

# Stochastic dynamics of sea surface winds

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## **Abstract**

Sea surface winds play a central role in determining air/sea exchanges of momentum, energy, and material substances. As these fluxes are generally found to be nonlinear functions of the sea-surface wind vector, average fluxes typically depend on higher order moments of the distribution of the sea-surface vector wind. In this talk, it will be demonstrated that the nonlinear dependence of surface wind stress on wind speed characteristic of boundary layer dynamics constrains the probability density function of the sea-surface vector wind, such that higher order moments are functionally related to lower order moments. In particular, the mean and skewness of the wind vector components are demonstrated to be anticorrelated, and the skewness of the wind speed is shown to be a decreasing function of the ratio of the mean of the wind speed to its standard deviation. These theoretical predictions are in excellent qualitative agreement with high-resolution global observations of sea-surface winds.