



## **River discharge monitoring with multi-mission satellite sensor**

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River discharge is one of the fundamental components of the water cycle and it is the key variable for many scientific and operational applications related to water resources management, flood risk mitigation and climate studies. The monitoring of river discharge suffers of different problems especially linked to the collection, archiving and distribution of data at global scale operated with the ground network. This issue affects the knowledge of surface freshwater and its implication in the hydrological processes.

With the increasing of number and potentiality of the satellite sensors, new sources of data are available for monitoring river discharge contributing to provide or to improve the in-situ information related to river discharge. The integration of satellite and in situ data is the only solution for the still open issue regarding the monitoring of freshwater.

Among the satellite sensors, radar altimeters and optical sensors have the capability to estimate indirectly river discharge with high accuracy. The recent advances in radar altimetry technology offers important information for the monitoring of river water level that can be related to river discharge through specific relationships, called rating curve. The limitation due to the spatial and temporal resolution of this kind of sensor can be overcome by multi-mission approaches, i.e. interpolating different altimetry river crossings. Alternatively, the recent advantages obtained by optical sensors, have demonstrated high potential to evaluate the river discharge variations, thanks to their frequent revisit time and large spatial coverage. Attempts to merge the information from both the sensors, optical and altimeter, have been also investigated to improve the evaluation of river discharge, by using physical approach and machine learning approach (i.e. artificial neural network).

In this study, we illustrate the capabilities of different satellite sensors to provide useful estimates of river discharge. We focus on the optical (Near InfraRed) and altimetry to estimate river discharge variation in Nigeria and Italy.

The results confirm the capability of the integration of different satellite sensors to provide useful estimates of the river discharge and encourage the use of all Sentinel-3 sensors in synergy, with the advantage that they are collocated on the same platform.