Asymmetry Spectrum Analysis of ADCP Data and Characterization of Tidal Currents Non-Stationary Dynamics

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The northeast Brazilian shelf is characterized by the presence of a rich suite of quartz sand bedforms having heights of 3-10 m and 100-4000 m crest lengths, which are clearly visible by satellite imagery up to 40 m depth. The impact of the kilometer-scale bedform fields, generated by currents and waves in a time scale of decades to centuries, strongly modifies ocean circulation patterns in the shallow shelf through bottom interactions. Recent analysis of the tidal band obtained from the Acoustic Doppler Current Profiler (ADCP) data suggests the presence of a nonlinear interaction of the subtidal and the tidal variability. In this paper the tidal and long-period bands are analyzed (from sep 2000 to nov 2001) from a hybrid approach combining the gradient pattern analysis and discrete wavelet decomposition. The asymmetry spectrum (amplitude asymmetries versus characteristic frequencies) is a robust and alternative method for short time series complex variability characterization. From the asymmetry spectrum slope the underlying dynamics as turbulence, deterministic chaos, reaction-diffusion and hybrid regimes can be well characterized. From this analysis, it can be stated that a reactive-diffusive regime can be responsible for the intermittency and coherent structures present observed in non-stationary multi-scaling tidal currents dynamics. In the context of these results, new insights on remote sensing improvements related to fine characterization of tidal current extended dynamics are discussed.