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A comparison of integrated water vapour measurements of MERIS with COSMO-DE and COSMO-EU model outputs

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We present an advanced algorithm for the retrieval of atmospheric integrated water vapor (IWV) over cloud free land areas from satellite data acquired by the Medium Resolution Imaging Spectrometer MERIS on board ENVISAT. The proposed algorithm is based on inverse modeling of radiative transfer simulations by using an artificial neural network. The new algorithm includes the spectral variability of the surface reflectance. Extensive validation provided by a comparison of the retrieved MERIS water vapor concentrations to three different sources of in-situ measurements: measurements of integrated water vapor taken by Microwave Water Radiometers (MWR) on the ARM-SGP site in Oklahoma / USA, by ground based GPS stations in Germany as well as by radio soundings over central Europe. The validation was done for a period of three years from January 2003 to December 2005. For this long validation period a very high agreement with MWR and GPS in-situ data is found. The root mean square deviation is 1.40mm and the bias is 0.11mm for MWR data. For GPS the root mean square deviation is 1.22mm and the bias is 0.97mm. The agreement between MERIS and Radio sonde measurements is good, with a root mean square deviation of 2.28mm and a bias of 1.63mm.
Further on we used the new algorithm for a comparison with IWV simulations of two coupled regional climate models, namely the COSMO-DE model covering the area of Germany and the COMSO-EU model covering the area of Europe. The comparison was performed for a period of six years (2005 - 2009).