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Sea Ice Dispersion Driven by Fluctuating Wind and Ocean Currents[1] BRYAN SHADDY, BHARGAV RALLABANDI, University of California, Riverside — The motion of sea ice is driven by wind and ocean currents and comprises both a steady drift and a fluctuating component. Here, we systematically describe the relation between sea ice dispersion and environmental noise starting from a Lagrangian description of non-interacting ice floes. We quantify the nonlinear dynamics of sea ice through stochastic simulations, accounting for noise in wind and ocean currents, in addition to Coriolis forces. The ice follows dispersive behavior on time scales on the order of days, consistent with observations. We find that the dispersion coefficient and the mean square velocity of the ice depend strongly on the direction of mean ocean currents relative to the wind as well as a dimensionless Coriolis parameter involving the ice thickness. We then develop a linearized Langevin-like framework which maps the dynamics of sea ice to that of a stochastically forced damped harmonic oscillator, yielding analytic insight into the ice dispersion statistics. Our results are useful in quantifying sea ice properties under known environmental conditions, or alternatively as a way to use wind data and sea ice images to infer ocean statistics.

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