Lake Ohrid Drilling Project SCOPSCO :

Scientific Collaboration on Past Speciation Conditions in Lake Ohrid

ICDP summer school, Lake Ohrid, September, 13-15, 2015

icdp

Bundesministerium
für Bildung
und Forschung

INGV

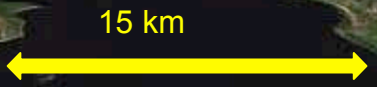
DFG

British
Geological Survey

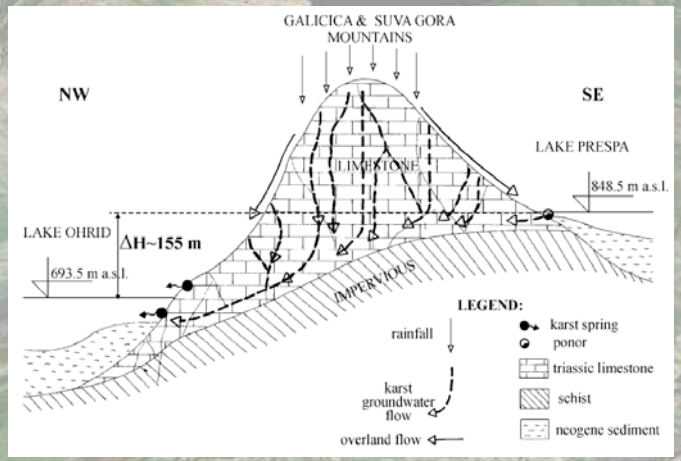
Completed ICDP lake drilling projects > 1 Ma

Project history: Lake Ohrid facts

Lake Prespa:	
Altitude:	849 m a.s.l.
Surface area:	254 km²
Volume:	3.6 km³
Max. depth:	48 m
Mean depth:	14 m
Catchment:	1300 km²
State:	mesotrophic



Lake Ohrid:	
Altitude:	693 m a.s.l.
Surface area:	360 km²
Volume:	55 km³
Max. depth:	293 m
Mean depth:	155 m
Catchment:	1300 km²
State:	oligotrophic



