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Global remotely sensed phenology of Blue-Green Ecosystems

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Changing environmental conditions have significantly altered the phenology, spatial distribution, and abundances of species in terrestrial and freshwater ecosystems. Recent work has shown that such changes may alter the strengths of interactions between species and may jumble structural patterns in networks of trophic, mutualistic and/or other interactions that are crucial for biodiversity. 'Blue' (aquatic) and 'green' (terrestrial) ecosystems are closely interlinked through biogeochemical cycles and species that inhabit both ecosystems. When the effects of abiotic drivers of global environmental change, such as a change in temperature, precipitation, or land use, are different for lakes and their surrounding watersheds, a blue-green phenological mismatch may therefore occur. In particular, because such changes in seasonal patterns may cascade down food webs.
Remote sensing provides spatially and temporally dense information on biochemical properties of the Earth surface, including biomass and primary production indicators for both aquatic and terrestrial ecosystems. Deriving phenology metrics for these indicators is routine practice for terrestrial vegetation, and several case studies demonstrate the feasibility of analogous metrics for lakes and inland seas. In this study, we used remote sensing data to extract phenology metrics (e.g. start of the growing season) for 4264 lakes distributed across a wide range of biomes from daily chlorophyll estimates and vegetation indices spanning a time-period of 15-20 years. We investigate whether changes in the phenology of lake phytoplankton and the surrounding terrestrial vegetation have occurred during this period, and how the phenology in either ecosystem type is synchronized.
Analysis are underway, but preliminary results suggest contrasting results across different biomes as well as substantial differences in the way in which the phenology of primary producers in lakes and on their surrounding watersheds has changed within these biomes.