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Characterization of atmospheric data quality for an improved determination of Earth gravity fields

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Highly accurate satellite gravimetry requires a correct modelling of the atmospheric mass including its temporal and spatial variability as well its vertical structure. Basic atmospheric input parameters used during the GRACE data processing are taken from meteorological data sets such as ECMWF or NCEP products. They are spatially resolved and time-tagged maps of surface pressure, temperature profiles and specific humidity. These are state-of-the art assimilation results combining various measurements and simulations. They include their assumed uncertainties that have physical impact on the gravity field determination.

In order to understand the propagated gravity field uncertainties and to improve the gravity field determination, we studied and described the atmospheric error bars with respect to their spatial and temporal variations and their different behaviour such as: constant bias, harmonic time dependent bias and random errors. Then we combined these error characterizations with external a priori contributions, such as additional meteorological and physical information. Based on this modelling, we describe the different effects on the gravity field determination and the improvement potential.