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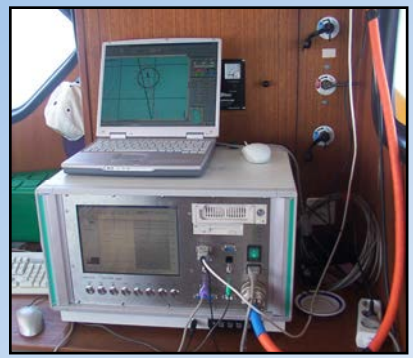
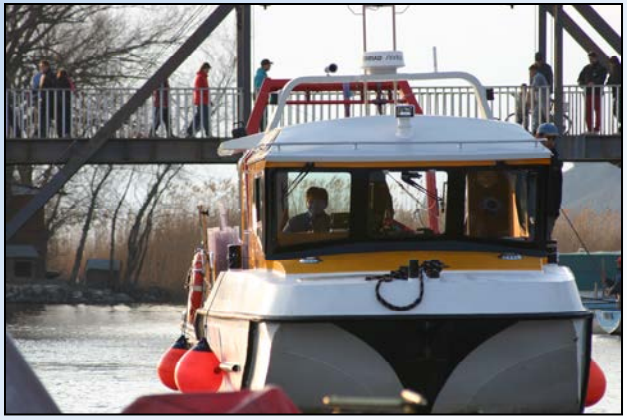
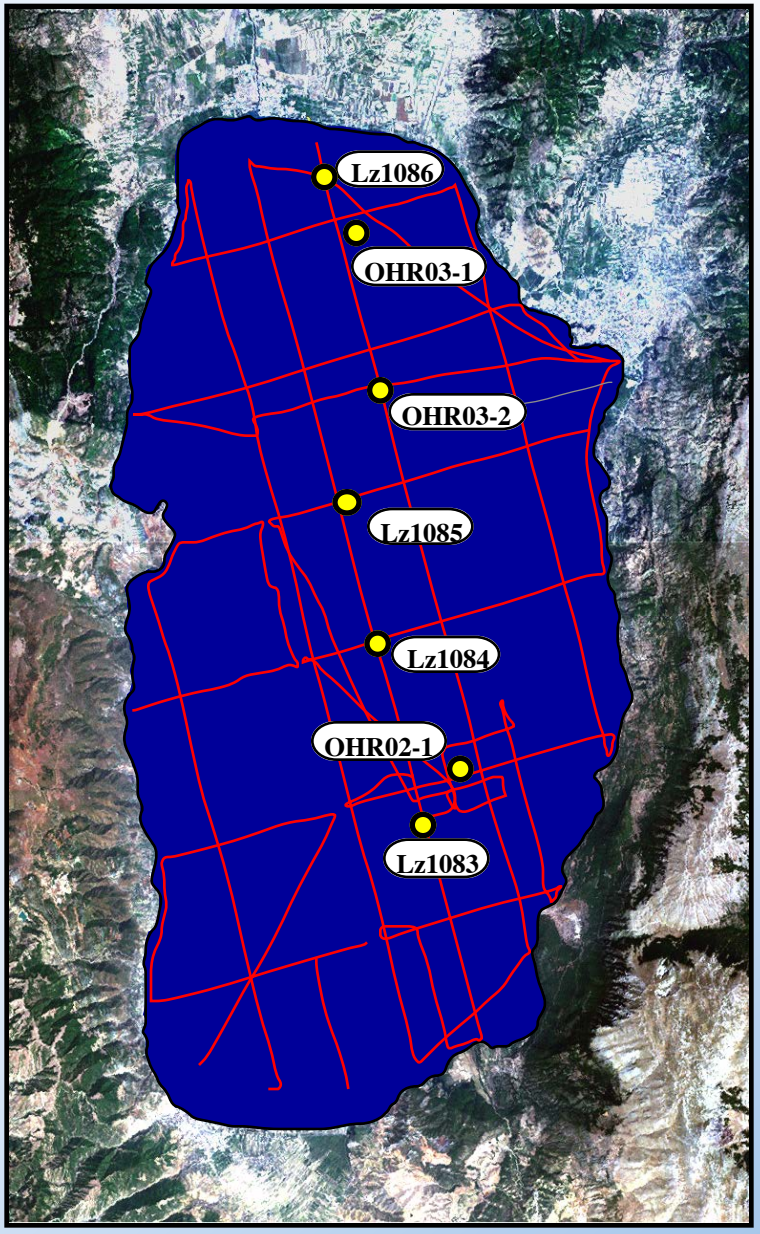
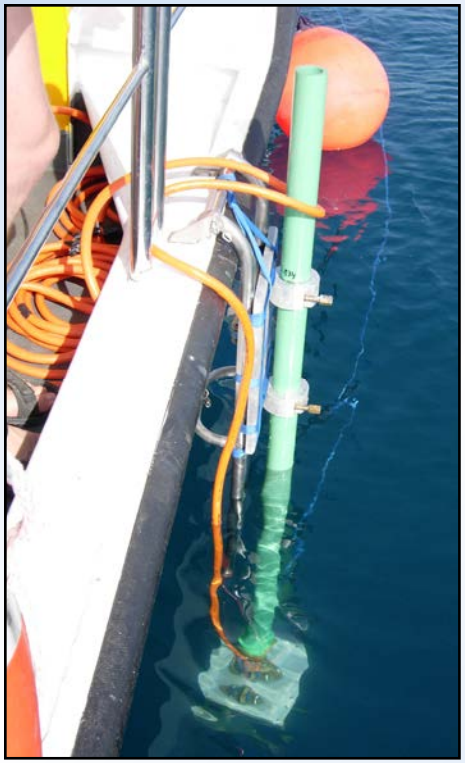
Project history: 2004 field campaign









