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Correction by GNSS data for wide area InSAR analysis

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InSAR results include not only deformation signals but also noises caused by orbital inaccuracies, tropospheric delay and ionospheric delay. Orbital inaccuracies yield a residual orbital phase ramp. As spatial wavelengths of tropospheric and ionospheric noise are typically long, the effect is trivial for a small area but it can be significant for a large area.

Tropospheric noise can be mitigated by estimating the amount of tropospheric delay from a numerical weather model. However, the mitigation does not always work because of the limitation of spatial and temporal resolution of the numerical weather model. There is no common and effective technique to correct ionospheric noise so far while several techniques have been proposed. The ionospheric noise remains a big problem because, in particular, L-band is greatly affected by ionospheric noise. A residual orbital phase ramp can be reduced by flattening the phase in an area with no deformation. Another effective correction method is estimating model parameters (e.g. bilinear surface) to fit other deformation data such as GNSS continuous observation (Tobita et al., 2005; Fukushima and Hooper, 2011). This method works even if the deformation extends the entire area (Kobayashi, 2011). However, if the area is wide, a bilinear surface model is not sufficient because of noises with long wavelengths. A spline interpolation method has been proposed to overcome this problem (Fukushima, 2013).

In this presentation, I will report a GNSS correction technique using a natural interpolation method for scattered points. This technique can mitigate not only residual orbital phase ramps but also noises with long wavelength. Adjusting correction steps enables realistic extrapolations while conventional steps sometimes result in outliers in extrapolated areas. The results of wide area time series InSAR analysis using ALOS/PALSAR data show less noise and more apparent phase changes with shorter wavelength than the interval of the GNSS stations.

References

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