

Analysis of regional variations in soil moisture by means of remote sensing, satellite gravimetry and hydrological modelling

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Abstract Regional and global variations in soil moisture are commonly assessed by remote sensing and/or hydrological models. Less attention has been paid to the associated large-scale mass changes detectable with satellite gravimetry. Here we analyse variations in soil moisture from remote sensing (satellite sensor AMSR-E) and hydrological modelling (WaterGAP Global Hydrology Model) with respect to mass changes in continental water storage from space gravimetry (satellite mission GRACE). The study is performed for a test area in Central Asia, where mass change in soil moisture is the dominant contributor to the total water storage (TWS). The different data sets are compared with respect to their spatio-temporal characteristics via principal component analyses. Results show high correlation in the annual cycles of all data sets. The high level agreement between the spatial patterns of TWS changes from GRACE and soil moisture variations from AMSR-E suggests an important potential of satellite gravimetry in studies related to regional variations in soil moisture.

Key words soil moisture; remote sensing; satellite gravimetry; principal component analysis; AMSR-E; GRACE; WGHM