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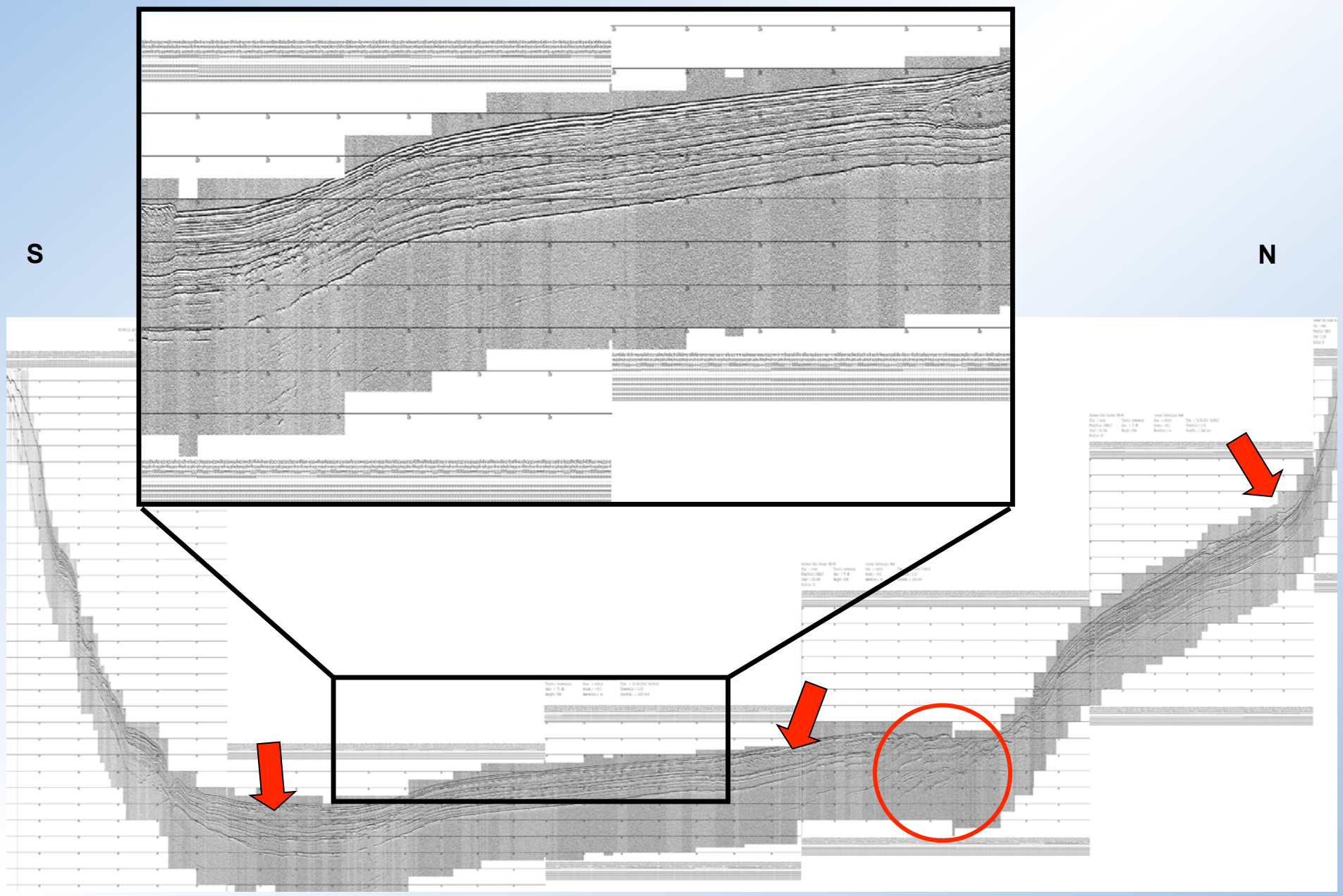

