Relationships between PASAR-2 backscatter amplitude changes and snow depths

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For local governments heavy snowfall gives a very big economic burden. A large amount of tax will be put into operation of the snow removal vehicle, for example. The snow removal expenses of Niigata prefecture approaches 10 billion yen annually, but the operation plan (route selection and operation count) of the snow removal vehicle is not based on objective awareness of snow depth which can vary year by year.
In order to solve this problem, it is important to grasp the snow depth deep space distribution. The estimation of snow accumulation by the conventional satellite-mounted synthetic aperture radar (SAR) was mostly based on the C-band, and adaptation to the snow layer including liquid moisture have difficulty due to the short wavelength (Bernier et al., 1999; Li et al., 2017; Rignot et al., 2001; Shi et al., 1993; Shi and Dozier, 1995). However, in the L-band SAR, the correlation between the snow depth and the backscattering intensity was confirmed to be wet snow, which was a negative correlation (the snow is deeper the reflected intensity decreases) in the night observation assumed to be dry snow It was shown that positive correlation was obtained by day observation (Nagai et al., 2018a, 2018b).
In this research, we examined the image processing algorithm suitable for snow depth estimation for PALSAR-2 which is the L-band SAR equipped with "Daichi-2". First of all, the night observation data was used to minimize the influence of liquid moisture. Obtain data of the observation as 2015/11/22, 2016/11/20 as the no-snow period and 2018/01/28 as the snowy season, convert the backscattering intensity (dB). A series of moving average filter of 0, 5, 10, 15...55 pixels were carried out for each. Then statistical comparison of the ground measurement value compiled by Niigata University (Iyobe and Kawashima, 2016) and the SAR-derived backscatter amplitude changes was carried out.
As a result, the moving average filter with 10 pixels or more shows a negative correlation of $r < -0.3$, $p < 0.1\%$ in all cases, and the correlation coefficient decreased as the number of pixels of the filter increased. There was no significant difference between the November average image and the single scene image. For the linear approximation between the intensity difference and the measured value, the slope was almost constant with the moving average filter of 10 pixels or more.
By using data at night during the winter season, we can estimate snow depth from SAR with high negative correlation. In order to create a snow depth map with a better correlation coefficient, it is necessary to apply a stronger moving average filter, but since it becomes a coarse and smooth snow depth map according to it, it is necessary to consider a filter according to the application.
In addition to this, statistical analysis is also presented in this presentation on other seasons as the standard as well as for snow melting daytime observations presumed to contain a large amount of snow in the snow, and a snow depth estimation method using SAR deepens in the discussion.

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