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# Sea surface temperature: The role of small-scale and short-term variability in the error of gridded observations

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Optimal analyses of climate fields require a priori error estimates for the input data. To be truly optimal, high-resolution gridded analyses of sea surface temperature (SST) that blend together various kinds of satellite and in situ data have to specify for all input data sets their error variances and, ideally, covariances. Satellite observations of physical fields represent averages over the satellite sensor's footprint, which might be smaller or larger than the size of the analysis grid box. The difference between the true gridded values, i.e. grid box averages, and individual observations is thus affected by physical variability on the scales between the observational footprint and the grid size. Short-term temporal variability within the averaging limits of the spatiotemporal grid box creates similar problems. In situ SST data may enter analysis procedures either individually, as zero footprint observations, or as averages over some space-time bins ("superobservations"). Their error is due to both the incomplete sampling of the bin volume and a measurement error of individual data reports. This approach to observational error modeling in gridded data sets of in situ and satellite observations was tested here. Pathfinder v.5 AVHRR SST data set was used to produce maps of spatial and temporal variability of SST within monthly bins of one and five degree sizes. These maps, together with the data on the number of available observations, were used to produce theoretical error estimates for data sets of gridded observations and to predict the magnitude of the differences between them. Comparisons of such predictions with standard deviations of the actual differences between data sets showed a good skill of the proposed model.