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In-Situ Validation of Water Quality Algorithms and Monitoring of Irish Lakes using Sentinel 2 Imagery

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Through Remote Sensing of Irish Surface Water (INFER) project, we are validating the algorithms to measure the water quality using Sentinel 2 imagery, which comprises of two European Space Agency (ESA) terrestrial satellites with combined temporal resolution of 5 days. The project is focused on selection of optimal algorithms that will be applicable in Irish context in relation to the high cloud cover and relatively small sizes of the water bodies. The current procedure entails collection of reflectance data from the lakes during the Sentinel overpass as it helps to identify the correct atmospheric correction algorithm. Field radiometry tasks were carried out using TRIOS RAMSES radiometers. Standard field procedures were employed for acquiring glint free reflectance from the water bodies.

Historical data collected from the 11 lakes, which had field bathymetry survey data, were analysed in order to determine the influence of environmental conditions on the quality of samples. Based on the analysis, recommendations to collect field samples from areas deeper than 10 m and 30 m away from the shoreline were provided in order to avoid the reflectance from the bottom and the surrounding topography. A site selection process was undertaken during the spring of 2019 to shortlist appropriate sites for field validation of satellite-derived products. A total of fifteen lakes were identified for field validation based on several criteria so as to ensure lakes with varying size, depth, trophic status and Water Framework Directive (WFD) status . In addition, a timetable for proposed sampling was established by drawing up a timetable of satellite passes starting from summer of 2019. C2RCC and Acolite processors are being used to compute the chlorophyll and turbidity from identified lakes. Considering the fast changing weather condition of Ireland, it was difficult to obtain the exact overlap between the sentinel overpass and the field sampling. In order to address this issue, the field samples collected within 10 days from the sensor overpass were considered for the field validation. Study of the satellite derived water chemistry data showed that the data collected outside of that time window may not represent the natural fluctuation that occurs in the water bodies.

The end product of this project is the web platform with the access to Sentinel 2 MSI data products where users can visualize the water quality products for Ireland. This platform will promote the

use of earth observation data for inland water quality monitoring and would enable sustainable utilization of the water resources.