Abstract View

Volume 14, Issue 2 (February 1984)

Journal of Physical Oceanography
Article: pp. 318–337 | Abstract | PDF (1.68M)

Design Studies for Climatological Measurements of Heat Storage

Francis P. Bretherton and Michael J. Mcphaden

National Center for Atmospheric Research, Boulder, CO 80307

Eric B. Kraus

Cooperative Institute for Research in Environmental Studies, University of Colorado, Boulder, CO 80309

(Manuscript received June 9, 1982, in final form October 5, 1983)

DOI: 10.1175/1520-0485(1984)014<0318:DSFCMO>2.0.CO;2

ABSTRACT

Objective analysis of large-scale simulated anomalies is used to estimate statistically the effectiveness of different sampling arrays. The methodology, which includes a new use of Bayesian inference, is of fairly general applicability, but is illustrated by a specific requirement to measure five-year changes in the North Atlantic to an accuracy equivalent to ±10 W m^{-2}. The numerical procedure require 1) specification of an overall measure of accuracy on an appropriate resolution, 2) a reference field approximating the long-term mean, 3) an assumed ensemble of large-scale anomalies, 4) the distribution of mesoscale eddy noise as derived from previous analyses of historical data and 5) a set of ship tracks and a sampling, in space and time along them. The numerical output is the expected accuracy and other diagnostic information.

The ship tracks and sampling are varied by trial and error until the expected accuracy is within requirements in an economical manner. The study indicates that the optimized sampling scheme is sensitive primarily to the specification of the overall accuracy requirements including both the resolution and the level of uncertainty. It is less sensitive to the distribution of mesoscale eddy noise and relatively insensitive to plausible changes in the reference field or in the assumptions about the ensemble of large-scale anomalies.