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### **In situ to in orbit: Optical properties of Swiss lakes**

**Abstract:** The maturing of optical satellite Earth observation technologies is closely linked to the development of field spectroradiometers that measure comparable parameters in situ. For surface water applications, the most comprehensive reference datasets are acquired by above-surface spectroradiometers mounted on jetties or buoys. These datasets consist of accurate reflectance measurements, which are used for satellite sensor vicarious calibration by all major space agencies. The Thetis profiler next to the LÉXPLORE platform in Lake Geneva is currently limited to below-surface reflectance measurements, but it simultaneously acquires absorption and scattering properties. This provides an unprecedented basis for the interpretation of reflectances, including vertical gradients of several bio-physical indicators at sub-diel scale. It furthermore allows for an optical closure via radiative transfer simulations, and hence a detailed description of reflectance measurement uncertainties. In this manner, we can optimize the measurements' comparability with daily observations by the Sentinel-3 satellites, and thereby mitigate the technical limitations of below-surface measurements. Based on Thetis measurements as well as longer but less comparable water quality monitoring time series, we currently develop daily primary productivity estimates for Switzerland's largest 20 lakes. The productivity estimated by a bio-optical model, and the underlying chlorophyll-a and Secchi depth estimates from 300 m resolution Sentinel-3 data are made available in [www.datalakes-eawag.ch](http://www.datalakes-eawag.ch), within a few hours after acquisition.

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