SPICE final conference
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Proposal	
Affiliated to topic (Session 1- 8)	Marine Geology and Biogeochemistry Part II: Biogeochemistry
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ENSO-driven changes in carbon fluxes to the deep sea off South Java
Impact of physical conditions on the carbon cycle in the Indonesian waters

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Abstract
Sediment trap experiments have been performed in order to study carbon fluxes to the deep sea in the seasonal upwelling system off South Java during the La Niña/El Niño transition in 2001 and 2002. The results show that during La Niña greater land-derived freshwater and nutrient inputs into the South Java Current enhance marine productivity and generate a thick buoyant low salinity surface layer delaying the onset of SE monsoon upwelling. Low rainfall and reduced inputs from land decrease the marine productivity, thin the buoyant surface layer during El Niño; SE monsoon upwelling sets in earlier and lasts longer. Carbon fluxes into the deep sea respond to these processes indicating a more efficient biological CO_2 uptake during La Niña and a reversed trend during El Niño. These results suggest in line with model calculations that changing freshwater fluxes exert an important influence on the CO_2 flux between the ocean around Indonesia and the atmosphere and act as source for atmospheric CO_2 during El Niño events.

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Trophic status of the tropical Brantas Estuary Indonesia: nutrient and phytoplankton dynamics

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Abstract

Research on estuarine phytoplankton ecology was conducted from March 2006 till March 2008 in two Brantas river mouths : Wonokromo and Porong, Indonesia, which was aimed to evaluate the phytoplankton ecology and its related environmental condition dynamics. Under water light measured as Secchi depth profiles show a strong influence of rainy season in reducing light availability due to high turbidity derived from the incoming rivers at both estuaries. Nutrient concentration dynamics were observed, showing higher values in the river mouth stations and lower values in the offshore stations. In Porong estuary, lowest nitrate concentrations were found in offshore waters (ranging from 0.72 to 1.21 µM NO_3-N), while maximum values prevailed at river mouth stations (ranging from 2.62 to 2.71 µM NO_3-N). Typical difference of the two monsoonal seasons on phytoplankton biomass is obviously observed, showing a low average phytoplankton biomass during the rainy season. Annual average of phytoplankton biomass in Porong and Wonokromo estuaries accounted for 4.75 µg Chl a l^{-1} and 2.51 µg Chl a l^{-1}, respectively (ranging from 0.21 µg Chl a l^{-1} to 22.23 µg Chl a l^{-1}). Low average of phytoplankton biomass in rainy season both at two estauries is likely due to light inhibition during the very turbid water of rainy period and inversely during the dry season. Phytoplankton biomas dynamics is correlated with that of nutrient concentration.

Keywords : Brantas – Madura, Porong, Wonokromo, nutrients, phytoplankton, phytoplankton biomass, tropical monsoon.

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Human activities and extreme events affecting fluxes of dissolved nutrients, suspended sediments and particulate organic matter in the Brantas River, Java, Indonesia

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Abstract

Increasing human modifications of the coastal zone are endangering the integrity of coastal ecosystems during the Anthropocene. This is of particular importance in SE Asia where large parts of the population live in the coastal zone and economically depend on its resources. The region is also affected by extreme natural events like storms, earthquakes and volcano eruptions. The Indonesian island of Java which has a population density >1,000 inhabitants km^{-2} is a prime example in this respect. Its second largest river, the Brantas, empties into the shallow Madura Strait through two major branches, the Wonokromo and the Porong. Major land use in the catchment is agriculture (61 %) and the hydrology of the river is regulated by 8 large dams and numerous weirs. The estuarine lowlands are characterized by extensive aquaculture ponds. The eruption of a mud volcano near the Porong in 2006 added another factor affecting the amount and composition of the dissolved and particulate river loads.

We found high concentrations of dissolved inorganic nutrients and particulate organic carbon (POC) related to land use with maxima during the rainy season (Nov-April, nitrate+ammonium 150 µM, phosphate 10 µM, silicate <800 µM, POC 0.6-4.1 mg l^{-1}). While high nitrate and POC loads originated from upstream regions dominated by agriculture, high amounts of ammonium were introduced from lowland aquaculture. The high POC load resulted in low oxygen concentrations particularly in the dry season (0.5-2.5 mg l^{-1}). The additional input of suspended sediment, POC and ammonium from the mud volcano exacerbated oxygen depletion in the Porong. The high POC supply led to high benthic degradation resulting in high ammonium release from sediments as well as high rates of carbon burial. We conclude that the mud volcano input amplifies adverse effects of human activities in the river catchment on the biogeochemistry of coastal waters.

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Seasonal Variability of Water Residence Time in Madura Strait, East Java, Indonesia

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A Lagrangian particle tracer method embedded within a 3-D finite difference hydrodynamic model is used to study the transport and exchange processes in a semi-enclosed water of Madura Strait, East Java, Indonesia. The 3-D hydrodynamic model forcing functions consist of tidal elevation at north and east open boundary, river discharge of Brantas River estuaries, and monsoonal wind. The validated model successfully estimated the variabilityof residence time. The calculation results show that water residence times in Madura Strait and especially in its tributaries are mainly governed by the strength of river discharges, whereas the direction of advection is influenced mainly by monsoon wind directions and less by the tide-induced residual current.