Supporting Information for “Random Error in Space-Time Bin Averages of Sea Surface Temperature Observations from Ships”

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Figure S1

Introduction

Figure S1(a) indicates $1^\circ \times 1^\circ$ areas, where some ICOADS R3.0 ship SST observations in the 1992-2010 period do not have corresponding CCI SST Analysis matchups, by showing percentages of such observations in those areas. This can only happen, when locations of these observations were outside of the CCI Analysis domain. Only $1^\circ \times 1^\circ$ boxes with positive percentages are shown in Figure S1(a). Figure S1(b) shows the percentages of $1^\circ \times 1^\circ$ areas that are not included into the CCI analysis domain. The $1^\circ \times 1^\circ$ boxes where these percentages are equal 0% or 100% are not shown. The values in panel (b) are

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generally larger than those in panel (a), as the former include land (or ice) areas within
1°×1° grid, where no SST observations are available.
(a) Percentage of the ICOADS ship SST observations lacking a corresponding CCI SST Analysis match-up

(b) Percentage of 0.05° × 0.05° grid points not included in the CCI SST Analysis domain
Figure S1. Ship SST observations from ICOADS R3.0 and ocean areas not included into the CCI SST Analysis domain: (a) percentage of ICOADS SST observations that are outside of the CCI SST Analysis domain; (b) percentage of 0.05°×0.05° grid points that are not included in the CCI SST Analysis domain. In both panels, the percentages are shown for the 1992-2010 totals in the spatial 1°×1° grid boxes. Only 1°×1° grid boxes with positive percentages are shown in panel (a), and only 1°×1° grid boxes with percentages that are not equal to 0% or 100% are shown in panel (b).
Figure S2. Correction factor $C(\phi)$ for the unbiased SD estimation, presented as a function of the number of degree of freedom (DOF) $\phi$, available for the SD estimation.
(a) Relative frequency of $N \geq 1$ values

(b) Relative frequency of $N-M \geq 1$ values
Figure S3. Relative frequency histograms of temporal degree of freedom (DOF) numbers (a) $N$ and (b) $N-M$, available in the 1992–2010 period for the $1^\circ \times 1^\circ$ grid boxes used in this study. The histogram in each panel uses bins of unit width and counts only those grid boxes, where the corresponding DOF number is no less than one. DOF number ranges are 1-228 and 1-216 in panels (a) and (b), respectively.
Figure S4. Relative frequency histograms of seasonally-dependent total DOFs $\Phi(m)$, where $m$ is a climatological month. The histogram in each panel uses bins of unit width in $\log_2 \Phi$ and counts only those grid boxes, where the corresponding temporal DOF number is no less than one.
**Figure S5.** The relative frequency histograms for $\Phi$ values presented in the bins of the width 1 along the axis of $\log_2 \Phi$ values.