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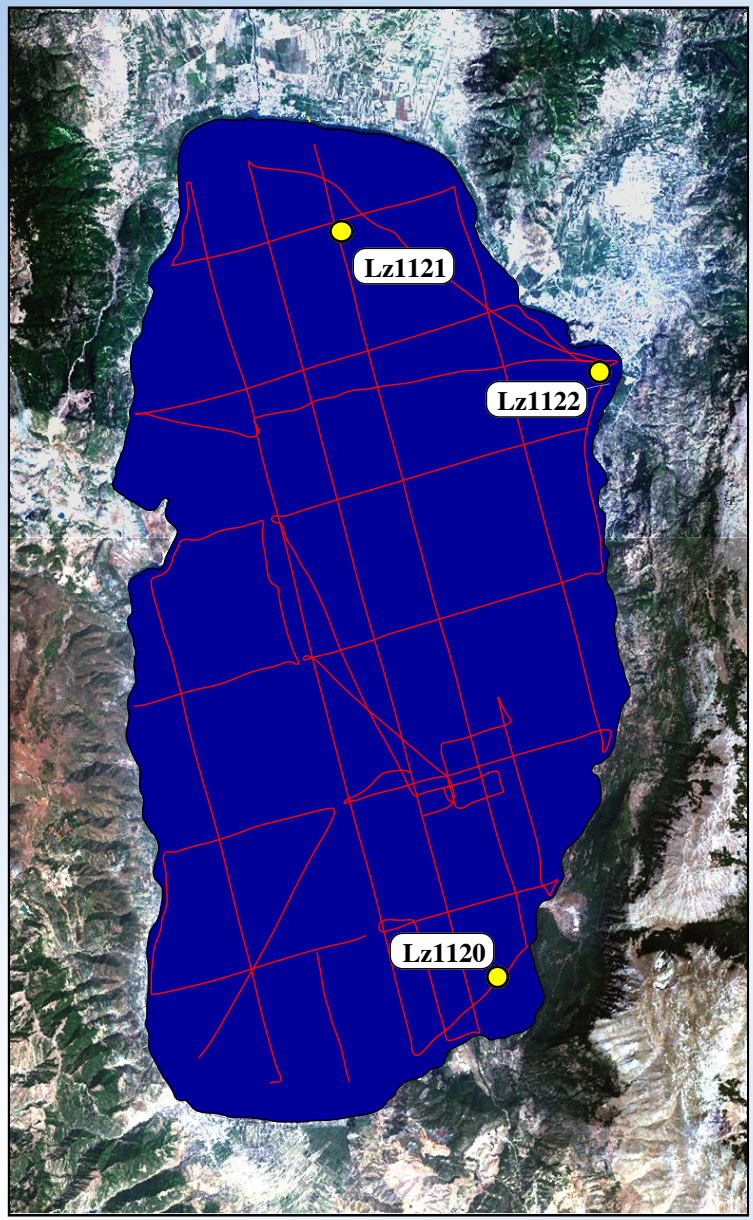
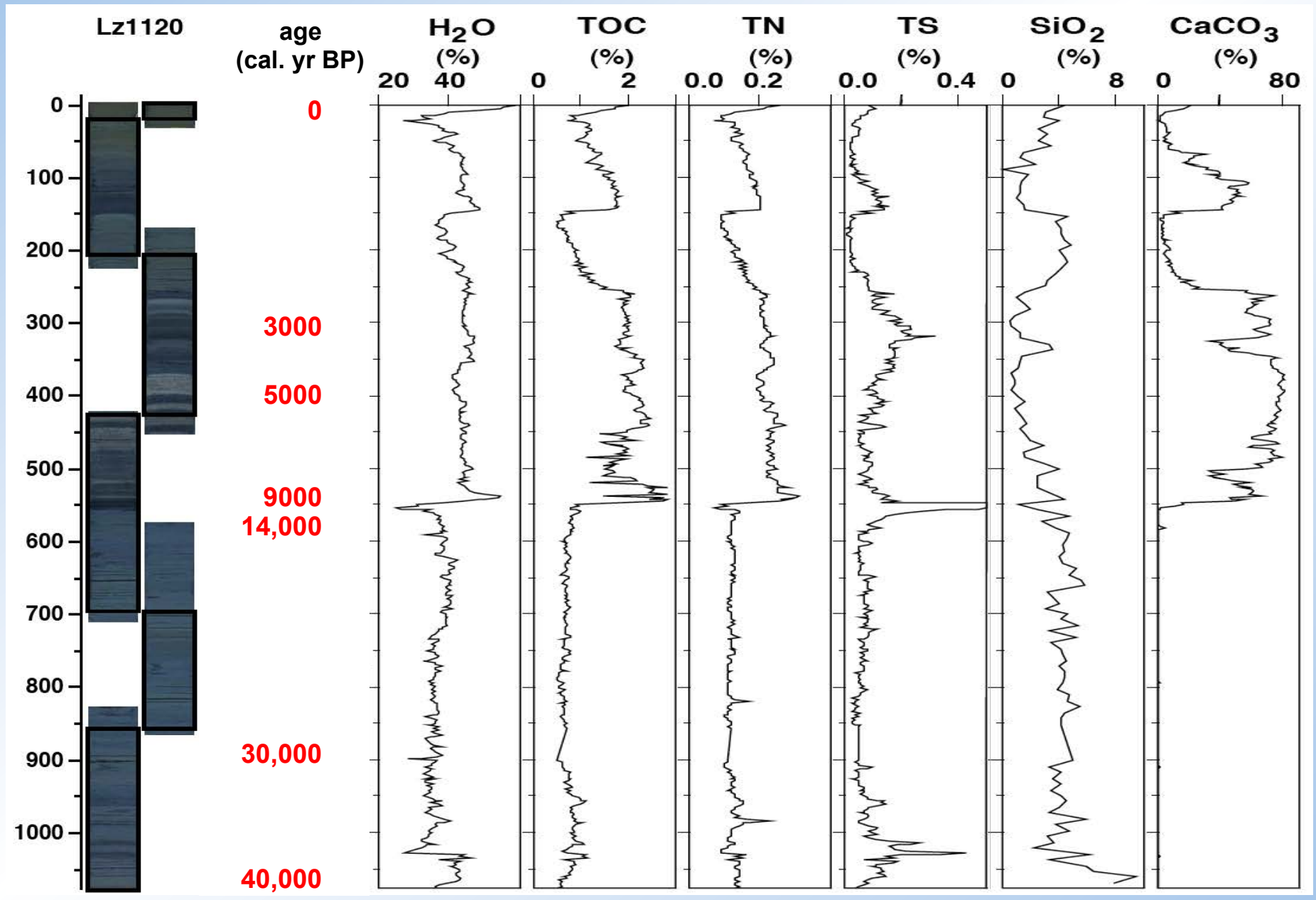


