

# Modeling mangrove propagule dispersal trajectories using high-resolution estimates of ocean surface winds and currents

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Mangrove forests are systems that provide ecosystem services and rely on floating propagules of which the dispersal trajectories are determined by ocean currents and winds. Quantifying connectivity of mangrove patches is an important conservation concern. Current estimates of connectivity, however, fail to integrate the link between ocean currents at different spatial scales and dispersal trajectories. Here, we use high-resolution estimates of ocean currents and surface winds from meteorological and oceanographic analyses, in conjunction with experimental data on propagule traits (*e.g.*, density, size and shape) and dispersal vector properties (*e.g.*, strength and direction of water and wind currents). We incorporate these data in a dispersal model to illustrate the potential effect of wind on dispersal trajectories of hydrochorous propagules from different mangrove species. We focus on the Western Indian Ocean, including the Mozambique Channel, which has received much attention because of its reported oceanic complexity, to illustrate the effect of oceanic features such as eddy currents and tides. In spite of the complex pattern of ocean surface currents and winds, some propagules are able to cross the Mozambique Channel. Eddy currents and tides may delay arrival at a suitable site. Experimentally demonstrated differences in wind sensitivity among propagule types were shown to affect the probability of departure and the shape of dispersal trajectories. The model could be used to reconstruct current fluxes of mangrove propagules that may help explain past and current distributions of mangrove forests and assess the potential for natural expansion of these forests.

Keywords: connectivity; eddy currents; long distance dispersal; Mozambique Channel; tidal motion; Western Indian Ocean