Ocean Modeling Based on Low-Dimensional Concepts BATTAL-GAZI YILDIRIM, Brown University, CHRYSSOSTOMOS CHRYSSOSTOMIDIS, Massachusetts Institute of Technology, GEORGE KARNIADAKIS, Brown University/Massachusetts Institute of Technology — Proper Orthogonal Decomposition (POD) was applied to the outputs of three different regional ocean models (HOPS, ROMS and FVCOM) for Massachusetts Bay, New Jersey coast, and gulf of Maine, respectively, for both short (several days) and medium range (several months) simulations. The POD energy spectra showed that the simulated dynamics of all regional ocean models is (very) low-dimensional. Furthermore, the optimal sensor placement in the ocean was investigated within the framework of Gappy POD; it was found that the extrema of spatial POD modes are best sensor locations. With this knowledge, the ocean's properties based on the POD modes with few measurements was reconstructed with an error of about 1% for a 3-day forecast and an error of about 10% for a 47-day forecast. Finally, it was shown that the larger magnitude of POD modes and large uncertainty values are related.

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