Project history: 2005 field campaign



Wagner et al. 2008

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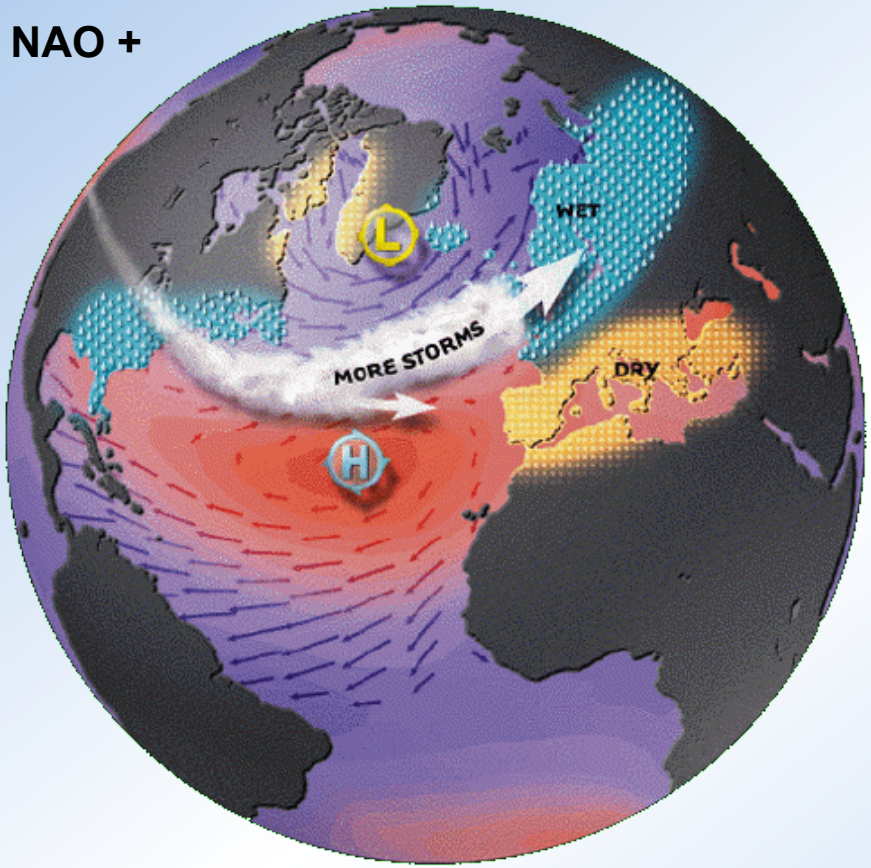
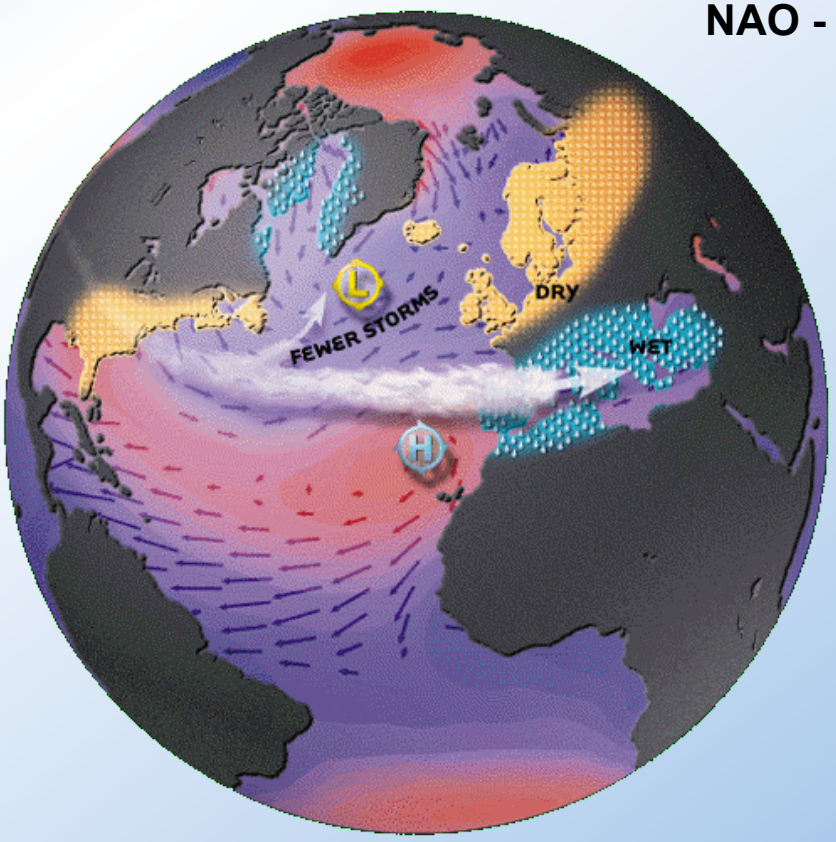
definition of scientific goals

