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Incorporating Quality Control Information in the Sensor Web

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The rapid development of sensing technologies had led to the creation of large amounts of heterogeneous environmental observations. The Sensor Web provides a wider access to sensors and observations via common protocols and specifications. Observations typically go through several levels of quality control, and aggregation before they are made available to end-users. Raw data are usually inspected, and related quality flags are assigned. Data are gap-filled, and errors are removed. New data series may also be derived from one or more corrected data sets. Until now, it is unclear how these kinds of information can be captured in the Sensor Web Enablement (SWE) framework. Apart from the quality measures (e.g., accuracy, precision, tolerance, or confidence), the levels of observational series, the changes applied, and the methods involved must be specified. It is important that this kind of quality control information is well described and communicated to end-users to allow for a better usage and interpretation of data products.

In this paper, we describe how quality control information can be incorporated into the SWE framework. Concerning this, first, we introduce the TERENO (TERrestrial ENvironmental Observatories), an initiative funded by the large research infrastructure program of the Helmholtz Association in Germany. The main goal of the initiative is to facilitate the study of long-term effects of climate and land use changes. The TERENO Online Data RepOsitORry (TEODOOR) is a software infrastructure that supports acquisition, provision, and management of observations within TERENO via SWE specifications and several other OGC web services. Next, we specify changes made to the existing observational data model to incorporate quality control information. Here, we describe the underlying TERENO data policy in terms of provision and maintenance issues. We present data levels, and their implementation within TEODOOR. The data levels are adapted from those used by other similar systems such as CUAHSI, EarthScope and WMO. Finally, we outline recommendations for future work.