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An approach to reduction of ionospheric noise in SAR interferometry for detecting small and secular deformation

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SAR interferograms produced from ALOS/PALSAR images, when compared with other C-band sensors, have a great advantage of obtaining signals on vegetated areas. It is becoming evident from case studies, however, that many interferograms are affected by large ionospheric noise that may critically mask small deformation signals. Such ionospheric noise is not a large issue for detection of localized signals on volcanoes or landslides, but it is essential to remove such noise for detection of broader signals due to, for example, plate subduction. This presentation proposes an idea of reduction of such ionospheric noise.

SAR interferograms contain LOS displacement signals and noise due to ionospheric disturbance, tropospheric phase delay and error in the orbit data. If we ignore such noise, we can obtain the LOS displacement time-series by an InSAR time-series analysis. On the other hand, if we can assume that there is no deformation in a specific period, and if we add a further constraint such that, for example, noise is small enough on a certain acquisition date, then we can estimate the noise component in all the SAR data. If we do such noise estimation on multiple different periods and remove the noise components from all the SAR data, we can then compute ”noise-free” interferograms that bridge different time periods, and can hence estimate LOS displacements precisely.

I will present results of a synthetic test and of application to ALOS/PALSAR data acquired in Kinki district that are supposed to have recorded the deformation due to the subduction of the Philippine Sea Plate.

Keywords: InSAR, Ionosphere, Crustal deformation, ALOS, PALSAR