Climate history:

NAO +

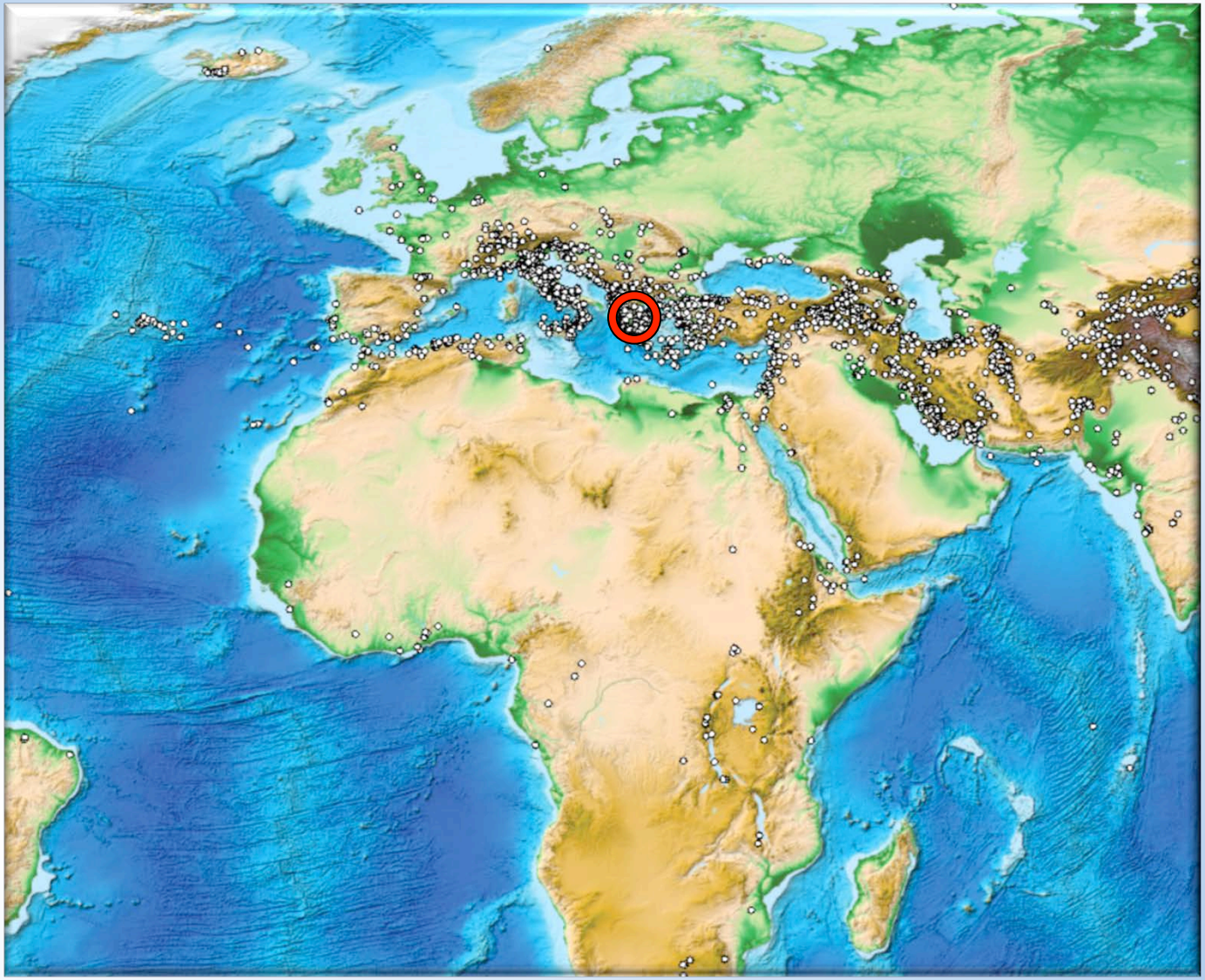


NAO -



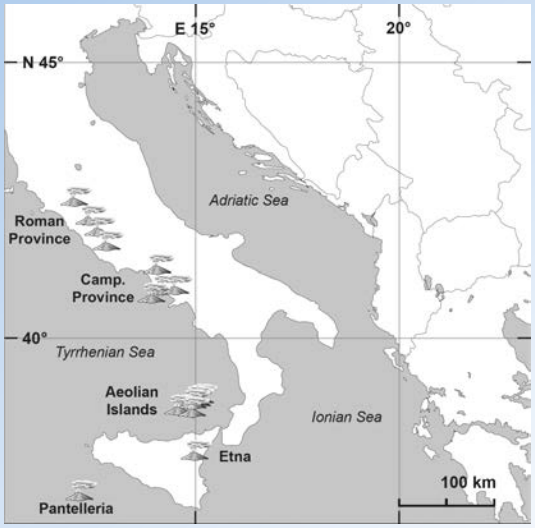
after M. Visbeck

Tectonic history:

