

Mekong Delta Hydrodynamics and Sediment Flux

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LONG-TERM GOALS

- Provide a comprehensive understanding of the linkages between hydrodynamics and sediment dynamics within the Song Hau distributary channel and the associated mangrove coastline
- Contribute insights to the larger Mekong source-to-sink sedimentary system that stretches from the river to the continental shelf, focusing on collaboration at the CLD coastline.

OBJECTIVES

- To study the hydrodynamics and sediment dynamics in the mangrove forest at the middle transect Cu Lao Dung (CLD) island.
- To make field measurements during approximately two weeks in two seasons: SW monsoon (Sep-Oct 2014) and two weeks in Feb-Mar 2015.
- To improve the experiments and knowledge for young scientists by training course and student visit

APPROACH

This area ranges from intertidal flats to lush tropical vegetation (i.e., mangrove forests), and turbidities and surface waves vary significantly on seasonal time scales. The study of these variables will allow investigators to understand sediment cycling and retention in these complex settings.

Two field studies were undertaken in Song Hau river, in the mangrove coastline at the ocean end of CLD. One field study was during a spring-neap tidal cycle in the period of maximum Mekong discharge and weak SW winds – Sep-Oct 2014. The other field study occurred during a similar spring-neap cycle with minimum Mekong discharge and strong NE winds – Feb-Mar 2015. The contrast of the two periods will provide a comprehensive understanding of the linkages between hydrodynamics and sediment dynamics within the Song Hau distributary channel and the associated mangrove coastline.

As part of field measurements in NE and SW monsoons (2014-2015), wave, current, river discharge, suspended sediment concentration, mud and water samples, and bathymetry were measured (Fig. 1). These data were collected in shallow sub-tidal water, on the muddy flat and within the mangrove

forest. Furthermore, mangrove characteristics (density of mangroves, topography, types of mangroves)... were observed and measured.

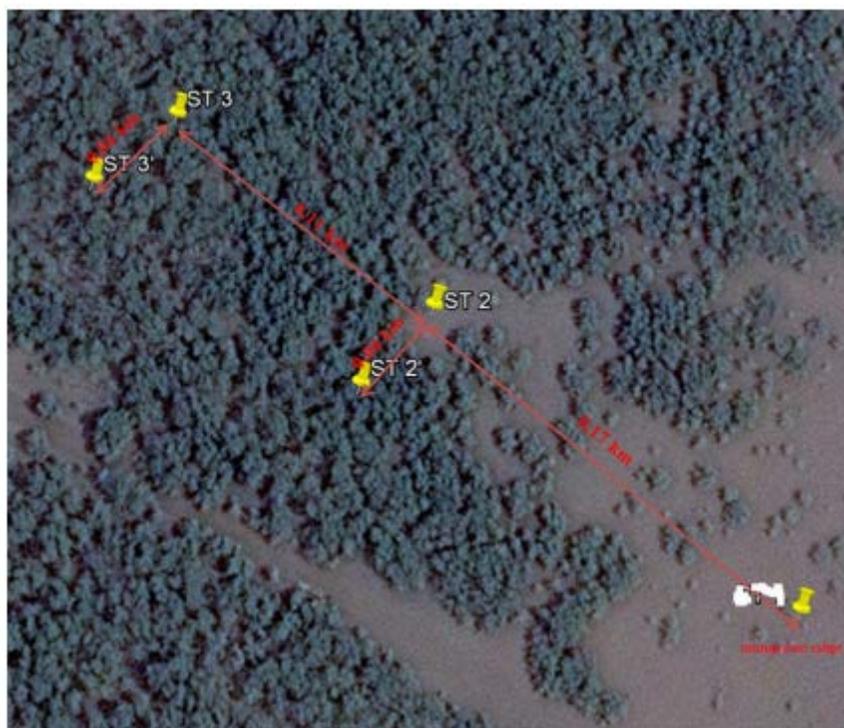
Four boats were used for observation: 02 boats for mooring stations (ST0 and ST1) and 02 boats for mobile measurements (ADCP, Bathymetry, mangrove activities...)

