

**New high resolution combined analysis of historical sea surface temperatures  
and sea ice concentrations**

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We present an enhanced data set of historical surface temperatures (SST) and sea ice concentrations (SIC). The technique of reduced space optimal estimation was modified to produce a globally complete high resolution (1x1 degree for the world ocean) objective analysis of monthly surface temperatures and sea ice concentrations with verifiable uncertainty estimates. Covariance matrix is modeled as a sum of two pieces: low-rank large-scale part and a small-scale localized covariance correction. Long-term variability is separated by an iterative procedure. We use multivariate (SIC and SST) reduced space optimal estimation for analyzing sea ice concentrations.