SPICE final conference
January 20 & 21, 2016

Proposal	
Affiliated to topic (Session 1- 8)	Marine Geology and Biogeochemistry Part I: Marine Geology
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Historical record of heavy metal of Jakarta Bay sediment

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Abstract

This study reports copper, zinc, lead, cadmium, and chromium records of Jakarta Bay sediment since 600 AD from two gravity cores taken in eastern part of Jakarta Bay . Heavy metal concentration was analyzed using atomic absorpstion spectrometry on bulk sample taken in 5 cm interval. The background level of each of the element is Cu 16 ppm, Zn 75 ppm, Pb 20 ppm, Cd 0.01 – 0.15 ppm, and Cr 80 ppm. The record show two stages of land use changes in the region: from 600 AD to 1600 AD and 1800 AD onward. This changes are interpeted as related to the history of West Java region.

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Affiliated to topic (Session 1- 8)	Marine Geology and Biogeochemistry Part I: Marine Geology
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Variations in continental runoff recorded in marine sediments around Java and Kalimantan over the past 5,000 years

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Life in Indonesia is highly dependent on the availability of water provided by precipitation. The seasonal migration of the ITCZ, the Australian-Indonesian monsoon system and the El Niño Southern Oscillation (ENSO) control the amount, the regional distribution, and the seasonal variation of precipitation over the Indonesian Archipelago. Four gravity cores – two off the Pembuang River, southern Kalimantan, and two off the Solo River, northeastern Java – were analyzed. X-ray fluorescence measurements and grain size analyses were conducted in order to investigate changes in the amount and the composition of terrestrial runoff as a direct response to changes in precipitation and the related forcing mechanisms over the past 5,000 years.

A contemporaneous decrease in clay and silt fraction, Ti/Ca and Zr/Rb ratios between 4,000 and 2,000 years BP indicate a decrease in precipitation followed by a simultaneous increase in clay and silt fraction, Ti/Ca and Zr/Rb ratios indicative for an increase in precipitation between 2,000 and 1,000 years BP over Borneo. The increase in clay fraction simultaneous to the decrease in silt fraction as well as the slight decrease in Ti/Ca ratios are interpreted as a continuous decrease in precipitation over the past 4,000 years over Java.

The different behavior of precipitation over Borneo and Java is caused by different forcing mechanism acting on a regional scale. We will put changes in the Australian-Indonesian monsoon system, variations in the ITCZ and the influence of other climate phenomena over the Java Sea into context.

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Proposal	
Affiliated to topic (Session 1- 8)	**Marine Geology and Biogeochemistry** **Part I: Marine Geology (SPICE III, topic 5 CAFINDO subproject 3)**
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Pollen, charcoal and organic-walled dinoflagellate cysts studies in the Java Sea: main outcomes and perspectives

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Abstract

Two shallow-water marine sediment cores drilled from the Java Sea off the river Jelai (core 1412-19) and the river Solo mouths (core 1609-30) were studied in order to reconstruct past vegetation communities and environment dynamics in SE Kalimantan and NE Java as well as in marine realm of the Java Sea during the last ca 3500 cal yr. A combined use of independent proxies, e.g. pollen, microcharcoal and organic-walled dinoflagellate cysts was applied and revealed a high correlation between changes on land and in the sea. The most important outcomes of this study could be summarized as following:

(1) Main vegetation communities of SE Kalimantan and NE Java as well as their changes in time are documented well by pollen in the sediments from the Java Sea, although a roll of pollen transported from a long distance (e.g. from the continental Asia, Sumatra, and N Australia) needs to be considered.
(2) Anthropogenic environmental changes play a leading role in the dynamics of the past vegetation communities in SE Kalimantan and NE Java during the last ca 3500 cal yr; the signals of natural dynamics are strongly biased by anthropogenic activity.
(3) Anthropogenic activity related to land use (e.g. logging, agriculture and plantations development, aquaculture and/or fires) increased during the late Holocene/Anthropocene, particularly in Java.
(4) Environmental changes are reflected both in pollen/spores and dinoflagellates assemblages; the pollen-based signal from land is delayed about 50-70 years compared to the dinocysts-based signal from the sea.
(5) Strong anthropogenic environmental changes in Java are evidenced to have started about 2000 yr earlier than those in Kalimantan.

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Affiliated to topic (Session 1- 8)	Marine Geology and Biogeochemistry Part I: Marine Geology
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Gradients in carbon and nutrient input into the Java Sea related to human activities in river catchments during the Late Holocene

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Abstract

Beginning a few thousand years ago, global climate and environmental change have become more and more affected by human activities. Hence, quantifying the 'human component' becomes increasingly important for predicting future developments. Indonesia's coasts are key in this respect, because it is the region (i) that receives the highest inputs of water, sediment and associated dissolved and particulate substances and (ii) that suffers from anthropogenically modified landscapes. Major goal of this study is to identify the contribution of human activities in river catchments (i.e. land use change, hydrological alterations) to gradients in carbon and nitrogen deposition in coastal sediments of the Java Sea during the Late Holocene. Sediment cores (90-166 cm long) off major river mouths on Java (rivers Solo and Citarum) and Kalimantan (rivers Pembuang and Jelai) were dated and analysed for C_{org}, N_{tot}, carbonate, stable isotope composition ($\delta^{13}C_{org}$, $\delta^{15}N$) and biogenic opal in high resolution. Most sediment cores were dominated by organic matter from autochthonous production with varying contribution of terrestrial sources. Anthropogenic effects were most prominent in a core off the Jelai River on Kalimantan indicating increasing signs of eutrophication and sediment erosion during the last century as depicted by lower $\delta^{13}C_{org}$ and higher $\delta^{15}N$, biogenic opal, C_{org}, N_{tot} and sedimentation rates in the upper sediment layers. These trends correlate with a reduction in pollen abundance of mangrove and timber trees and an increase in charcoal abundance towards the upper layers. Thus, the consequences of recent large scale logging and burning activities in the Jelai catchment appear to become visible even in coastal sediments.

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The "known knowns" and the "known unknowns" in understanding the hydroclimate history of Indonesia

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Abstract

Results from one decade of research within the framework of SPICE II and III on past Indonesian climate and hydrologic cycle, particularly the late Holocene trends and variability in hydroclimate and its forcing mechanisms are discussed. Consistent with instrumental and historical records, solar forcing, ENSO, and the position of the rainbelt largely control the (late) Holocene climate variability of Indonesia. The role of volcanic forcing and the Indian Ocean Dipole remain to be explored in future studies and require climate archives with very high temporal resolution, such as corals, stalagmites or varve sediments that are not yet available. Large differences exist between the hydroclimate of the deep tropics and the monsoon regions at various timescales, owing to the different feedbacks of these regions to the same, or a combination of forcing mechanisms. Records off Sumatra suggest a gradual drying trend over the course of the Holocene that reverses during the past 2000 years, while records from the monsoonal Indonesia show no trend during the Holocene but an abrupt two-step increase at about 3000 and 1000 years ago. Records from northern and eastern Indonesia are equivocal and do not show a coherent change over the Holocene and the past 2000 years, owing to different local feedback mechanisms and a limited understanding of the present and past behavior of the proxies used for hydroclimate reconstructions. A deeper understanding of these proxies is essential for a more reliable projection of future changes in Indonesian hydroclimate.