List of instruments were used:

Stations	Instruments	Measures
ST 0 (Outer station)	Meteorological	wind, pressure,temp., humidity
	01 CTD	Temp, salinity, turbidity
	01 ADCP	Current profile
	01 Valeport	Wave, SSC, current
ST 1 (in muddy flat)	Meteorological	wind, pressure, temp.
	01 AEM	Current
	01 Valeport	Wave, SSC, current
ST 2 (in spare forest)	01 INFINITY- Turbi	SSC
	01 INFINITY- WH	Wave
	01 INFINITY- EM	Current
	01 RBR TWR2050	Wave
ST 3 (in denser forest)	01 RUSKIN	Wave, SSC
	01 RBR TWR2050	Wave



(a) Cu Lao Dung study site



(b) Stations in mangroves

Fig 1. Positions of mooring stations along the transect in Cu Lao Dung (Soc Trang)

WORK COMPLETED

- a) **participating in field work** – VNU personnel (scientists and students) participated in the mangrove studies helping to collect data and samples. This will include deployment of fixed instrumentation and subsequent surveys of the forest (e.g., elevation, sediment, vegetation). Field measurements during approximately two weeks in two seasons: SW monsoon (22nd Sep- 4th Oct 2014) and two weeks in NE monsoon (3-15 Mar 2015).
- b) **organize the field work in middle transect in Cu Lao Dung mangrove area** – VNU personnel (scientists and students) organized measuring the hydrodynamics (waves, tides, SSC, currents, river discharge...) and mangrove characteristics (density of mangroves, topography, types of mangroves...) in Middle of Cu Lao Dung mangrove area from shallow sub-tidal water, on the muddy flat and within the mangrove forest. Field measurements during approximately two weeks in two seasons: SW monsoon (22nd Sep- 4th Oct 2014) and two weeks in NE monsoon (3-15 Mar 2015).
- c) **data exchange workshop:** VNU organized the data workshop on 14th – 15th September, 2015 with the aims to share preliminary observational data and modeling results, to coordinate plans for special session at Ocean Sciences meeting (Feb 2016); and to prepare for an integrated written volume of results.
- d) **training course:** VNU students and other institutions were able to learn new technology and applications in measurements, observations, data analyses, allowing them to gain deeper knowledge in theory and practice. It was hold in 16th – 20th September, 2015 in HCMUS- VNU

Besides, other activities will be the following.

- d) **arranging Vietnamese visas** – VNU personnel will help arrange multiple-entry visas for US and New Zealand scientists to visit Vietnam to undertake collaborative research.
- e) **facilitating import and storage of equipment** – VNU personnel will help with import of US and NZ equipment for use in collaborative research; and will arrange for storage on VNU campus between the two field studies (i.e., storage during period Oct 2014 to Feb 2015).

RESULTS

- The observed data proves that waves and current are dissipated quickly from shallow coastal water into the mangroves. They also depend on topography changes, characteristic in mangroves. Suspended sediment concentration increases from shallow water into the mangroves, and fluctuates according to tides, waves and currents. Fig 2 is an example of wave height dissipation in mangrove forests. It can be emphasized the role of mangroves in soil retention under the hydrodynamic impacts.
- Topography in mangrove shows that the topography trends to get some erosion (Fig 3) in two seasons but the bathymetry in front of mangrove (Fig. 4) gets more accumulation in the shallow water but also gets more deposition in near the mangrove edge.
- Results can provide a comprehensive understanding of the linkages between hydrodynamics and sediment dynamics within the Song Hau distributary channel and the associated mangrove coastline.

- Furthermore, it is also good opportunities for Vietnamese young scientists and students to improve themselves and to study further.

