



# Tropical Wetlands

## Sensitive Archives for Reconstructing Asian Summer Monsoon Variability

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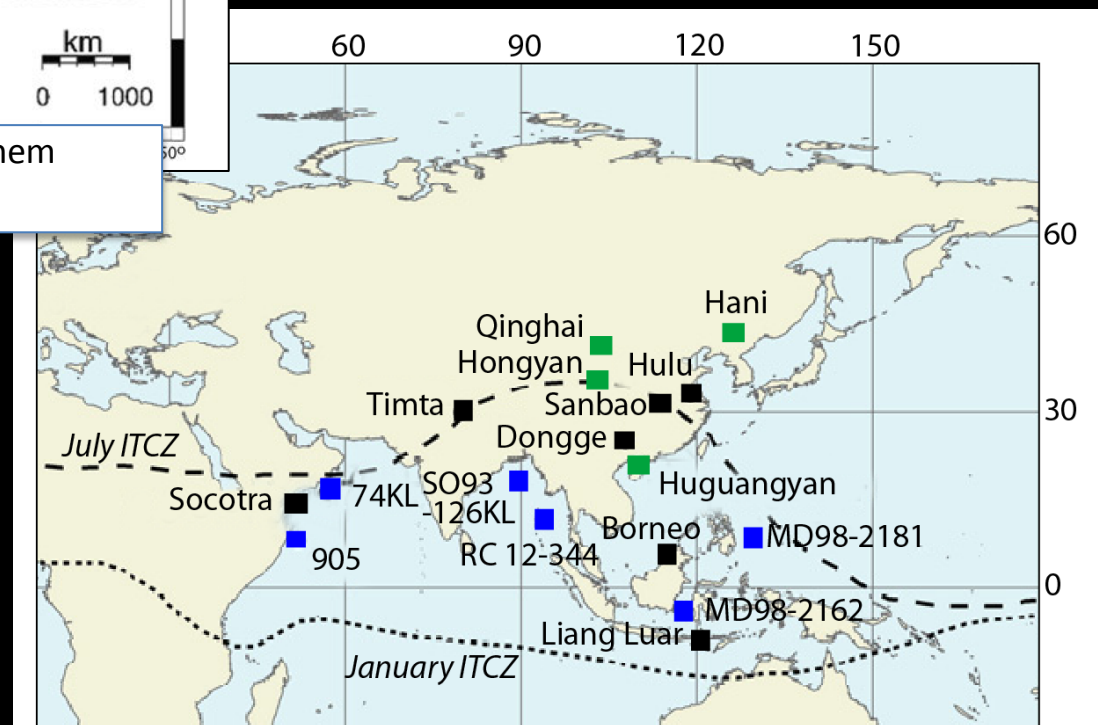
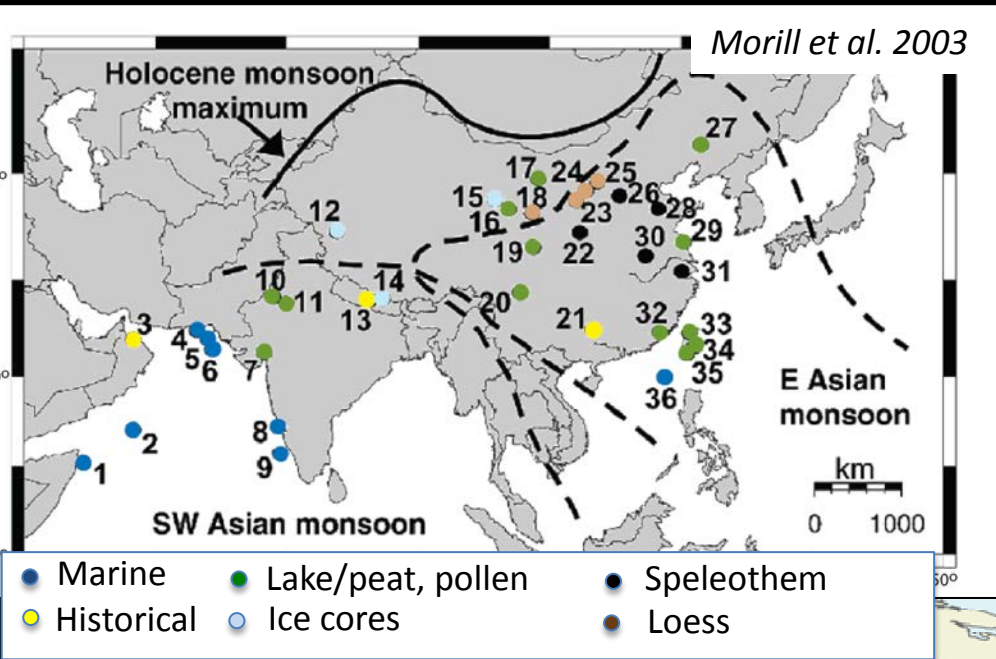
- Current and future climate change
- More than 1/3 of the world's population live in Asia and are/will be influenced by climate change
- Geological records offer a means to better understand natural climate variability in the past

