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A Global Observatory of Lake Water Quality

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Our planet's surface waters are a fundamental resource encompassing a broad range of ecosystems that are core to global biogeochemical cycling, biodiversity and food and energy security. Despite this, these same waters are impacted by multiple natural and anthropogenic pressures and drivers of environmental change. The complex interaction between physical, chemical and biological processes in surface waters poses significant challenges for in situ monitoring and assessment and this often limits our ability to adequately capture the dynamics of aquatic systems and our understanding of their status, functioning and response to pressures.

Recent developments in the availability of satellite platforms for Earth observation (including ESA's Copernicus Programme) offers an unprecedented opportunity to deliver measures of water quality at a global scale. The UK NERC-funded GloboLakes project is a five-year research programme investigating the state of lakes and their response to climatic and other environmental drivers of change through the realization of a near-real time satellite based observatory (Sentinel-3) and archive data processing (MERIS, SeaWiFS) to produce a ∼20-year time-series of observed ecological parameters and lake temperature for more than 1000 lakes globally.

However, the diverse and complex optical properties of lakes mean that algorithm performance often varies markedly between different water types. The GloboLakes project is overcoming this challenge by developing a processing chain whereby algorithms are dynamically selected according to the optical properties of the lake under observation. The development and validation of the GloboLakes processing chain has been supported by access to extensive in situ data from more than thirty partners around the world that are now held in the LIMNADES community-owned data repository developed under the auspices of GloboLakes. This approach has resulted in a step-change in our ability to produce regional and global water quality products for optically-complex waters complete with greatly improved uncertainty estimates. The value of these data and the future scientific opportunities they provide will be illustrated with examples of how it can be used to improve our understanding of the impact of global environmental change on inland, transitional and near-shore coastal waters.