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Operational application of remotely sensed snow and soil moisture products in water balance models - potential, status, limitations and challenges

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Water balance models provide the spatial distribution of main hydrological state variables and their change with time. Precipitation, soil moisture, snow water equivalent and evapotranspiration are the most important of these. Conventionally, water balance models use GIS information as spatial data source. A digital terrain model and a land use map are key inputs. Both are already routinely obtained from EO data. Besides these two temporally almost static information layers, temporally highly dynamic variables, like the snow cover and the surface soil moisture distribution can be obtained from remote sensing data. Their operational application in water balance models is still in a developing phase, also since they can not simply be used as input into the models. Instead data assimilation procedures are required in order to adjust the water balance calculations in such a way that they provide snow or soil moisture distributions similar to the observed ones. Further, the retrieval of surface soil moisture information from remote sensing with high spatial resolution can presently only be obtained using C-band SAR data. Since C-band penetrates soil on the first few centimetres only, just the moisture of the land surface boundary layer can be assessed. This leads to the need for complex data assimilation strategies using a multi layer soil moisture model. This presentation will show application examples how soil moisture products can be provided operationally from SAR data. The potential and present status for the use of this information in water balance will be illustrated. The limitation of the remote sensed information, as well as the challenges for the future will be described. The operational application of remotely sensed snow information has already reached a higher level of development and acceptance. Examples will be shown how snow cover properties are routinely provided within the snow services of ESA's

GMES activity Polar View. Not only the snow cover, also the snow cover fraction, the snow line and the regions where the snow melts are observable using multisensoral data sources (optic and SAR) and provided as standardized products to a set of users. As for the soil moisture, data assimilation is still a challenge in order to provide maps of snow water equivalent that yet can not directly be derived from the remote sensing observations. An example of such an assimilation strategy will be demonstrated.