# Climatic and environmental archives

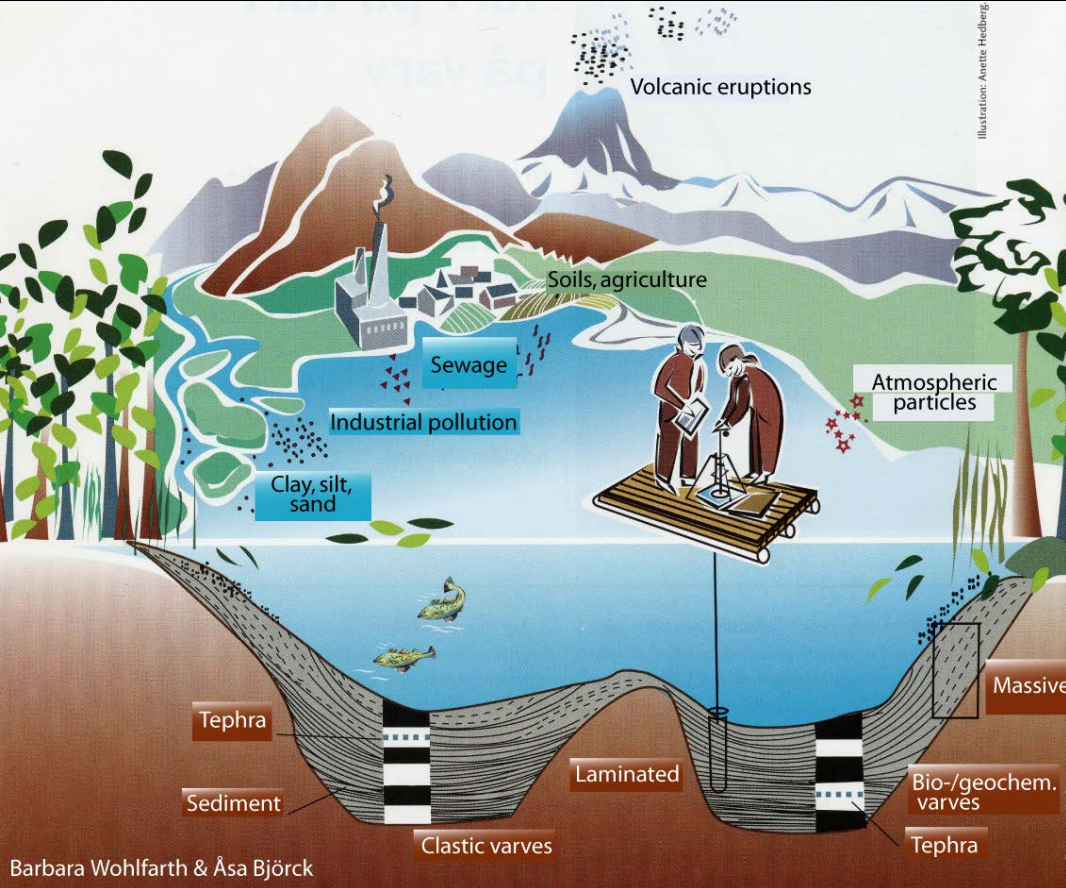




# Few paleo-records are available for SE Asia



# Lake sediment records



Lake & peat deposits/Isla de los Estados



Lake sediments/Gotland



Lake sediments/Northern Sweden

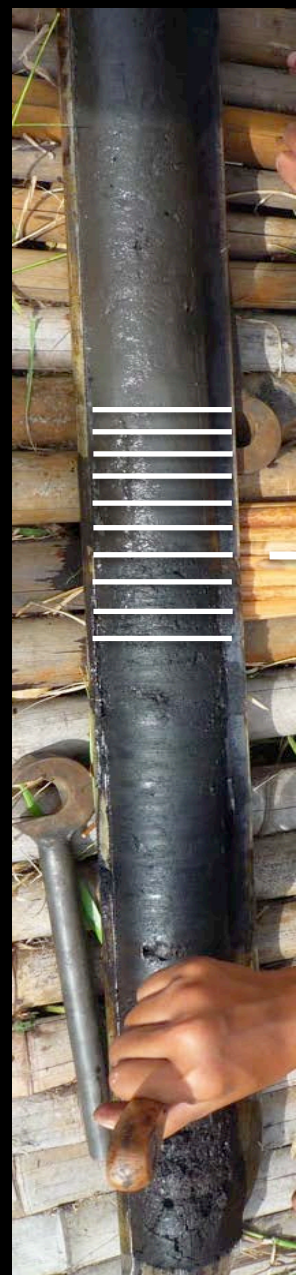


Glacial varved clays/Southern Sweden





# Lake sediments – sampling and analyses



Physical, biological,  
chemical analyses

## Multi-proxy analyses

### Limnic response

- Geochemistry: LOI, TOC, TN, TS, C/N,  $\delta^{18}\text{O}$ ,  $\delta^{13}\text{C}$ ,  $\delta^{15}\text{N}$ ,  $\delta^{34}\text{S}$ , major elements, biogenic silica, biomarkers, compound specific isotope analysis
- Lithology, mineral magnetic properties
- Pollen, plant macrofossils, diatoms

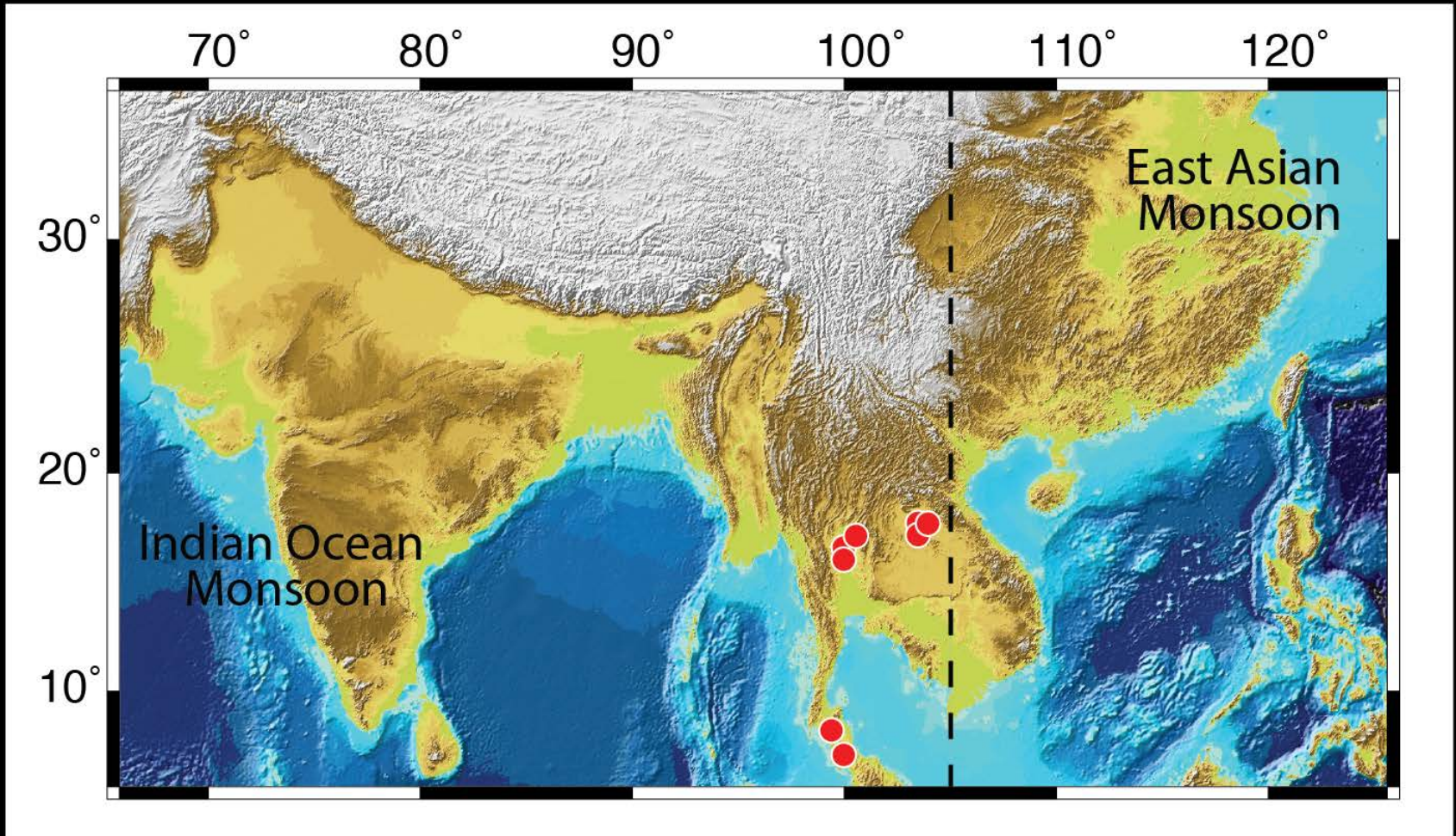
### Terrestrial response

### Geochronology

$^{14}\text{C}$   
Age modelling

**Qualitative and quantitative reconstructions  
(environment, climate)**

# Thailand located 'between' two monsoon systems



8 possible lake records?



# Survey of possible target lakes



# Discussion of a joint project





## Project set up:

- Joint research & research training
- Stockholm University, Chulalongkorn University, University of Nebraska-Lincoln, and Queen's University, Belfast
- Focus on lake sediment records in NW, NE and S Thailand

