[EJ] Evening Poster | S (Solid Earth Sciences) | S-TT Technology & Techniques

[S-TT48]Synthetic Aperture Radar

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ALOS-2 and Sentinel-1, which have highly enhanced capacity compared to previous SAR satellites, were launched in 2014, and their utilization has been widely expanding as the data has accumulated. Now we are facing a new and abundant era of the satellite SAR, along with a worldwide trend to an open and free data policy of satellite data, and with next-generation advanced SAR satellite plans by several countries. In addition, SAR technologies with other platforms, such as ground-based SAR with high temporal resolution and UAV (Unmanned Aerial Vehicle) SAR with flexible operability, have also been developed and used for various targets. These facts indicate that the SAR utilization data has become widespread in both basic researches (e.g., earth science) and diverse applications (e.g., disaster prevention and forest monitoring). In this session, we would like to share a broad knowledge and information regarding SAR. A wide range of research topics from basic researches to advanced applications will be welcomed.

[STT48-P10]InSAR atmospheric correction using precipitable water vapor information estimated from Himawari-8 geostationary meteorological satellite

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The atmospheric delay effect due to water vapor is one of the limitations for the accurate surface displacement detection by Synthetic Aperture Radar Interferometry (InSAR). Many previous studies have attempted to mitigate the neutral atmospheric delay in InSAR (e.g. Jolivet et al. 2014; Foster et al. 2006). Li et al. (2009) used the precipitable water vapor (PWV) product derived from MERIS/MODIS satellites and found that the PWV-based delay model effectively reduced the InSAR phase delay. Here we showed a preliminary result of the newly developed method for the neutral atmospheric delay correction using the PWV estimates derived from Himawari-8 Japanese geostationary meteorological satellite data.

The Himawari-8 satellite is the Japanese state-of-the-art geostationary meteorological satellite that has 16 observation channels and has spatial resolutions of 2.0 km (infrared) with a time interval of 2.5 minutes around Japan. To retrieve PWV, we used the split window algorithm (Suggs et al. 1998). For the retrieval algorithm we used the 6-hourly ECMWF ERA-Interim data and the RTTOV radiative transfer model. For the PWV validation, we used Japanese operational radiosonde data observed every 00UTC and 12UTC between August 2015 and October 2017. Note that we excluded cloudy days around the radiosonde stations by eyes because of the accuracy deterioration of the estimated PWV, which can theoretically be obtained under the clear sky condition. Although the split window algorithm requires at least 2 IR bands to estimate the PWV, the number of bands used in the algorithm is not limited because the PWV is estimated with the least squares method. In the research we used all ten IR band data for the best estimation accuracy. We also prepared the cloud mask with the corresponding region and time with the algorithm proposed by Suseno and Yamada (2012). The estimated PWV will be converted to the ZWD and then to the InSAR slant phase delay after modeled PWV validation and calibration. For the delay

comparison, we use InSAR images derived from the ESA’s C-band Sentinel-1 SLC data around Tokyo and Sapporo. The interferograms were processed by the GAMMA software with the 1-arc SRTM DEM.

The PWV estimation by Himawari-8 resulted in a good agreement to that derived from the radiosonde observations. The root mean square error between these two observations was 3.85mm with the bias of 1.40mm. In the validation for each station, we found that the Himawari-8 PWV showed a systematic bias of approximately 5mm in stations located at the small islands like Chichi-jima and Ishigaki-jima. When we exclude stations located at small islands, the RMSE and the bias reduced to 3.035mm and 0.271mm, respectively, which was correspond to the results in previous studies. The radiosonde PWV at Taipei, which locates south of these islands, showed a small bias in PWV. This indicates that the systematic bias is not due to the latitude dependence. Therefore the systematic bias would be due to the coarse resolution in the model which defines the surface reflectance and emissivity according to the land type.

In the presentation we will show these results and the progress after the abstract submission, and discuss the limitation of our method and the future plan.