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Use of Analytical Modeling and Limited Data for Prediction of Mesoscale Eddy Properties

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ABSTRACT

The use of analytical modeling in the study of oceanic eddies is considered. Limited observational data, in combination with eddy models, are used to obtain analytical approximations to environmental effects (including current and temperature perturbations) throughout the eddy. Techniques which efficiently use discrete measurements are presented for accurate specification of any given analytical model, containing an arbitrary number of parameters, to an observed eddy. Questions of unique parameter specification and data sufficiency are considered for various data types and amounts, using a previously derived eddy model. Examples with bathythermograph data are presented in which eddy size, strength and center position are to be determined. AXBT data are emphasized, and an investigation is made of the influence of the number of such instruments on the accuracy of parameter estimates. It is then shown how data obtained from oceanographic moorings might be utilized to specify eddy drift speed and direction. In both the bathythermograph and mooring examples, it is demonstrated that even when the type of data available leads to non-unique parameter specification, significant information can be obtained about the observed eddy. Results in this paper suggest possible efficiencies in data utilization and in the design of subsequent experiments.

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