Swedish Research Council funding for 2009 - 2014

# Project group members 2008



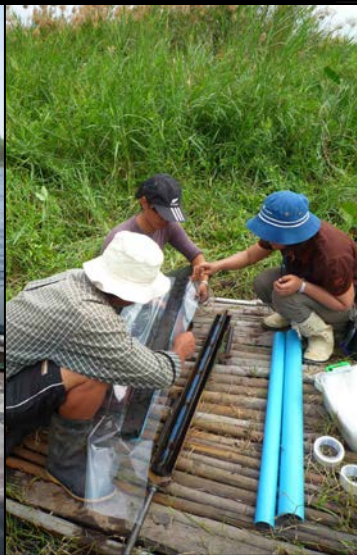


# Searching for suitable lakes and wetlands



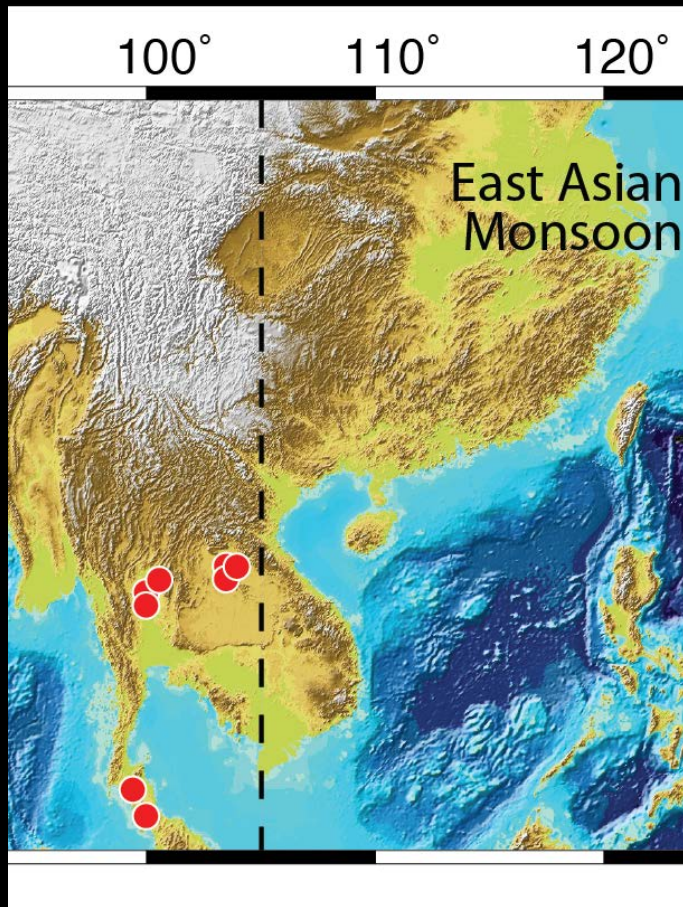


# Searching for suitable lakes and wetlands





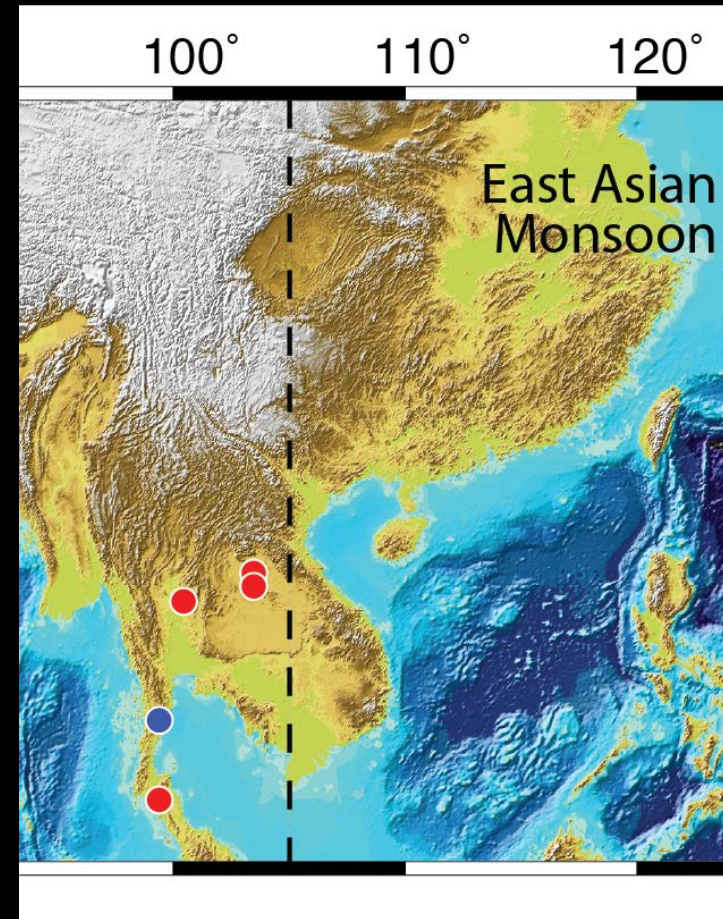
# Suitable lakes – no more than four or five



NW Thailand  
Nong Leng Sai

NE Thailand  
Pa Kho  
Kumphawapi

S Thailand  
Sam Roi Yod  
Nong Thale Pron



Out of >30 surveyed sites



# Thailand Monsoon Project members 2013

## **Helsinki University**

Minna Väiliranta  
MSc students

## **Queen's University, Belfast**

Maarten Blaauw  
Chris Hunt  
Paula Reimer  
PhD student

## **Stockholm University**

Akkaneewut Chabangborn  
Sakonvan Chawchai  
Malin Kylander  
Magnus Mörth  
Rienk Smittenberg  
Christophe Sturm  
Barbara Wohlfarth  
Kweku Yamoah