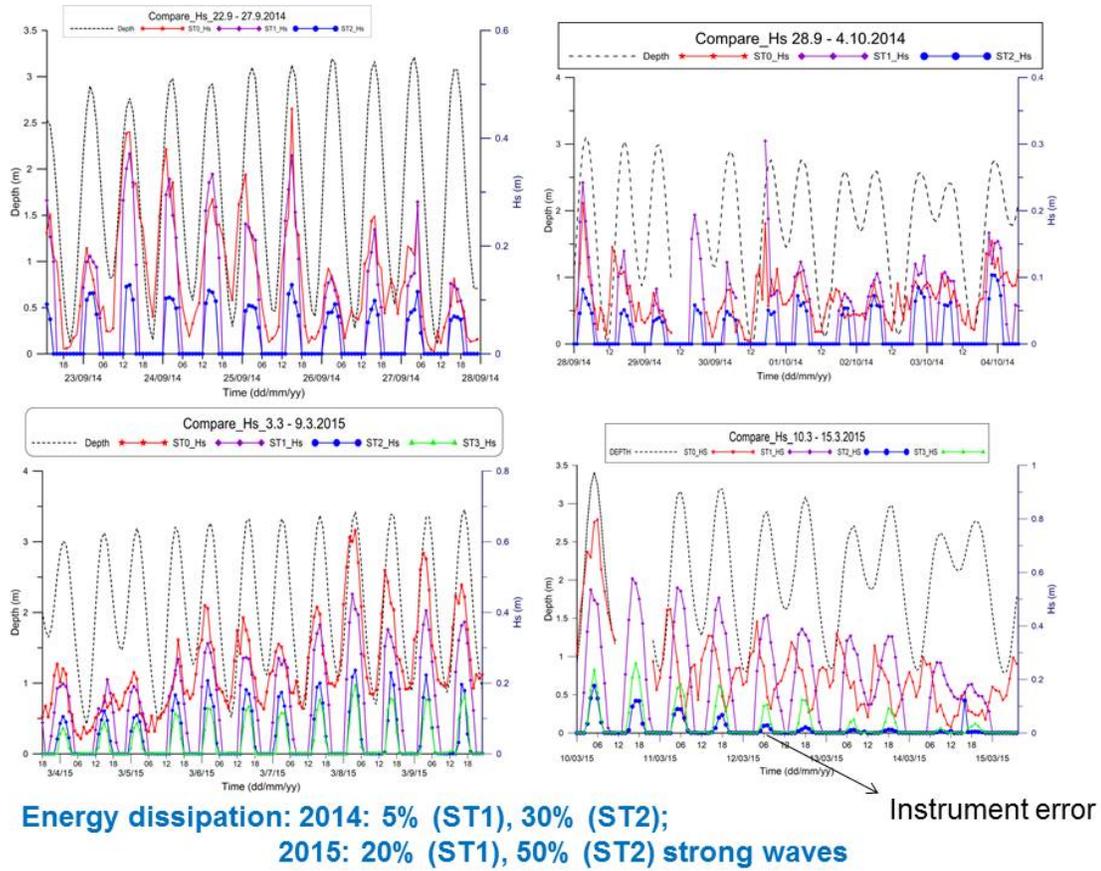


Fig2. Wave energy dissipation from shallow sub-tidal water, on the muddy flat and within the mangrove forest

