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Recent advances in the geodetic correction of SAR data for deformation measurements

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This contribution deals with the quantitative evaluation of the performance of deformation measurements using both interferometry and absolute ranging techniques after geodetic corrections have been applied to SAR data. The effects to be corrected are tropospheric delay and Solid Earth Tides using external models (ECMWF and NASA-NAIF respectively) and ionospheric delay using both external model (CODE) and a data based approach (split spectrum). Our assessment is based on a large set of SAR data and aims to assess the location accuracy for the absolute ranging and the residual phase errors for interferometric measurements. The absolute positioning accuracy of radar targets has been assessed to be on the centimetre level using artificial reflectors at different test sites. For interferometric applications, even if such corrections are available on coarser resolution than radar data itself, they strongly reduce the signal power of spatial low pass components that cannot be reduced simply by spatial averaging. This leads to an improvement in the measurement performance, in particular at large distances, where such errors are bigger and the models are valid. Applications like tectonics particularly benefit of the deformation measurement accuracy that SAR interferometry can provide. However, since the magnitude of relative errors increases with distance, it may well happen that the performance of relative deformation measurements between very distant points does not achieve the required accuracy for tectonic applications. Therefore a pre-compensation of low pass components is necessary. This work investigates the gain that the corrections can provide to the single interferograms and then extrapolates it to the performance of linear deformation rate estimation in terms of the amount of time/data required to achieve a given accuracy.