Hierarchical Bayesian Ocean Models

Hierarchical Bayesian models (HBM) allow for the representation of complex systems in a layered fashion. We start by considering a model to link the observed quantities to unobserved, underlying processes. The next step is to describe the evolution of such processes in space and time. The third is to input information about the parameters that regulate the evolution of the processes. Within the model fitting process, estimation uncertainty is propagated at all levels of the hierarchy. In this talk we will give a review of the use of process convolutions as a general tool to obtain flexible, non-stationary processes in space for environmental data. We will then focus on applications of HBM that use process convolutions for oceanic data. We will consider applications to the estimation of ocean climatologies and detection of long-term trends as well as the problem of merging information from different data sources at different spatial resolutions.