Practical aspects and data analysis of 2 years-long water quality and current monitoring in an estuary

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The Simpatico system is an autonomous environmental monitoring module operating continuously since March 2008 at the Guadiana Estuary (southern Portugal-Spain border). The health of this estuary is compromised due to the recent (February 2002) closure of the Alqueva dam on the Guadiana River with subsequent water flow reduction. The Simpatico system includes a surface floating buoy equipped with batteries loaded by solar panels, a data logger and a multi-parameter probe (YSI V6200-4) that measures temperature and conductivity (hence salinity), dissolved oxygen, turbidity, chlorophyll and pH. In addition, an Acoustic Doppler current Profiler (ADP, Sontek Argonaut XR 750KHz) is bottom-mounted nearby the buoy, providing current velocities along the water column and pressure. Recorded data are automatically uploaded to a central server through cellular communication and exported on a daily basis to a web database. Although still relatively rare, the deployment of autonomous systems for long-term environmental monitoring in estuaries is bound to increase, in relation with the implementation of tight legislations (e.g. EU Directives) and increasing awareness towards nature preservation. Practical aspects and example of the results of such system are discussed in this contribution, based on the 2 years-long experience gained with the Simpatico at the Guadiana Estuary. The requirements for system maintenance are detailed and discussed, together with their associated costs. Special attention is given to the biofouling issue and how it affects the data. An overview of the 2 years-long records is provided with examples of causes for erroneous and missing data. Then, a preliminary analysis of the dataset is presented. The measured parameters are cross-correlated and analyzed at various frequencies (from intra-tidal to seasonal). The results are discussed in term of natural variability and anthropogenic disturbance related mainly to changes in the estuarine hydrodynamics induced by the Alqueva dam.