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Analysis of water quality time series for improving the measurement strategy in the Brantas basin, Indonesia

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Water quality in the rivers and tributaries of the Brantas catchment (about 12.000 km²; East Java, Indonesia), which is deteriorating due to various reasons, is measured by different agencies involved in water resource development and management. We discuss how different time series of water quality data from three local agencies in the Brantas basin (differing in specific parameters and measurement frequency) have been used to provide recommendations on the improvement of (using) the different measurement strategies (in policy recommendations). In general, monthly to quarterly data were available from 2009 until 2019 at 104 locations. Data were analyzed with Principal Component Analysis (PCA) to show which parameters vary significantly across the catchment. Preliminary results suggested how parameters were related, based on series of box plots of the PCA scores. This provided insights on the first order processes that control the physical-chemical status of the Brantas River, of each agency and for all the data sets combined. Applying Python and QGIS to separate the parameters and map the hot spots in terms of eigen functions allowed relating water levels with hot spots to estimate the fluctuations in the concentrations of different parameters in time and space. These data elaborations allow improving the different measurement campaigns, and to address specific policy questions related to water quality monitoring more efficiently.