Changes of Polarimetric Scattering Characteristics of ALOS PALSAR Caused by the 2011 Eruption of Shinmoe-dake Volcano

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Abstract: Full polarimetric SAR images of ALOS PALSAR of Shinmoe-dake volcano in Japan were analyzed. The volcano erupted in January, 2011 and volcano ash deposited more than 10 cm in 12 km^2 and 1 m in 2 km^2. Two images before and after the eruption were compared based on a point view of the four-component scattering model to detect changes of polarimetric scattering characteristics. The main detected changes are as follows.

Total power of the four-component scattering model decreased on a farslope after the eruption. An incident angle on a farslope is larger than the angle on a foreslope. Decrease of surface roughness due to deposited volcanic ashes makes back-scattering smaller in the area of a larger incidence angle.

However the rate of the double-bounce component got higher in a forest at the foot of a mountain slope and on a plain, where the ground surface is almost horizontal and the incident angle is relatively-large. Decrease of roughness of the forest floor increases forward scattering on the floor of the larger incident angle. This increases the double-bounced scattering due to bouncing back between the forest floor and trunks which stand "perpendicularly" on the almost horizontal forest floor.

The rate of the surface scattering component got higher around an area where layover occurred. In the study area, most of layovers occurred at a ridge where an incidence angle was small. Decrease of surface roughness due to the ash deposit increases the surface scattering power in the area of the small incidence angle.

Keyword: SAR, Volcano, Polarimetry, Four-component scattering model..