

A01 - Development and dynamics of rainforest and rainforest transformations in Sumatra during prehistoric and historic times



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Aims

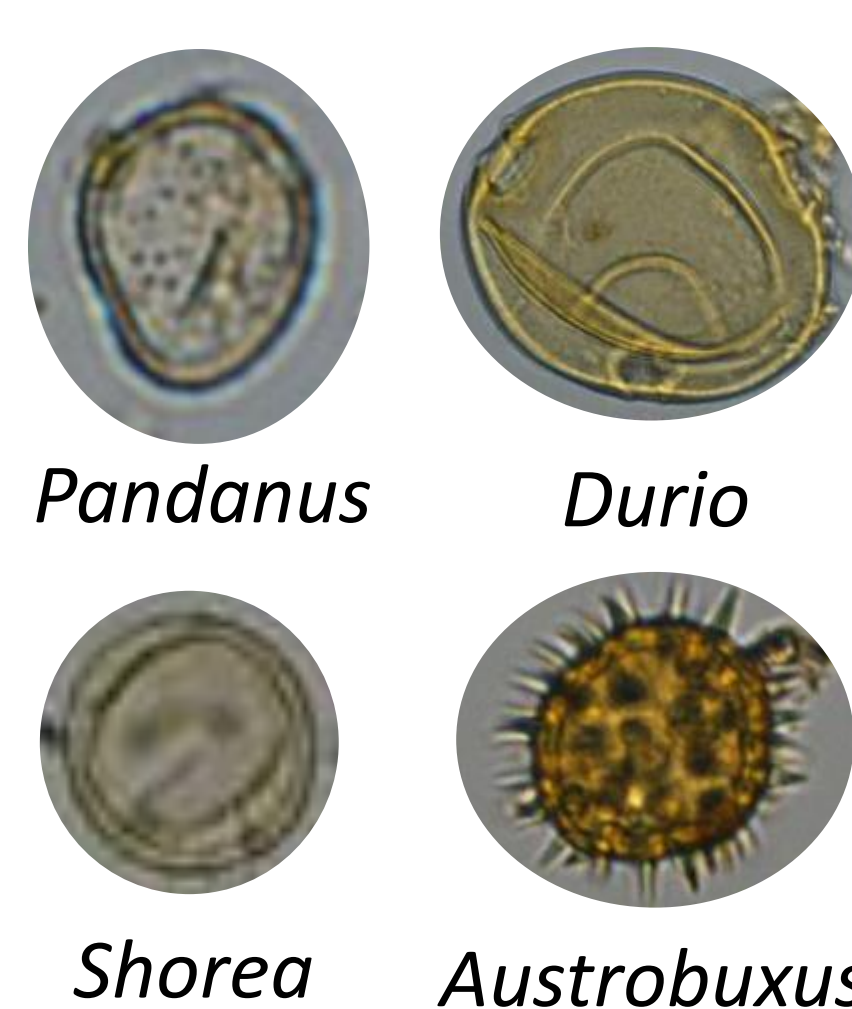
Swamps and peatlands in Jambi Province are important environmental archives which can record rainforest and rainforest transformations in the landscape at different scales in space (local to regional) and time (decadal, centennial, millennial). The research is carried on with the aims of:

- Reconstructing past vegetation, plant diversity and climate dynamics
- Assessing the ecological response of Jambi ecosystems to environmental and climatic variability in the long-term
- Assessing the human impact and role of droughts (ENSO) and fire
- Providing the evaluation of current and future changes from a historical perspective

Methods

We use for palaeoenvironmental and palaeoecological reconstructions multi-proxy data from radiocarbon dated sediment cores. Proxies used include high resolution pollen, spore, charcoal, testate amoebae (in collaboration with project B07), biochemical traits (C, N and ¹⁵N: in collaboration with project A05) and sediment analysis

