

**Ph.D. in Information Technology
Thesis Defense**

**March 4th, 2022
at 9:00
online by Zoom**

Marco MANZONI – XXXIV Cycle

Fast and robust estimation of Atmospheric Phase Screens using C-Band spaceborne SAR and GNSS cross-calibration

Supervisor: Prof. **Andrea Virgilio Monti-Guarnieri**

Abstract:

This work consist in the development a fast and robust method to optimally estimate atmospheric phase screens from a stack of SAR images using both Permanent Scatterers (PS) and Distributed Scatterers (DS). Such delay maps can be used to predict extreme weather events and to provide better accuracy in short time forecasting.

To satisfy the requirement on the large size of the derived product and at the same time to keep low the computational effort, it is mandatory to degrade the resolution. It is also mandatory to exploit DS, thus use all the information (looks) available in the atmospheric resolution cell in order to provide dense atmospheric maps.

The procedure is based on the Phase Linking algorithm and the usage of ground patches whose size compares with the desired spatial resolution. The method is suited for short revisit time, C-Band SAR mission such as Sentinel-1, where sufficient coherence is present when estimating interferometric phases using large windows.

Just a few images need to be processed with a short total temporal span: this helps reducing the effect of deformations and decorrelations, which helps the unwrapping procedure.

A cross-calibration of the data using the Global Navigation Satellite System (GNSS) is conducted in order to remove sub-centimetric orbital errors that would lead to smooth but significant errors in the final products.

The method is validated in several regions using as validation set the state-of-the-art technique SqueeSAR[®], GNSS measurements and NWPM estimates of the tropospheric delay.

PhD Committee

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