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Enhancement of the Automated Quality Control Procedures for the International Soil Moisture Network

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In-situ soil moisture observations are still trusted to be the most reliable data to validate remotely sensed soil moisture products. Thus, the quality of in-situ soil moisture observations is of high importance.

The International Soil Moisture Network (ISMN; http://ismn.geo.tuwien.ac.at/) provides in-situ soil moisture data from all around the world. The data is collected from individual networks and data providers, measured by different sensors in various depths. The data sets which are delivered in different units, time zones and data formats are then transformed into homogeneous data sets.

An erroneous behavior of soil moisture data is very difficult to detect, due to annual and daily changes and most significantly the high influence of precipitation and snow melting processes. Only few of the network providers have a quality assessment for their data sets. Therefore, advanced quality control procedures have been developed for the ISMN (Dorigo et al. 2013). Three categories of quality checks were introduced: exceeding boundary values, geophysical consistency checks and a spectrum based approach. The spectrum based quality control algorithms aim to detect erroneous measurements which occur within plausible geophysical ranges, e.g. a sudden drop in soil moisture caused by a sensor malfunction. By defining several conditions which have to be met by the original soil moisture time series and their first and second derivative, such error types can be detected. Since the development of these sophisticated methods many more data providers shared their data with the ISMN and new types of erroneous measurements were identified. Thus, an enhancement of the automated quality control procedures became necessary.

In the present work, we introduce enhancements of the existing quality control algorithms. Additionally, six completely new quality checks have been developed, e.g. detection of suspicious values before or after NAN-values, constant values and values that lie in a spectrum where a high majority of values before and after is flagged and therefore a sensor malfunction is certain.

For the evaluation of the enhanced automated quality control system many test data sets were chosen, and manually validated to be compared to the existing quality control procedures and the new algorithms. Improvements will be shown that assure an appropriate assessment of the ISMN data sets, which are used for validations of soil moisture data retrieved by satellite data and are the foundation many other scientific publications.