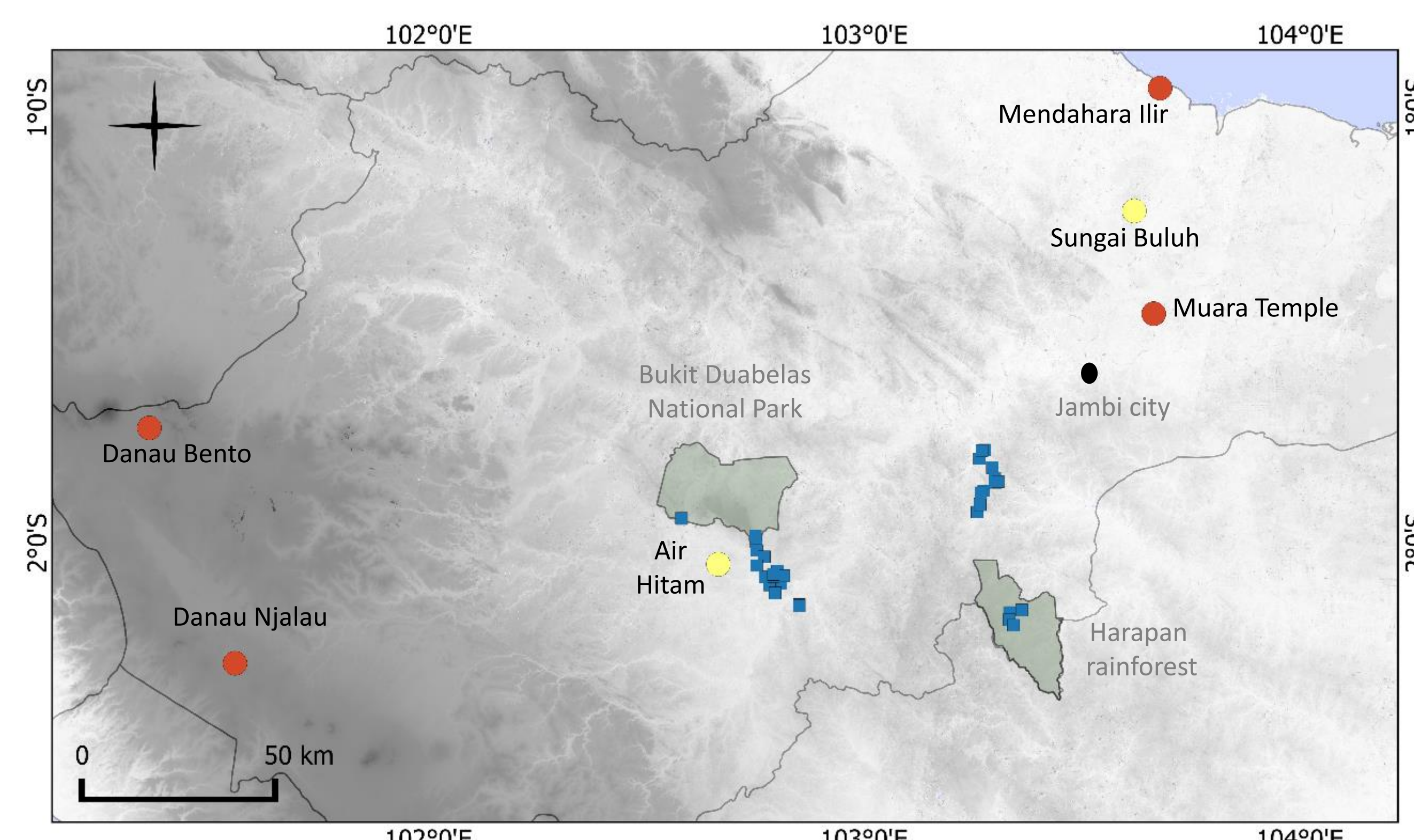
fossil pollen grains



Study area and progress

In the A01 we work in the Jambi Province. During the field campaigns (2012-2013-2014) we cored different locations along an altitudinal transect from lower montane ecosystems (Kerinci) to lowland ecosystems. We collected a total of 9 cores.

