**Improving Long-term Records of High-Resolution Satellite-derived Lake Surface Temperature for Global and Regional Climate Studies**

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Competition: CPO- Ocean Observing and Monitoring Program (OOM)

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**Abstract (not to exceed one page)**

Lakes are a critical component of the earth system and are known as “sentinels” of climate change. Lake surface water temperature (LSWT) is an important parameter for quantifying and modeling regional responses to climate change and LSWT has been shown to have impacts on regional climate. However, considerable uncertainty in the trends calculated from existing satellite-derived LSWT exists, and global climate models do not resolve many lakes and/or do not use appropriate surface temperature forcing data sets to prescribe LSWT in retrospective climate simulations. The proposed work will utilize satellite-derived lake temperature datasets from two state-of-the-art global climate SST products (NOAA Pathfinder V5.3 and NASA MODIS LST V) to produce new quality-controlled LSWT climatological and trend data sets with uncertainty estimates for use by global climate change modeling and observational studies.

The summary of the work to be completed is threefold:

1. Produce a new, improved global lake temperature mean climatology data set as well as a long time series trend dataset for hundreds of lakes for use in climate change observational and numerical modeling studies derived from the NOAA Pathfinder V5.3 and NASA MODIS LST data sets, with a focus on both cold-season (when clouds limit number of available observations) and smaller lakes (5-30 km in diameter), as these products are currently unavailable.
2. Determine the ability of satellite-derived lake temperature datasets to evaluate global trends in lake surface temperature between 1985-2014. Rigorous *in situ* validation of satellite retrievals will be conducted for numerous lakes over long periods of record, which has not been previously conducted.
3. Apply improved cloud masking and other statistical quality-control algorithms to produce an improved lake temperature time series, and quantify the potential impact of errors and uncertainties associated with cloud contamination and temporal gaps (long cloudy periods) on satellite-derived lake temperature trends.

The proposed research targets the following areas in the Ocean Observing and Monitoring FY18 program call for proposals: *(1) Development of data sets for the climate research community and (2) Projects that develop or improve datasets suitable for periodically updated assessments or monitoring products for weather and climate extremes and impacts on water resources.* This work will provide the basis for improving existing as well as providing new climate data for satellite-derived LSWT data sets, and will produce targeted research results that will improve uncertainty in the error characteristics of satellite-derived LSWT retrievals for use in long-term monitoring and climate modeling. In terms of NOAA’s long term climate goals, this proposal will advance climate intelligence and resilience through providing a data set useful for addressing (1) weather and climate extremes, (2) Climate impacts on water resources, and the (3) sustainability of marine ecosystems.