MEASURING SHORT-TERM BIOPHYSICAL INTERACTIONS IN COASTAL MANGROVES IN MATANG, MALAYSIA

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Introduction

Mangrove ecosystems are considered the tropical equivalent of salt marshes. They provide mankind with many ecosystem services (e.g. food and wood) and they are an important habitat for fauna as well. Moreover, the presence of mangroves with their peculiar root systems (figure 1) impacts on the physical processes in the coastal zone (e.g. Quartel et al., 2007). However, field data on the rate of energy attenuation in mangroves and the flow paths of water and sediment through mangroves is limited yet. The current study focuses on these biophysical interactions in coastal mangroves, especially the short-term components, i.e. interactions on time scales of individual waves, tidal cycles and storm events or seasonal variations. The two main aims are: 1) quantifying controls on attenuation of hydrodynamic energy and 2) quantifying local gross sediment fluxes. This study starts with a field campaign in the Matang mangroves (Figure 2).

Figure 1: Peculiar root system of a mangrove tree: stilt roots of Rizophora.

Field campaign to study the use of mangroves

Hydrodynamic energy attenuation in mangroves will be measured along three cross-shore transects through accreting, stable and eroding mangroves respectively. Transects are located parallel to prevailing wave directions. Along these transects we plan to measure: wave heights and water levels (using Coastal MacroWave sensors); current velocities (applying HR ADCP's); vertical and horizontal vegetation density patterns (spatially explicit inventory); and bottom elevation (method to be decided on).

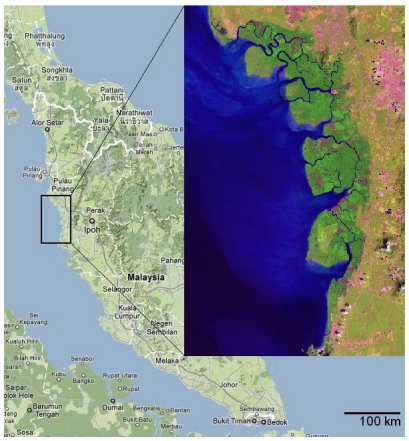

Figure 2: Peninsular Malaysia with a satellite image of Matang mangrove forest (inset (NASA Earth Observatory)).

Concerning sediment fluxes, cross-shore transects are insufficient as creeks might play an important role in sediment transport through mangroves (Hong Phuoc & Massel, 2006). Therefore, measurements concerning sediment fluxes focus on one entire creek basin. In this creek basin we plan to measure: current velocities (using HR ADCP's) and sediment transport (using an OBS) at the mouth of the creek; sedimentation rates all over the basin (by sediment traps); vertical and horizontal vegetation density patterns (spatially explicit inventory); and bottom elevation of the basin (method to be decided on).

Field measurements will be executed over one year, so that the results show all patterns in the short-term biophysical interactions due to individual waves, tidal cycles (spring-neap) and seasonal (monsoons) impacts.

Expected results

This field campaign is expected to unveil patterns in hydrodynamic energy attenuation and sediment trapping in a mangrove forest due to variations in both vegetation characteristics and hydrodynamic forcing. The results of the field campaign will later on be applied to develop a calibrated model in Delft3D simulating these short-term biophysical interactions in mangroves.

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Literature cited:

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