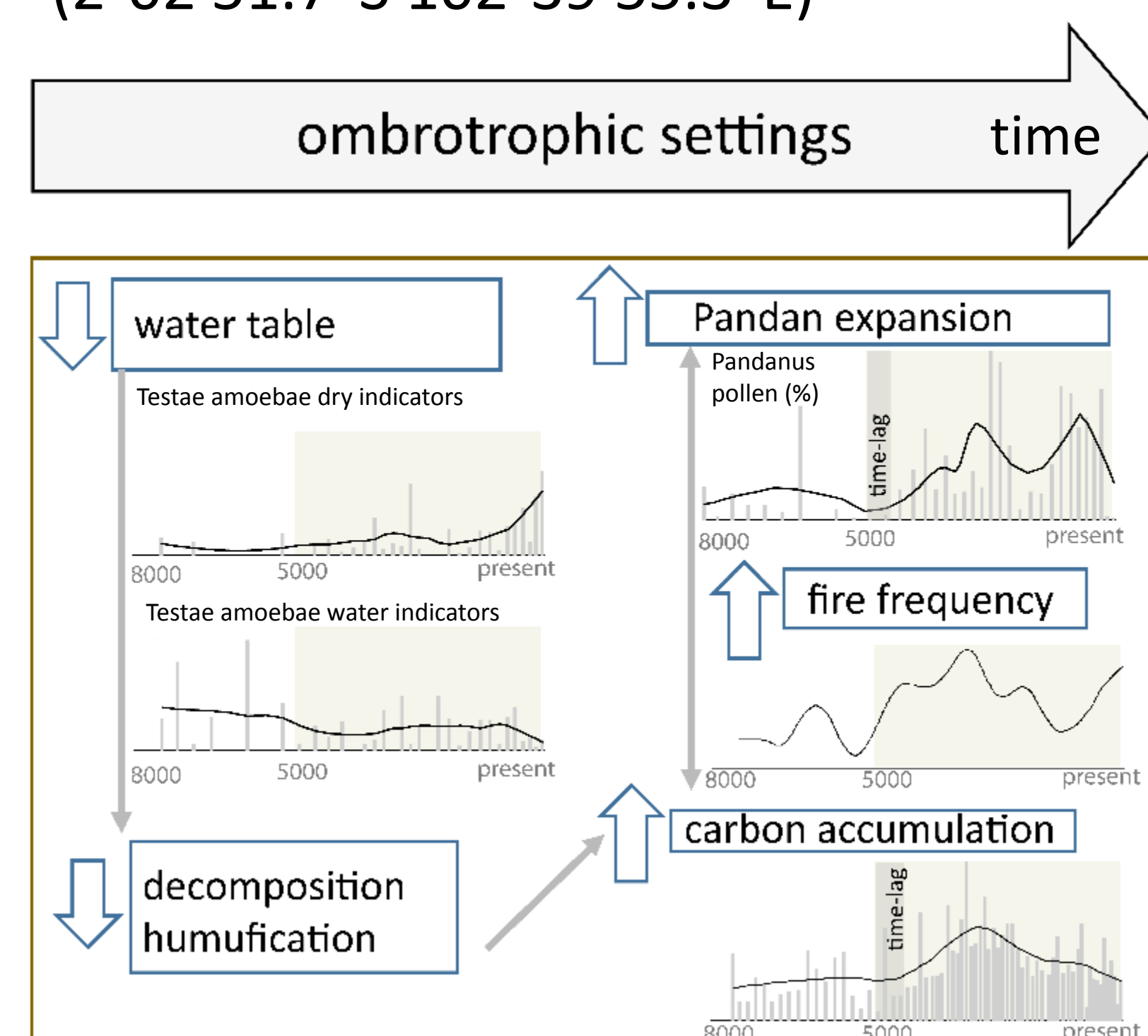
Since September 2012 pollen traps were placed in the EFForTS/CRC990 plots to collect yearly pollen rain. The first 42 pollen traps are currently under study



- AO1 pollen traps (EFForTS-CRC990 plots)
 - AO1 sediment cores (ongoing analysis)
 - AO1 sediment cores (results presented)
- altitude m asl
- <1000
 - 2000
 - 3000
 - 4000

The **largest** peat area in the central part of Jambi Province:

