

Application of Remote Sensing and In-Situ Measurements for Discharge Monitoring in Large Rivers: Case of Pool Malebo in the Congo River Basin

Authors : Kechnit Djamel, Ammarri Abdelhadi, Raphael Tshimang, Mark Trrig

Abstract : One of the most important aspects of monitoring rivers is navigation. The variation of discharge in the river generally produces a change in available draft for a vessel, particularly in the low flow season, which can impact the navigable water path, especially when the water depth is less than the normal one, which allows safe navigation for boats. The water depth is related to the bathymetry of the channel as well as the discharge. For a seasonal update of the navigation maps, a daily discharge value is required. Many novel approaches based on earth observation and remote sensing have been investigated for large rivers. However, it should be noted that most of these approaches are not currently able to directly estimate river discharge. This paper discusses the application of remote sensing tools using the analysis of the reflectance value of MODIS imagery and is combined with field measurements for the estimation of discharge. This approach is applied in the lower reach of the Congo River (Pool Malebo) for the period between 2019 and 2021. The correlation obtained between the observed discharge observed in the gauging station and the reflectance ratio time series is 0.81. In this context, a Discharge Reflectance Model (DRM) was developed to express discharge as a function of reflectance. This model introduces a non-contact method that allows discharge monitoring using earth observation. DRM was validated by field measurements using ADCP, in different sections on the Pool Malebo, over two different periods (dry and wet seasons), as well as by the observed discharge in the gauging station. The observed error between the estimated and measured discharge values ranges from 1 to 8% for the ADCP and from (1% to 11%) for the gauging station. The study of the uncertainties will give us the possibility to judge the robustness of the DRM.

Keywords : discharge monitoring, navigation, MODIS, empiric, ADCP, Congo River

Conference Title : ICGHHE 2023 : International Conference on Geotechnics, Hydrology and Hydraulic Engineering

Conference Location : Athens, Greece

Conference Dates : April 03-04, 2023