Relating Satellite Gravimetry Data To Global Snow Water Equivalent Data

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In 04/2002, the gravimetric satellites GRACE were launched. They measure Earth's gravity via a precise microwave system. These satellites assess changes of Earth's mass. Main contributions of these changes originate from hydrological compartments as e.g. surface water, groundwater, soil moisture, or snow water equivalent (SWE). The benefit of GRACE data is to receive a direct measured signal. The data are not calibrated with other data (as e.g. done in models) or unusable due to particular Earth's surface conditions (e.g. AMSR-e for thick and wet snow surfaces). GRACE data show changes in total water storage (TWS) but cannot distinguish between different sources. Therefore, other data, models, and methods are necessary to extract the different compartments. Due to the spatial resolution of 200,000 km^2 and an accuracy of 2.5 cm w.e., mostly other global products are compared with GRACE. In this study, the hydrological model WGHM (TWS and SWE), the land surface model GLDAS (TWS and SWE), and the passive microwave sensor AMSR-E (SWE) are compared with the GRACE data. All data have to be pre-processed in the same way as the GRACE data to be comparable. A correlation analysis was performed between the different products assuming that changes in TWS can be linked to changes in SWE if either SWE is the dominant compartment of TWS or if SWE changes proportionally with TWS. To focus on the SWE product a second correlation was performed only for the winter season. Spatial extent was focused on the large permafrost areas in North America and Russia. By this method, those areas were detected in which GRACE data can be integrated for SWE data assessment to, for example, improve the models.