



Mitigation of Atmospheric Delay in SAR Absolute Ranging Using Global Numerical Weather Prediction Data: Corner Reflector Experiments at 3 Different Test Sites

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The atmospheric delay due to vertical stratification, the so-called stratified atmospheric delay, has a great impact on both interferometric and absolute range measurements. In our current researches [1][2][3], centimeter-range accuracy has been proven based on Corner Reflector (CR) based measurements by applying atmospheric delay correction using the Zenith Path Delay (ZPD) corrections derived from nearby Global Positioning System (GPS) stations. For a global usage, an effective method has been introduced to estimate the stratified delay based on global 4-dimensional Numerical Weather Prediction (NWP) products: the direct integration method [4][5]. Two products, ERA-Interim and operational data, provided by European Centre for Medium-Range Weather Forecast (ECMWF) are used to integrate the stratified delay. In order to access the integration accuracy, a validation approach is investigated based on ZPD derived from six permanent GPS stations located in different meteorological conditions. Range accuracy at centimeter level is demonstrated using both ECMWF products. Further experiments have been carried out in order to determine the best interpolation method by analyzing the temporal and spatial correlation of atmospheric delay using both ECMWF and GPS ZPD. Finally, the integrated atmospheric delays in slant direction (Slant Path Delay, SPD) have been applied instead of the GPS ZPD for CR experiments at three different test sites with more than 200 TerraSAR-X High Resolution SpotLight (HRSL) images. The delay accuracy is around 1-3 cm depending on the location of test site due to the local water vapor variation and the acquisition time/date.

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