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DInSAR measurement and modelling errors and their impact on geophysical applications

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This work is focused on the precision and accuracy of the terrain deformation estimates derived by the Differential Interferometric SAR (DInSAR) techniques. In particular, it considers the DInSAR measurement and modelling errors and their propagation in the subsequent geophysical analyses. Two key issues in remote sensing are the estimation of the uncertainty associated with the outcomes of a given remote sensing technique and the assessment of the impact that this uncertainly may have in a generic application driven by remotely sensing data. These two issues are certainly relevant in the case of DInSAR, whose deformation measurements can be potentially used in a wide range of geological and geophysical applications.

The work will firstly address the two main classes of DInSAR errors, i.e. measurement and modelling errors, and their impact on the precision and accuracy of the DInSAR-derived products. Then, it will analyse some typical examples of DInSAR modelling errors, proposing some approaches to reduce them. Finally, a full processing chain will be proposed, which includes the full characterization of DInSAR uncertainty and the uncertainty and sensitivity analyses of a generic geophysical model driven by DInSAR data. The examples shown in this work will be based on the results obtained at the Institute of Geomatics and the Earth Sciences Department of the University of Milan, in particular in the frame of an ongoing research project funded by the Italian Space Agency.