## **Royal Institute of Technology, Stockholm**

Jenny Brandefelt

## **University of Nebraska-Lincoln**

Sheri Fritz  
PhD student

## **Chulalongkorn University**

Thanawat Jarupongsakul  
Wichuratree Klubseang  
Suda Inthongkaew

## ***National University of Taiwan***

*Chuan-Chou (River) Shen  
Ludvig Löwemark*

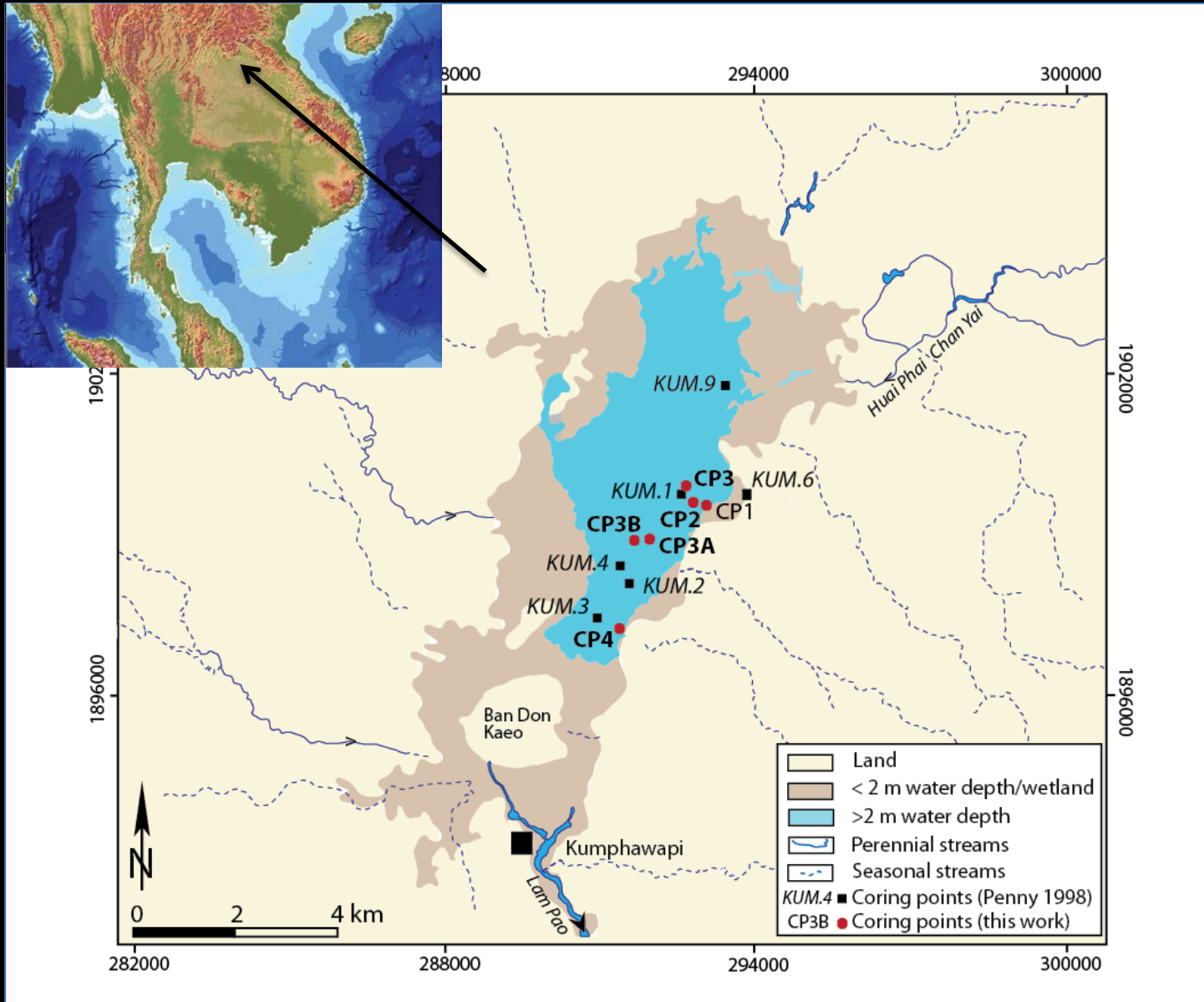




Monsoon impact during the Holocene  
Viewed from Nong Han (Lake) Kumphawapi

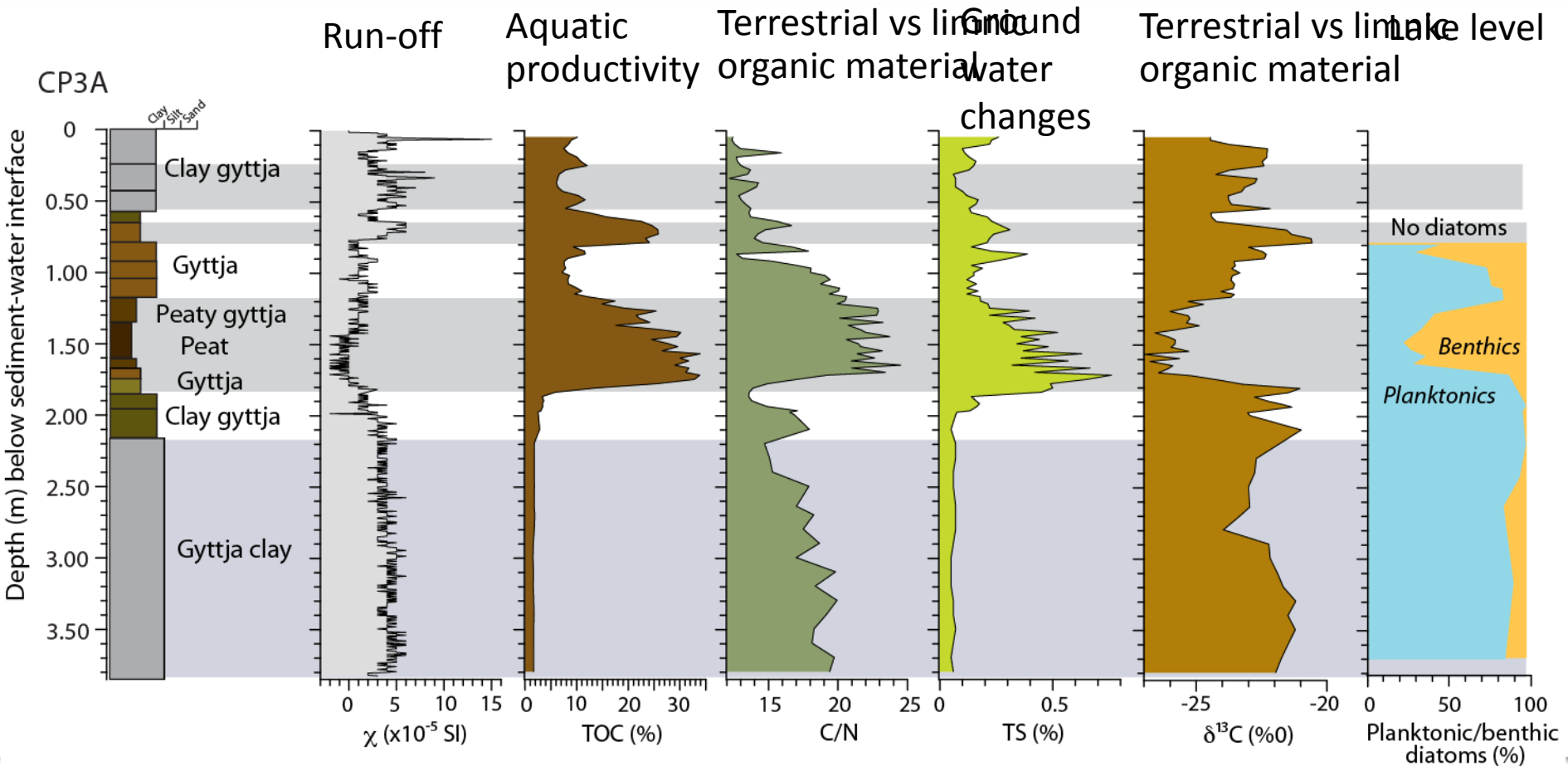


# Lake Kumphawapi, NE Thailand

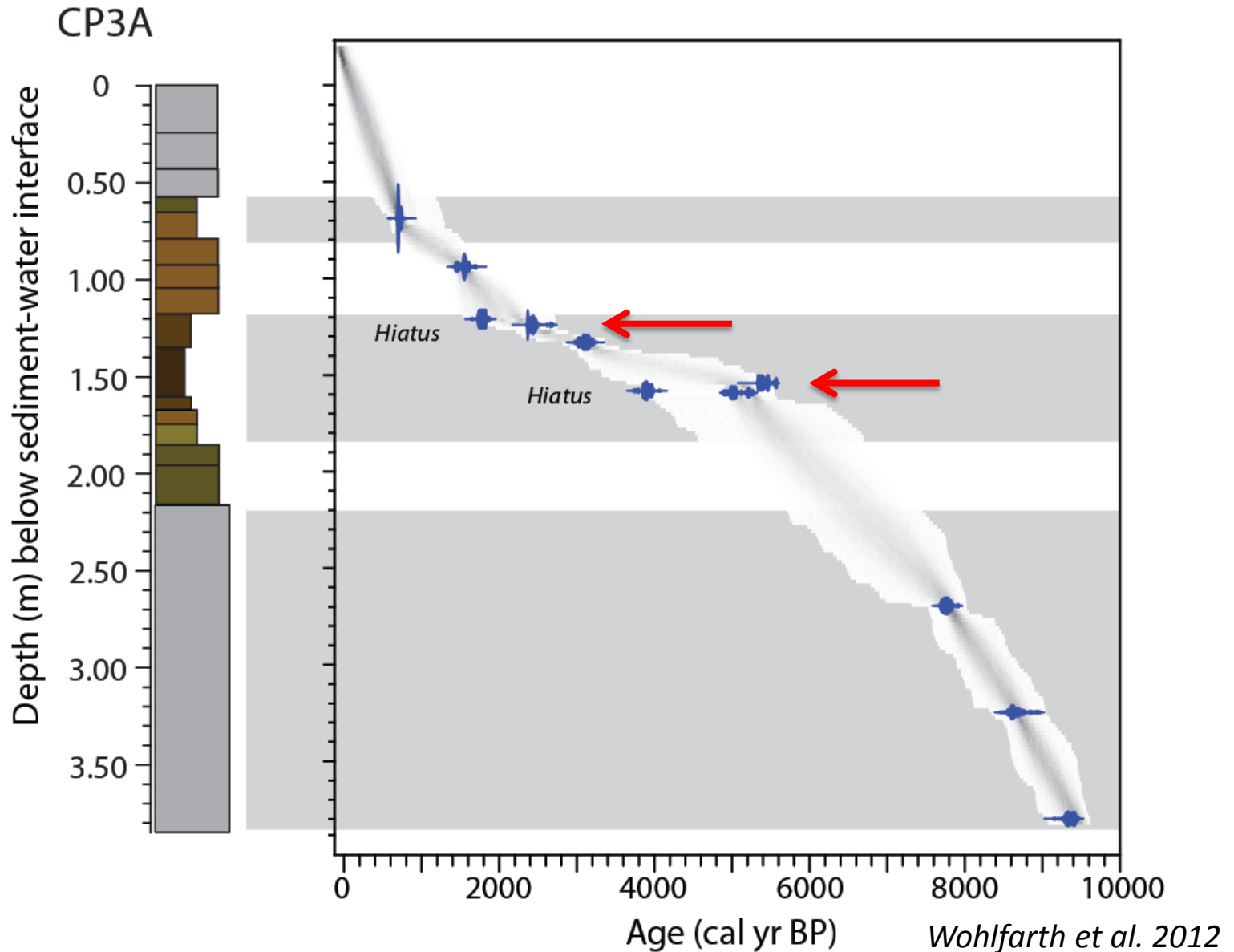




