Interaction between wind and water as a driver of passive dispersal in mangroves

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Although knowledge on dispersal patterns is essential for predicting long-term population dynamics, critical information on the modalities of passive dispersal and potential interactions between vectors is often missing. Here, we use mangroves as a model to investigate the interaction between wind and water as a driver of passive dispersal. We imposed 16 combinations of wind and hydrodynamic conditions in a flume tank, using propagules of six important mangrove species (and genera), resulting in a set of dispersal morphologies that covers most variation present in mangrove propagules worldwide. Overall, the effect of wind on dispersal depended on propagule density (g l^{-1}). The low-density *Heritiera littoralis* propagules were most affected by wind, while the high-density vertically floating propagules of *Ceriops tagal* and *Bruguiera gymnorrhiza* were least affected. *Avicennia marina*, and horizontally floating *Rhizophora mucronata* and *C. tagal* propagules behaved similarly. Morphological propagule traits, such as the dorsal sail of *H. littoralis*, explained another part of the interspecific differences. Within species, differences in dispersal velocities can be explained by differences in density and for *H. littoralis* also by variations in the shape of the dorsal sail. A conceptual model of dispersal in a natural mangrove habitat illustrates that different propagule types have a different likelihood of reaching the open ocean depending on prevailing winds and water currents. Results demonstrate that in open water, propagule traits (density, morphology, and floating orientation) appear to determine the effect of wind and water on dispersal dynamics. This has important implications for inter- and intraspecific variation in dispersal patterns and the likelihood of reaching suitable habitat patches within a propagule's viability period.