Exploring a Convolution-Based Self Attraction and Loading Technique for the Ocean Model MOM6

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Abstract

Self Attraction and Loading (SAL) is an important term in ocean models. The importance can be most clearly seen in the impact on tides, where failure to include SAL results in significant amplitude and phase errors. Traditionally, SAL has been computed using either a scalar approximation or a spherical harmonic transform, but both of these approaches have significant drawbacks. In this work, we discuss an alternative approach based on a spherical convolution, which is further accelerated with a tree code. To test this approach, we implement this computation in MOM6, the Modular Ocean Model, developed by NOAA's Geophysical Fluid Dynamics Laboratory, and the ocean component in various weather and climate models. We demonstrate improved accuracy in tidal simulations, and also present some results for regional ocean modeling.

Keywords: Ocean models, tides, self attraction and loading

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