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Variational assimilation of InSAR-derived integrated water vapour in mesoscale models: improving initial conditions at high spatial resolution

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The high spatial resolution Numerical Weather Prediction (NWP) models are able to reproduce realistic atmospheric scenarios, but one of their most limiting factor is the poor resolution of the initial conditions (IC). In particular the lack of both precise and continuous water vapour data is one of the major sources of error in short-term forecast of precipitation. An improvement in monitoring the atmospheric water vapour and its assimilation in NWP models would lead to more accurate forecasts of precipitation and severe weather. In this context, benefits from InSAR high resolution phase wet delay can be employed by obtaining integrated water vapour (IWV) maps from InSAR data and assimilating them in NWP. In this study a preliminary experiment of variational assimilation of InSAR data has been performed to correct initial condition of the mesoscale model MM5. The basic procedure for GPS assimilation has been adapted to InSAR data, suitably converted in IWV information. Cases study of the 2008 campaign of ESA METAWAVE (Mitigation of Electromagnetic Transmission errors induced by Atmospheric Water Vapour Effects) project has been simulated . A sensitivity study is performed using different error matrix of the measured data; the impact on both IC and simulated results has been investigated. Variations on the initial horizontal and vertical distribution of water vapor will be discussed. Moreover a comparison of MM5 simulations with experimental data by radiosondes, surface stations and RADAR has been performed to the aim of establishing the impact of InSAR assimilation on model results. An impact on the rain distribution and amount is found: InSAR assimilation allows to correct MM5 overestimation of accumulated rain, although no impact is found on the timing of the rain cells evolution. These results are anyway promising and further experiments will be performed