An approach to high frequency monitoring of lakes: the SAILING and PITAGORA projects

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Recent developments in sensor technology allow high-resolution monitoring of lakes and reservoirs from sensor based systems such as buoys and platforms. The data collected by these systems may be provided to end-users by web-based technology and in this way be readily available for both advanced users (e.g. researchers) and citizens. With respect to traditional monitoring, based on discrete samples, high frequency data may resolve diel or short-term events and detect horizontal and vertical patterns in large deep lakes. Starting in 2014, we assembled a multi-parameter measuring system, adaptable to specific needs and implementable with different type of sensors. This system was initially tested on a sailing boat, in the framework of the SAILING project (Sensor-based Assessment on In Lake processes and water quality - Scientific INvestigation and Growing environmental awareness): two monitoring campaigns were performed, on Lake Maggiore (during 2014) and Orta (during 2015), with the aim of measuring basic limnological parameters (water temperature, pH, conductivity, dissolved oxygen) in surface water with high temporal and spatial frequency. Successively, through the PITAGORA project (Platform of interoperable technology for the acquisition, management and organization of environmental data), a similar measuring system was installed on a couple of buoys, deployed in both the two lakes. In this paper we describe the approach we used in the development of these sensor based systems and present some preliminary results obtained from the analysis of high frequency data. Results highlight the usefulness of these data in detecting processes that occur on very short time scales, such as those driven by rapid changes in meteorological condition. These activities have been performed in the framework of the EU COST Action NETLAKE (Networking Lake Observatories in Europe), aiming to build a network of sites and individuals to support the development and deployment of sensor-based systems in lakes and reservoirs.