# Lake Kumphawapi – some proxies



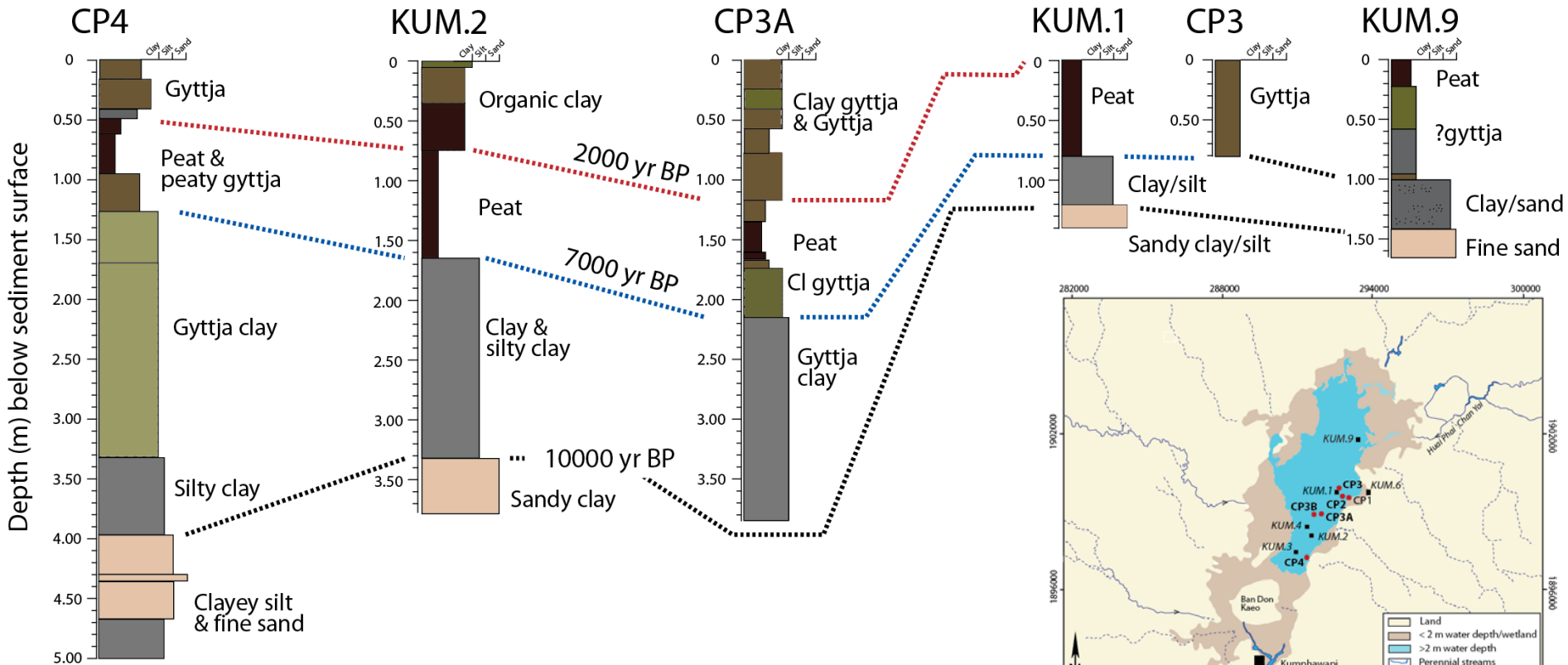
# Kumphawapi – age model



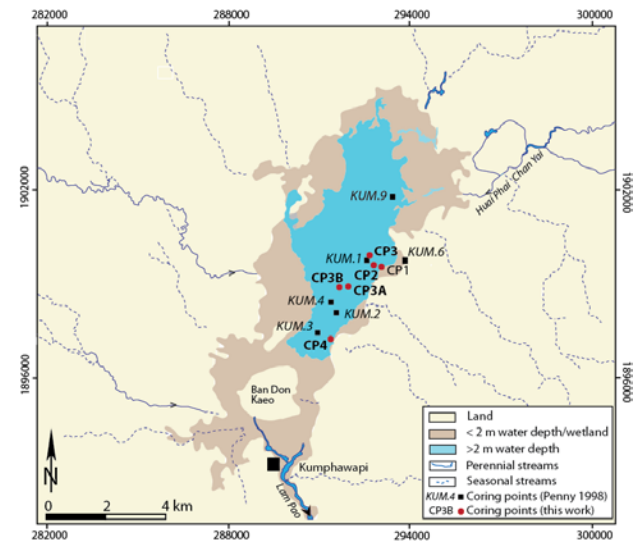


# SW – NE transect across Kumphawapi

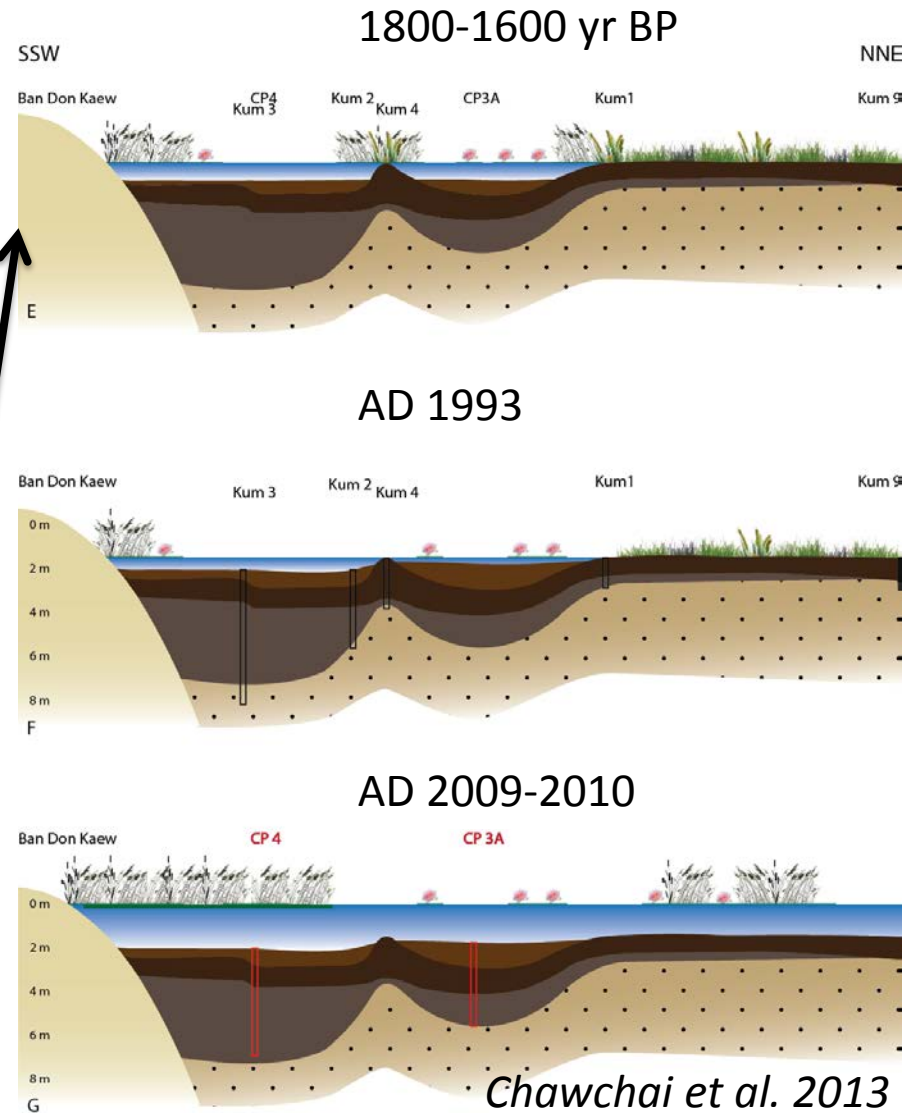
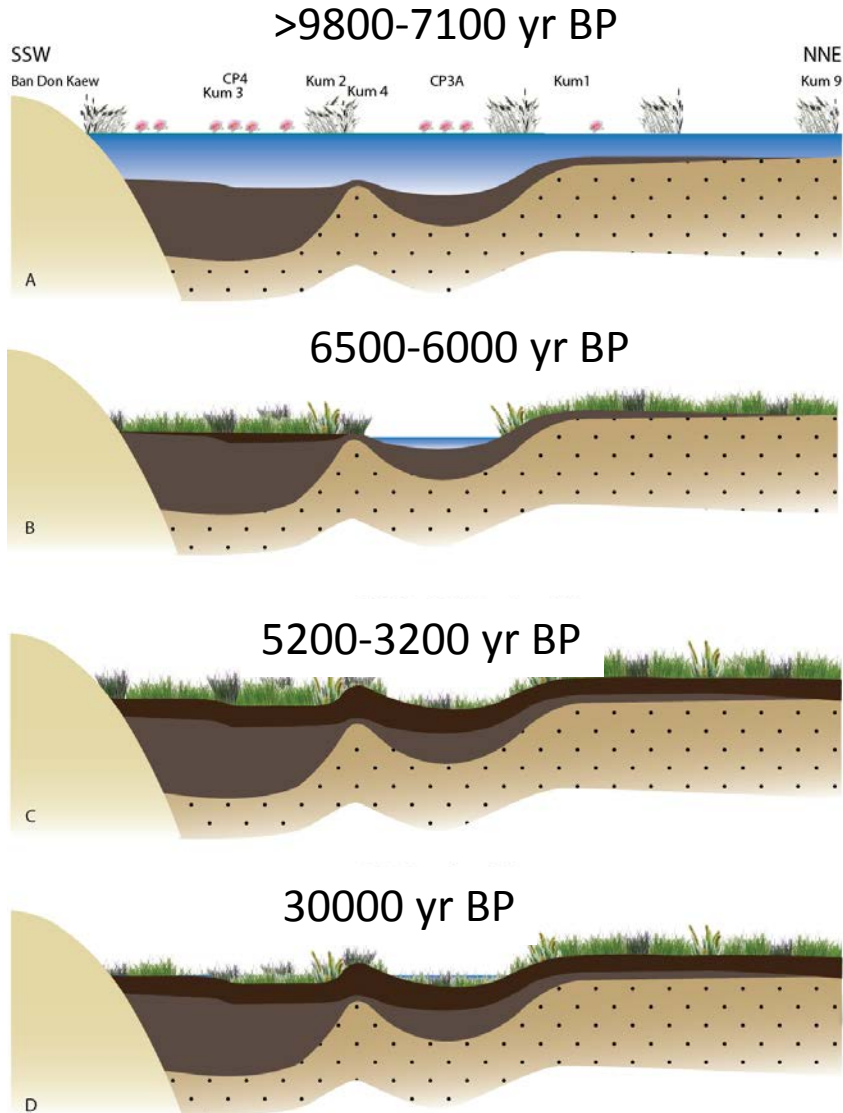
## Transect G



Time-transgressive development!

