



The relation between the statistics of open ocean currents and the temporal correlations of the wind

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We study the statistics of wind-driven open ocean currents. Using the Ekman layer model for the integrated currents, we investigate, analytically and numerically, the relation between the wind distribution and its temporal correlations and the statistics of the open ocean currents. We find that temporally long-range correlated wind results in currents whose statistics is proportional to the wind-stress statistics. On the other hand, short-range correlated wind leads to Gaussian distributions of the current components, regardless of the stationary distribution of the winds, and therefore, to a Rayleigh distribution of the current amplitude if the wind stress is isotropic. An interesting result is the existence of an optimum in the amplitude of the ocean currents as a function of the correlation time of the wind stress. The results were validated using an oceanic general circulation model.