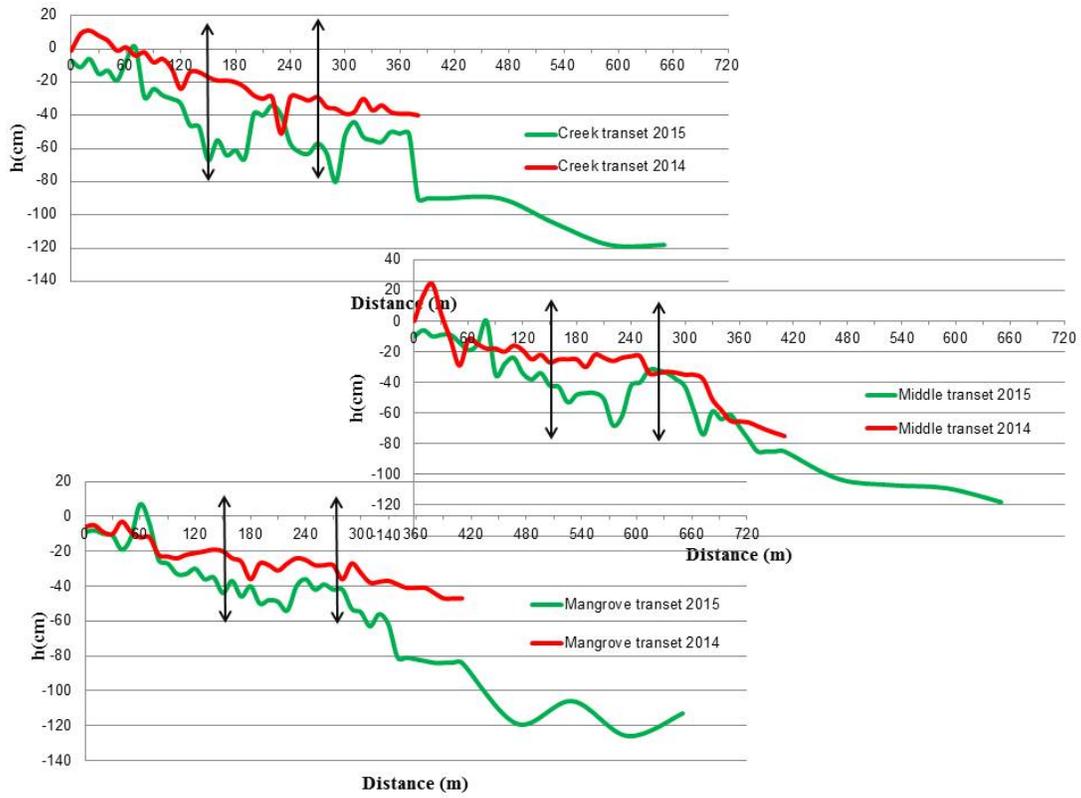


Fig.3 Topography in study mangrove site

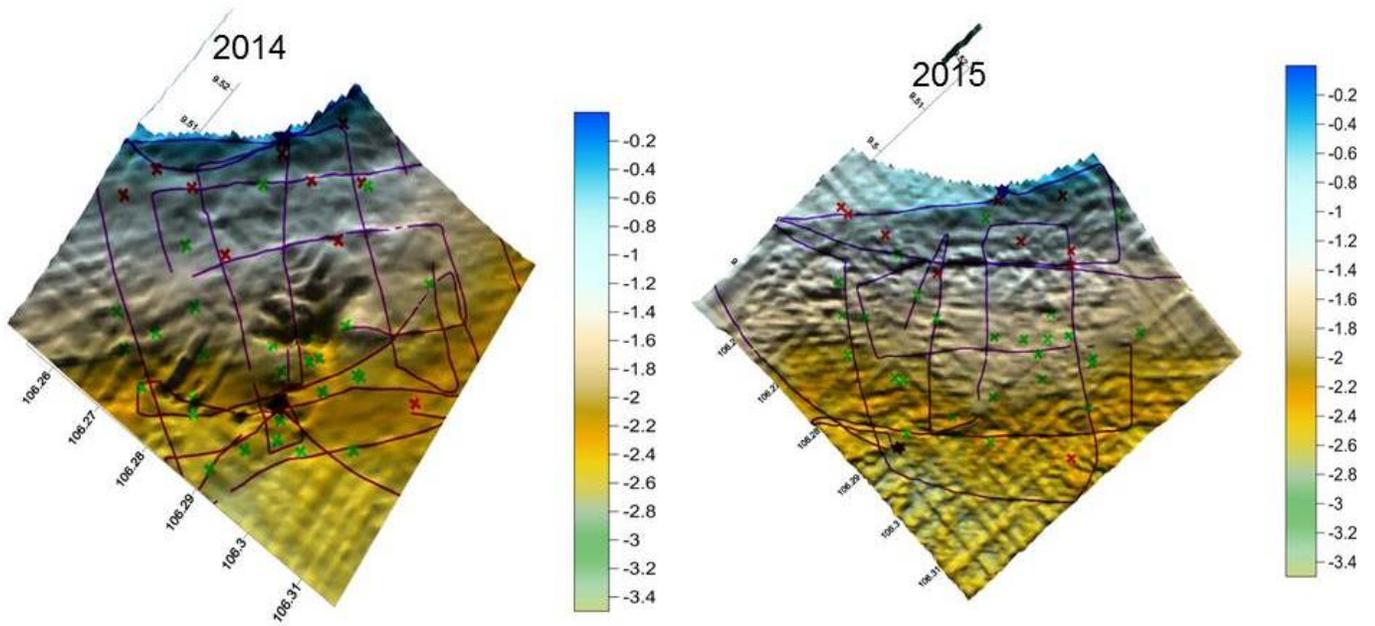


Fig. 4 Bathymetric changes in two seasons: erosion (red mark) and deposition (Green marks)

IMPACT/APPLICATIONS

The analysed results will be good evidence for studying the hydrodynamic impacts in mangrove forests.

The application these data on modelings or stimulation are really necessary and important in prediction the hydrodynamics progress in furture.

RELATED PROJECTS

The Mekong Research Project is the combination of many US scientists from different institutions such as university of Washington, Boston University, North Carolina State University, Tulane University and University of Waikato, New Zealand. We can share observational data and modeling results and to coordinate plans for special session at Ocean Sciences meeting (Feb 2016); and to prepare for an integrated written volume of results.