Combined estimates of uncertainties in gridded marine temperature fields due to measurement errors and under-sampling of variability

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Gridded marine temperature fields based mostly on the I-COADS data base have been created for 1851-2002. Inevitably, these measurements do not sample the full range of variability within each grid box, as they are taken at set times of day from moving platforms. Compounded into this uncertainty is a small contribution from random measurement errors. Sampling/measurement errors are found to be independent between grid boxes and are quantified by fitting certain relationships to high-pass filtered data binned by number of constituent observations. The fit in the limit of an infinite number of observations determines the true variance and allows the spurious variance to be estimated. Once the error in using only one observation in a grid box has been quantified, this can be translated into the uncertainty in the actual monthly value using the number of independent observations in the box.