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Interactive comment on "The role of wind in hydrochorous mangrove propagule dispersal" *by* T. Van der Stocken et al.

Anonymous Referee #2

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The role of wind in hydrochorous mangrove propagule dispersal (Van der Stocken et al. 2013)

General comments

The authors present an interesting read on the drivers of hydrochorous mangrove propagule dispersal. Laboratory and field experiments were an opportunity to confirm field observations with laboratory experiments and vice versa. The success of this depends on how well the laboratory conditions replicated the natural environment. The authors used a flume and fans to simulate the effect of wind on dispersal of mangrove propagules by water. Thus they controlled for wind effects, effects of water only, effects of species-specific characteristics (morphology) and combinations of these. The main findings were that 1) wind augmented or obstructed the speed of propagules dispersed

by water if these were light and buoyant enough, and if the morphology of the species was amenable to trapping wind, and 2) irrespective of their morphological characteristics and hence sensitivity to wind, the final dispersal shadow of the propagules was the same.

Specific comments

While these findings are important in the context of a better understanding of mangrove propagule dispersal, the research also raises a number of discussion points. It is up to the author to decide to what extent he wants to elaborate on these in the Discussion section. The depth of the flume tank, while standard for these types of experiments (see Chang et al. 2008), is an issue because the actual volume of water determines the momentum with which the main stream flows. When there is higher momentum in stream flow, stronger wind currents are required to make a significant contribution especially if acting in opposition to the water currents. The depth of 0.35 m needs to be justified in relation to field conditions.

When water is considered in isolation of all other factors in dispersal, two hydrologic forces act on the propagule – direct stream flow which acts downstream of the general direction of the river and tides with a simultaneous wave force (Chang et al. 2008) which shifts the propagules progressively towards the edge. Stranding of propagules depends on which of these forces prevails and the situation is dynamic.

In wave-dominated systems, time is another important consideration, which the authors referred to with respect to propagule viability. The field study was for a period of two ebb tides. There is a possibility that the next high tide would have picked up the propagules once again, resulting in a different distribution pattern in the subsequent ebb tide, as there is no evidence that stranding is a once-off event. That is, until propagules germinate and establish, dispersal could still continue. This has been demonstrated by Merritt and Wohl (2002).

Irrespective of morphological differences and differential response to wind, the authors found no significant differences in the dispersal distances of C. tagal and R. mucronata. This suggests the overall dispersal distances are more hydrological- than wind- or morphology- driven. Thus the question is, if irrespective of the wind the final dispersal shadows are the same, how important then is the wind in hydrochorous dispersal of mangroves?

In terms of technical aspects the Introduction must clarify that there would be field, lab and fishermen studies. In addition the authors need to say why different numbers of propagules were released in the field experiment for different species?

The authors need to clarify the analysis of their data. There are treatments with wind, without wind and with wind in different directions. We cannot just assume that the water effect is constant when the wind component is added – a two- or three way analysis of this data set would have served better for purposes of statistical significance. In a similar experiment which simulated retention of seeds by extant vegetation of a marsh, Chang et al. (2008) used a General Linear Model that allows for simultaneous analyses of multiple factors which is more appropriate as it allows for interactions between factors to be teased out. For X. granatum, the calculation of dispersal velocity was adjusted because of its high density. This seems biased since density is a factor under investigation.

A more comprehensive study would need to take more factors into consideration, as the current experimental design does not sufficiently control for other key determinants of hydrochorous dispersal; the extant plant vegetation along the channel, wave action (Chang et al. 2008), the hydrologic regime, the channel morphology and hydraulics, the phenology of propagule release as it relates to hydrology (Merritt and Wohl 2002).

Technical corrections

Table 1, correct spelling of “length” Use only 2 decimal places

References Chang ER, Veeneklaas RM, Buitenwerf R, Bakker JP, Bouma TJ. 2008.

To move or not to move: determinant of seed retention in a tidal marsh. Functional Ecology 22, 720 – 727. Merritt DM, Wohl EE. 2002. Processes governing hydrochory along rivers: hydraulics, hydrology, and dispersal phenology. Ecological Applications 12 (4), 1071 – 1087.

Interactive comment on Biogeosciences Discuss., 10, 895, 2013.