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Quality surveillance of hydrological data by an online monitoring system

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The automatic monitoring and sustainable protection of important hydrological data is based on an online monitoring system. Therefore measured values which were transmitted by LEO satellites are stored in a data base. Hence this juncture, users can demand the data in terms of tables or graphics. It is possible to observe the course of all transmitted parameters and to get important statistical values over a selected space of time immediately. Registered users can download the data in a "doc" or "xls" format. A special feature of early warning systems is that if values get out of range the system gives an alarm and is able to send messages via Email or SMS to specific users or a local service team which can verify the data. The online monitoring system works automated, maintenance of the measuring site is economized more and more. As the whole system works in "near real-time", short response times are possible, the quality of time series is improved and the risk of data gaps is reduced.

Backbone of the system is a near real-time bidirectional satellite communication by means of satellites in the low earth orbit. From a measuring station periodical measurements, e.g. of gauge height, conductivity or temperature, are transmitted to a Central Monitoring Station (CMS). The great advantages are the flexible network setup so that new measuring stations are quickly integrated, no necessity of terrestrial infrastructure and the possible remote configuration of the stations. For data transmission we use the Orbcomm satellite communication system which is a low cost system for short messages, between six bytes and several kilobytes. For transferring greater messages other systems like Iridium and Globalstar can be used and are implemented for

our investigations.

At the moment we pursue two different methods to check the data quality of the remote measuring stations. The first one check the quality of water level measurements and the second one the quality of conductivity measurements.

Control values for the water level are created with the help of a camera. This camera takes pictures of a staff gauge and an image editing software generates a value for the gauge height. This value together with the measured value from the pressure probe are transmitted to the CMS and stored in a database for the online monitoring system. Now the two values are available for automated comparison and alarm messages are generated in case of deviations. Also the pictures taken by the camera are available to check the quality of the control measurements.

A big problem in context with conductivity measurements is that the sensors are sensitive against contamination and sinter. By the means of a purpose-built measuring system and algorithm simultaneously to the conductivity also the situation of current and voltage at a four electrode conductivity cell is recorded. From this, after an appropriate measurement processing, a new quality parameter is generated and enables us to evaluate the situation of contamination at the electrodes. The thresholds of this new quality parameter for accurate conductivity measurements are also known.