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Poster
A frequency–wavenumber tidal analysis for deriving internal-tide harmonic constants from TOPEX/Poseidon (T/P) measurements of sea-surface height (SSH) has been developed, taking advantage of the evident temporal and spatial coherence and the weak dissipation of internal tides. The approach is a close cousin to Fourier series or objective mapping methods for fitting and interpolating data, but employing basis functions of traveling waves. Previous analyses consisted of simple tidal analysis at individual points, with resulting harmonic constants that were inconsistent with the dispersion relation and not self-consistent at altimeter track crossover points. Such analyses have difficulty in distinguishing between the effects of interference, incoherence, and dissipation. The frequency–wavenumber analysis provides an objective way to interpolate the internal tides measured along altimetry tracks to arbitrary points, while leveraging all available data for optimal tidal estimates. Tidal analysis of T/P data from 2000 to 2007 is used to predict in situ time series measured by tomography during the 2001–2002 Hawaiian Ocean mixing experiment (HOME), the 1987 Reciprocal Tomography Experiment (RTE87), and the 1991 Acoustic Mid-Ocean Dynamics Experiment (AMODE), demonstrating both the temporal coherence and the lack of incoherent elements to this wave propagation. The temporal coherence is directly evident in time series measured by acoustic tomography. Further, after correcting for changes in background stratification, it is evident that the internal-tide waves experience little attenuation as they cross the Northe Pacific basin. A significant fraction of the variability of internal waves, that component associated with mode-1 internal tides, appears to be predictable over most of the world’s oceans, using harmonic constants derived from satellite altimetry.
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