ROSSBY SOLITONS IN THE EQUATORIAL PACIFIC INFERRED FROM THE K^{-2} SPECTRUM OF SEA SURFACE HEIGHT VARIATIONS

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Basedon2yearsof Topex/Poseidonobservations of sea surface height (SSH), we estimated spatial and spatio-temporal autocorrelation functions, wavenumber and wavenumber-frequency spectra of SSH variations and some higher statistical moments, - for the range of spatial scales from about 200 to 10^4 km and temporal scales from 10 days. The spectrum of zonal variations exhibits a k-2-law on scales 10^3 to 104 km. The spatio-temporal autocorrelation reveals a broad-band system of westward propagating waves with the propagation velocity about 1.1 m/s. The waves are identified as baroclinic Rossby waves of the first vertical, first horizontal mode. These oscillations, representing equatorial wave regime, are shown to be inconsistent with both the linear theory and the weak turbulence theory of baroclinic Rossby waves. We explain them as a random sequence of Rossby solitons and discuss the implications. It is also interesting that in this particular case, power law k-2 (which normally yields the (mono-) fractal dimension D_H = 2,- equal to the embedding space dimension for 1-d waves) is not related with any cascade process.

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