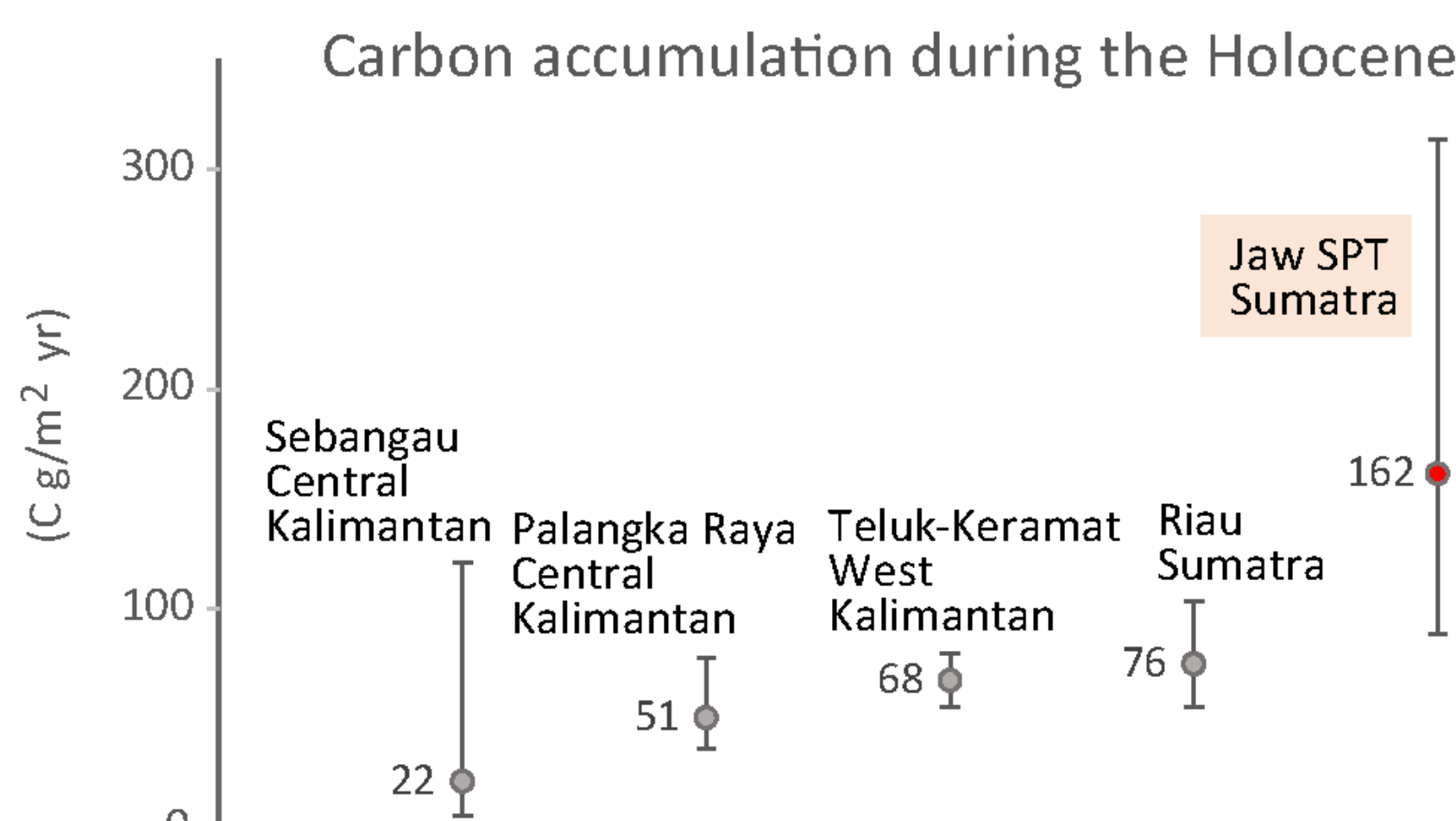
Jaw SPT core, Air Hitam peat dome, Sarolangun Regency (2°02'51.7"S 102°39'55.3"E)



Combined results reveal:

- Peat started to accumulate at least 7800 years ago
- Changes in peat/carbon accumulation rates were mostly a function of vegetation phases (from mixed-swamp to pole rainforests) and regional sea-level changes

- Highest ranges and values of carbon accumulation over time in SE Asia
- Higher rates of peat/carbon accumulation correlate with *Pandanus* expansion under ombrotrophic settings

