caused by the seismic structure whose magnitude of anisotropy is so large that they are not sensitive to the stresses or stress perturbation of Mw 5.9 event are not significant on anisotropic structure of the area. Further analysis is required for quantitative analysis of magnitude of anisotropy and its sensitivity to the stresses that govern the Mt. Fuji volcanic region.