



## Abstract View

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## Systematic Design of Observational Arrays

**Peter C. McIntosh**

*Institute of Ocean Sciences, Sidney, British Columbia, V8L 4B2 Canada*

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### ABSTRACT

The variational data assimilation method of Bennett and McIntosh permits an assessment of the information content of observational arrays. This method relies on an approximate knowledge of the (linear) dynamics of the system, and on the instrument location, so that the efficiency arrays may be ascertained before deployment. The cumbersome trial-and-error optimization of array configuration may be circumvented by a careful study of the physics underlying the data assimilation procedure. As an example, array design criteria are developed for observing barotropic tides using tide gauges. In an open-ended channel, the variational method endeavors to synthesize the free modes of an infinite channel. Instruments should be located to facilitate the resolution of these modes. In a channel that is too small to support propagating Poincaré waves, tide gauges are best deployed along open sea boundaries where the amplitude of exponentially decaying Poincaré waves is largest. The maximum number of instruments contributing independent information depends both on the accuracy of the numerical modeling involved and on the data accuracy. Hence the desired numerical resolution may be used to determine the optimum number of measurements (for a given instrument uncertainty), or vice versa.

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DC Office: 1120 G Street, NW, Suite 800 Washington DC, 20005-3826  
[amsinfo@ametsoc.org](mailto:amsinfo@ametsoc.org) Phone: 617-227-2425 Fax: 617-742-8718  
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