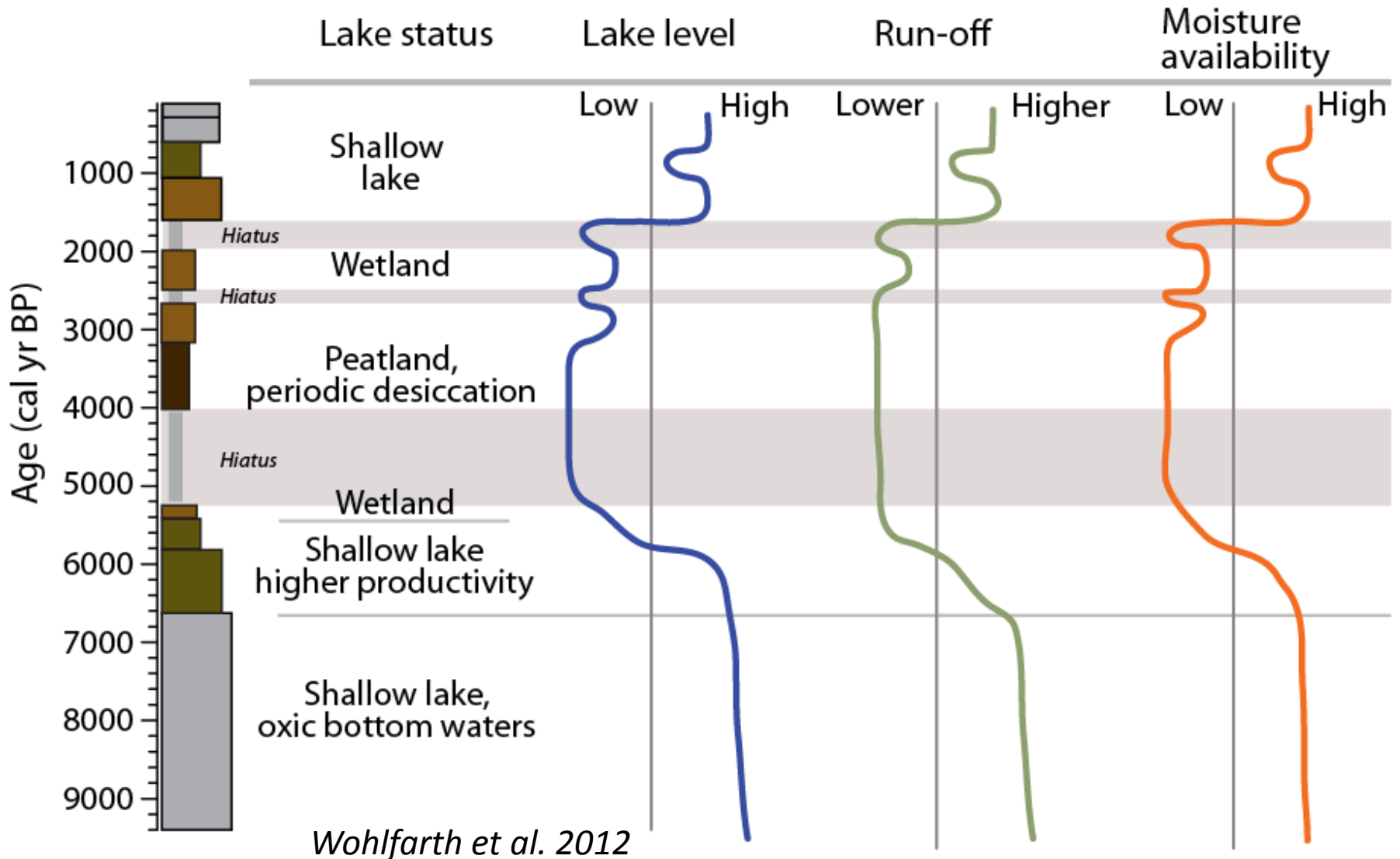


# Kumphawapi – lake status changes

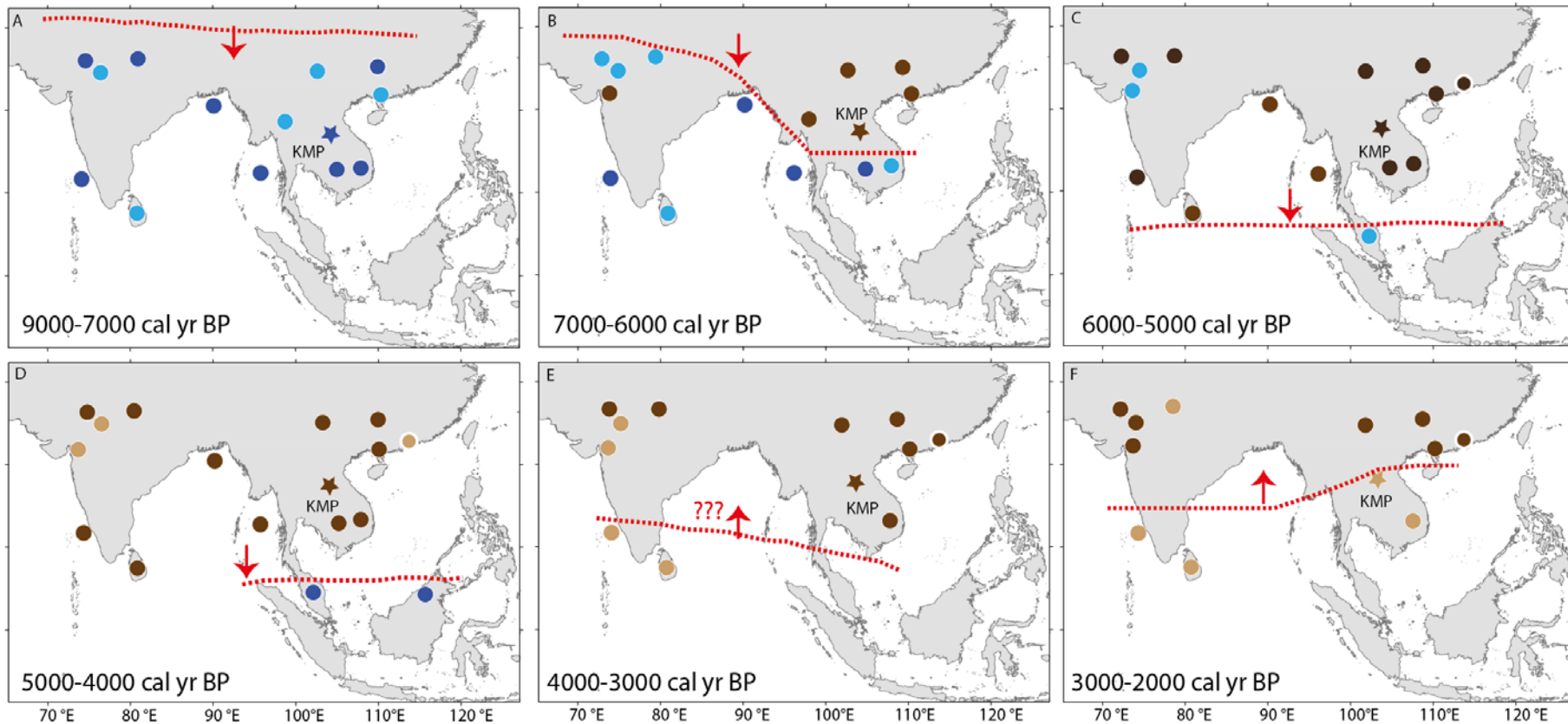




# Kumphawapi - qualitative reconstruction



# Kumphawapi – in space and time



New data from Yu et al. 2012 added

*Modified after Chawchai et al. 2013*

- Very high moisture availability
  - Very low moisture availability
  - High moisture availability
  - Low moisture availability
- - - ITCZ



