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A combined QC methodology in Ebro Delta HF radar system: real time web monitoring of diagnostic parameters and offline validation of current data

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Over recent years, special attention has been focused on the development of protocols for near real-time quality control (QC) of HF radar derived current measurements. However, no agreement has been worldwide achieved to date to establish a standardized QC methodology, although a number of valuable international initiatives have been launched.

In this context, Puertos del Estado (PdE) aims to implement a fully operational HF radar network with four different Codar SeaSonde HF radar systems by means of:
- The development of a best-practices robust protocol for data processing and QC procedures to routinely monitor sites performance under a wide variety of ocean conditions.
- The execution of validation works with in-situ observations to assess the accuracy of HF radar-derived current measurements.

The main goal of the present work is to show this combined methodology for the specific case of Ebro HF radar (although easily expandable to the rest of PdE radar systems), deployed to manage Ebro River deltaic area and promote the conservation of an important aquatic ecosystem exposed to a severe erosion and reshape.

To this aim, a web interface has been developed to efficiently monitor in real time the evolution of several diagnostic parameters provided by the manufacturer (CODAR) and used as indicators of HF radar system health. This web, updated automatically every hour, examines sites performance on different time basis in terms of:
- Hardware parameters: power and temperature.
- Radial parameters, among others: Signal-to-Noise Ratio (SNR), number of radial vectors provided by time step, maximum radial range and bearing.
- Total uncertainty metrics provided by CODAR: zonal and meridional standard deviations and covariance between both components.
- Additionally, a widget embedded in the web interface executes queries against PdE database, providing the chance to compare current time series observed by Tarragona buoy (located within Ebro HF radar spatial domain) and those measured by the closest radar grid point.

A thorough analysis of the temporal evolution of the aforementioned parameters allows to define the standard thresholds for each site within which they are considered to be running optimally. In contrast, a site performance could be categorized as sub-optimal if an erratic and/or anomalous behavior is persistently detected in radial parameters values, related to a significant discrepancy from the mean and clearly outside the limits defined by the associated standard deviations. Consequently, a three colored-based alert system is activated according to each site′s current status: green (OK), yellow (acceptable, but issue detected) and red (KO).

Since this approach is constrained by the fact that it can not state the intrinsic quality of surface current data, a complementary validation analysis is required: HF radar-derived radial and total vectors are compared with observations from a current meter installed in Tarragona buoy. This validation, conducted for the entire 2014, aims to complete the proposed methodology through the exploration of the existence of bearing errors and the evaluation of intrinsic uncertainties related to HF radar technology by means of objective quality indicators.