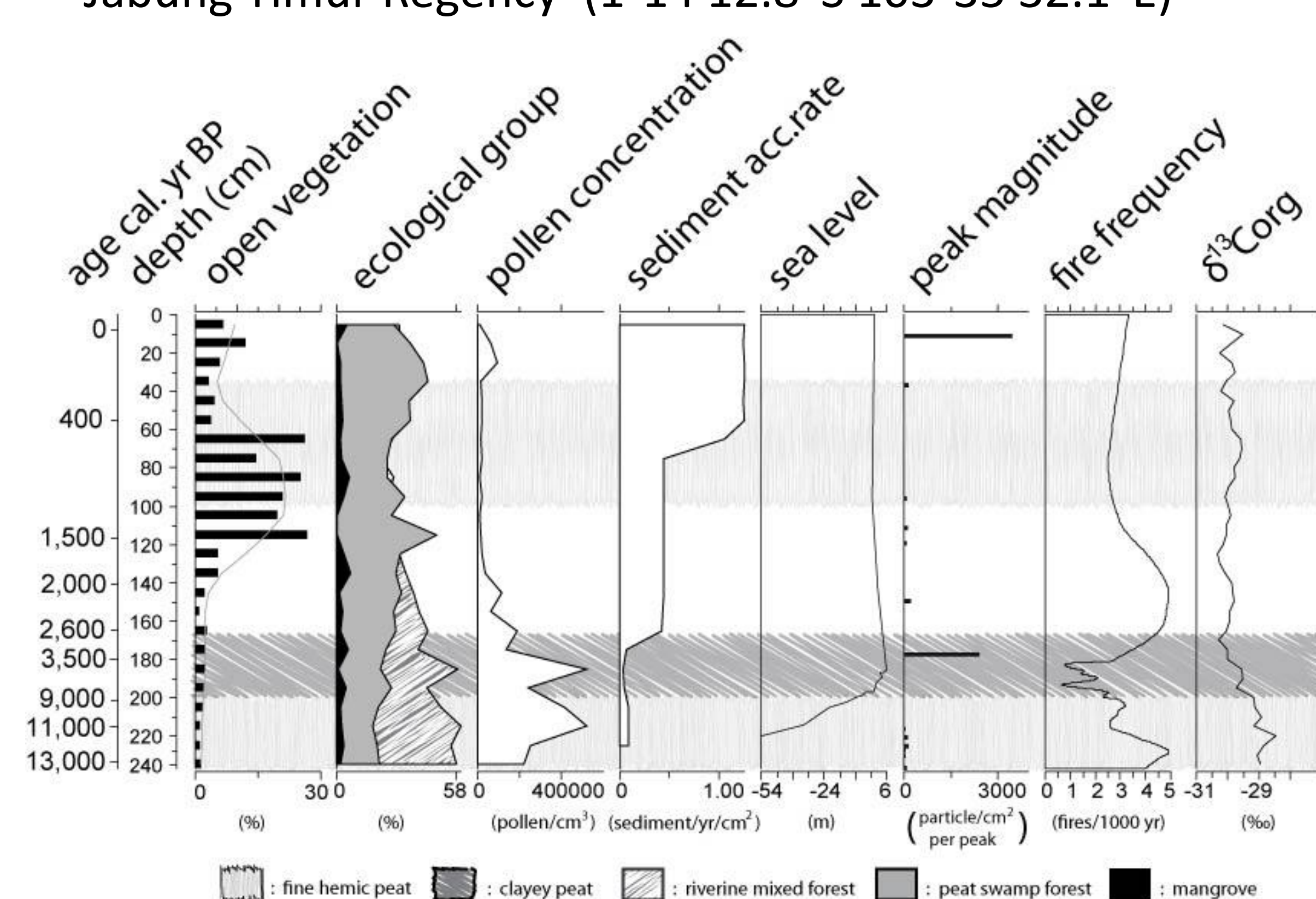


Biagioni et al. (in review)

First results

The **oldest** peat deposit in the eastern part of Jambi Province:

Sungai Buluh core, Kawasan hutan lindung gambut, Tanjung Jabung Timur Regency (1°14'12.8"S 103°35'32.1"E)



- Peat started to accumulate 13000 years ago. Several thousands of years before other peat records in Sumatra
- The initial development took place on an oxbow lake in riverine forest
- Increase in fire frequency linked to ENSO onset in the late Holocene did not affect the accumulation of peat
- Pollen/vegetation changes suggest human activities since the last 1500 years

Hapsari et al. (in prep.)

General conclusions

- Results of the two cores indicate peat-swamp ecosystems have been resilient towards long-term scale changes in climate (i.e. ENSO onset and fires increase in the late Holocene)
- Changes in rates of peat/carbon accumulation follow sea-level changes and are mostly a function of vegetation communities
- Human-landscape interactions were recorded in the eastern part of Jambi already 1500 years ago, the central part of Jambi remained unaffected until the modern conversion to oil palm plantations
- Due to unprecedented rapid transformation of the peat-swamp rainforests to oil palm plantations, these ancient carbon sink areas might very soon turn into carbon sources

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University of Göttingen



Bogor Agricultural University



University of Jambi



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