

## **HYDRAC, a novel hydroacoustic inversion software for Suspended Particulate Matter measurements**

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Among the great challenges in operational flow monitoring, Suspended Particle Matter (SPM) measurements are of primary importance because they address several fundamental environmental, industrial and social issues related to the monitoring and prediction of extreme climatic events and their impact on fluvial, estuarine and coastal nearshore morphodynamics. Access to reliable SPM measurements is essential for the identification of physical processes controlling SPM dynamics and the impacts of SPM on the environment. Among various existing measurement techniques, hydroacoustic methods have the advantage of providing non-intrusive measurements, with high spatial and temporal resolutions. However, the science of hydro-acoustical SPM measurement (concentration, sizes and fluxes) still remains at low Technological Readiness Level (TRL 3) in spite of the significant progress made over the past decades in operational monitoring of flow current, discharge and bathymetry (TRL >6). This situation arises from the inherent complexity of the SPM measurement principle, requiring scientific knowledge and methodological expertise. Here, we present the hydroacoustic inversion tool **HYDRAC**. This versatile open-source software, developed in Python 3, offers the capability to read hydroacoustic data from widely-used instruments (eg. ABS, ADCP,...) and perform acoustic inversions following several advanced methods found in the literature to estimate the SPM mass concentration and particle size characteristics. This software, designed for long-term community-based developments, includes a specific module for modelling the SPM scattering properties, from organic to mineral particles. The originality of this tool lies in its high technological readiness level (TRL 5), towards the emergence of a performant SPM technology for operational use.