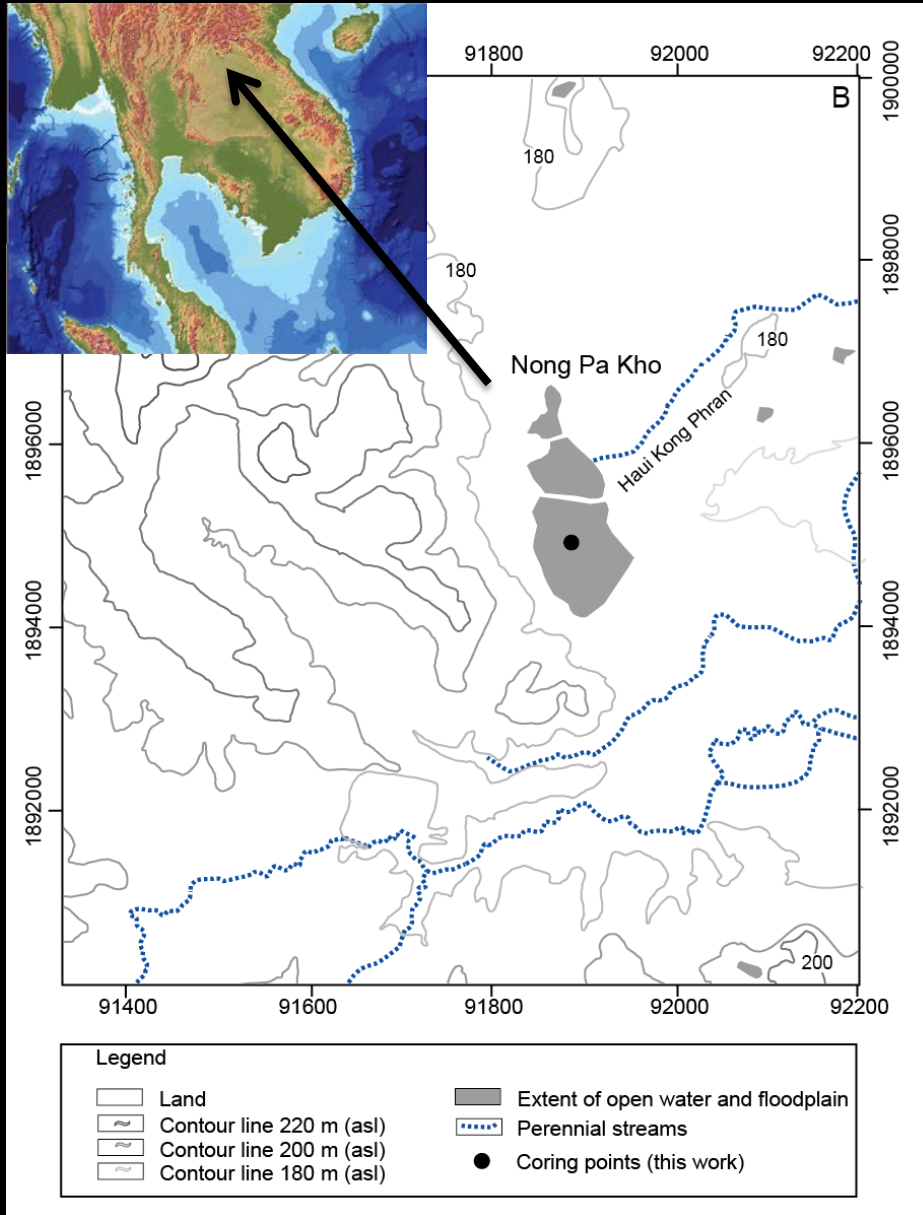


Monsoon impact during the last 2000 years

Viewed from Lake Pa Kho

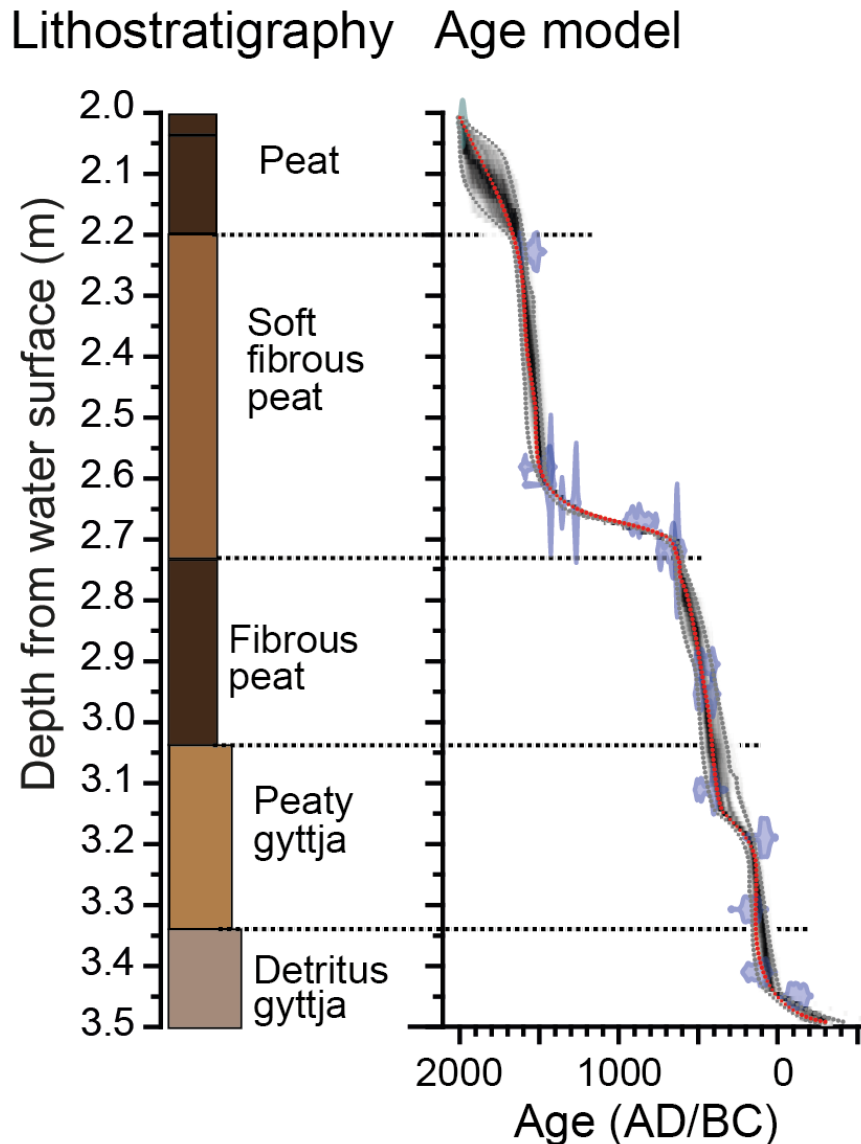


# Lake Pa Kho and the last 2000 years





# Lake Pa Kho and the last 2000 years



22  $^{14}\text{C}$  dates on  
plant macro  
remains for 150 cm  
of sediment

- Few suitable lake sediment sequences in Thailand
- Centennial- (and decadal) scale shifts in moisture availability are recorded
- Linked to summer monsoon intensity





# Thailand Monsoon Project

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## *Work in progress:*

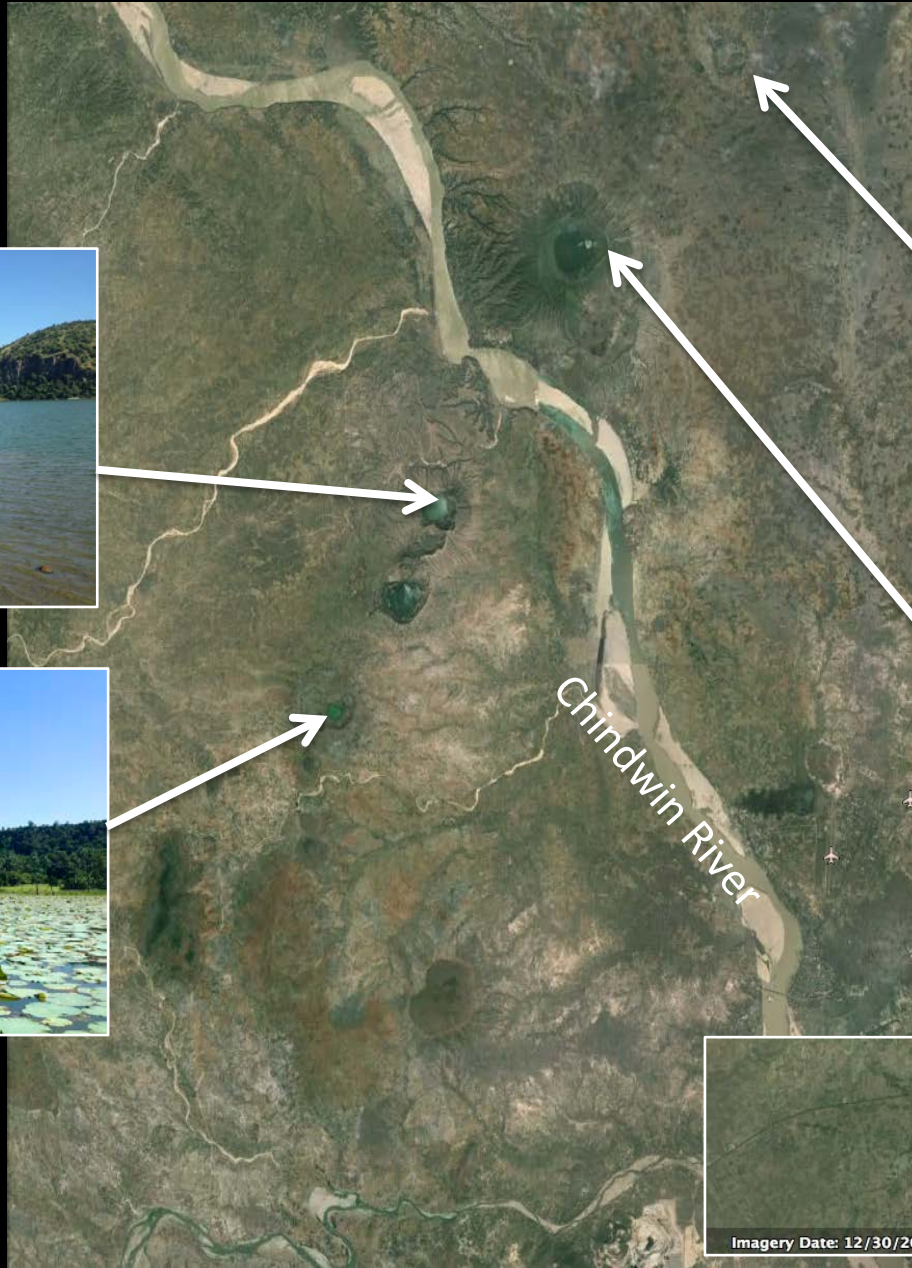
- Pa Kho – the last 2000 years (Chawchai et al.)
- Pa Kho – 20,000-50,000 years (Chabangborn et al.)
- Paleoclimate and paleoenvironment during the past 2000 years in northern Thailand (Chawchai et al.)
- Biomarkers & compound specific isotopes: Kumphawapi, Pa Kho (Yamoah et al.)
- Nong Thale Pron, S Thailand (last 17,000 years)
- MSEA and LGM compilation (Chabangborn & Wohlfarth)

# Myanmar fieldwork November 2013





# Myanmar fieldwork November 2013





# Myanmar fieldwork November 2013







Documentary about  
our project:

*Under the Eyes of the  
Buddha I and II*

[http://www.youtube.com/u  
ser/GeologicalSciences](http://www.youtube.com/user/GeologicalSciences)





Thank you