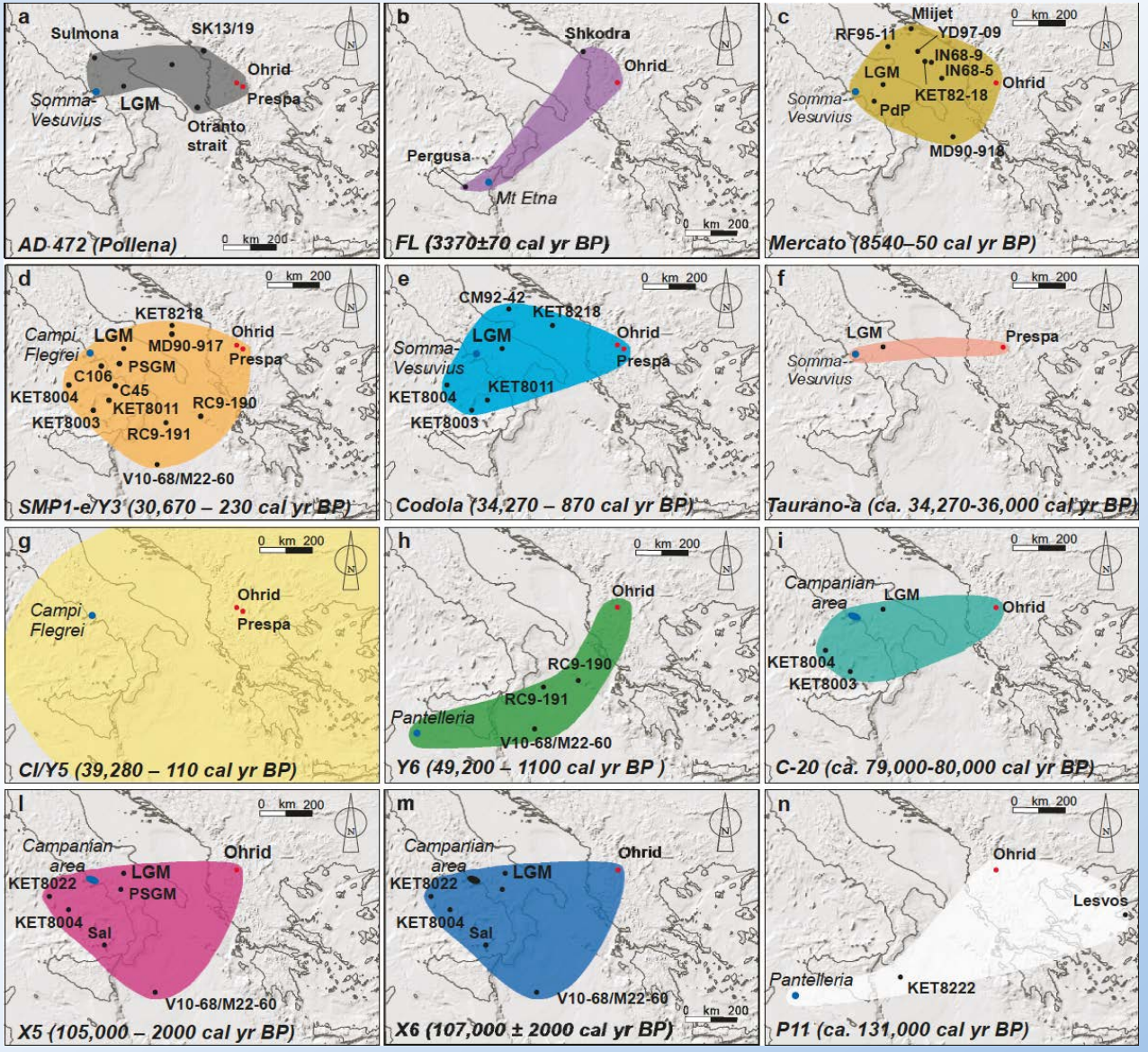


NOAA, National Geophysical Data Center

Volcanic history:

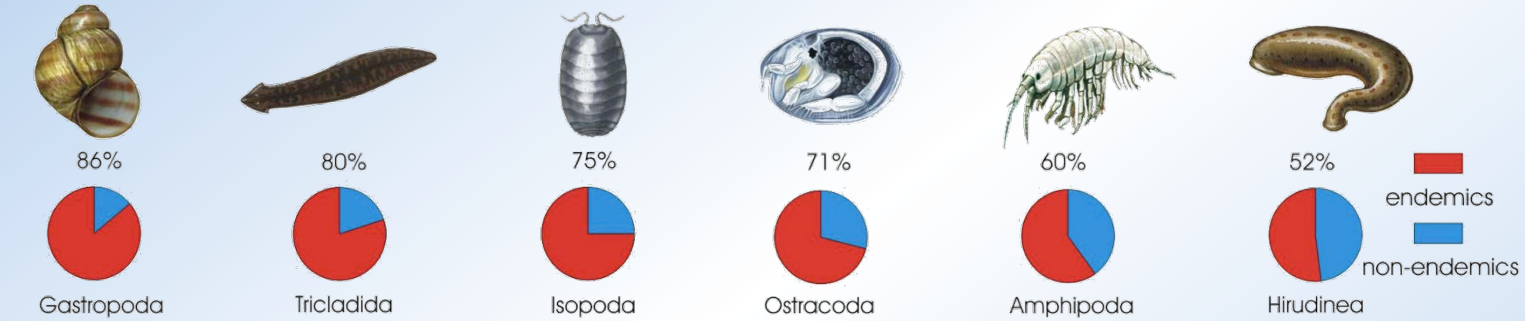


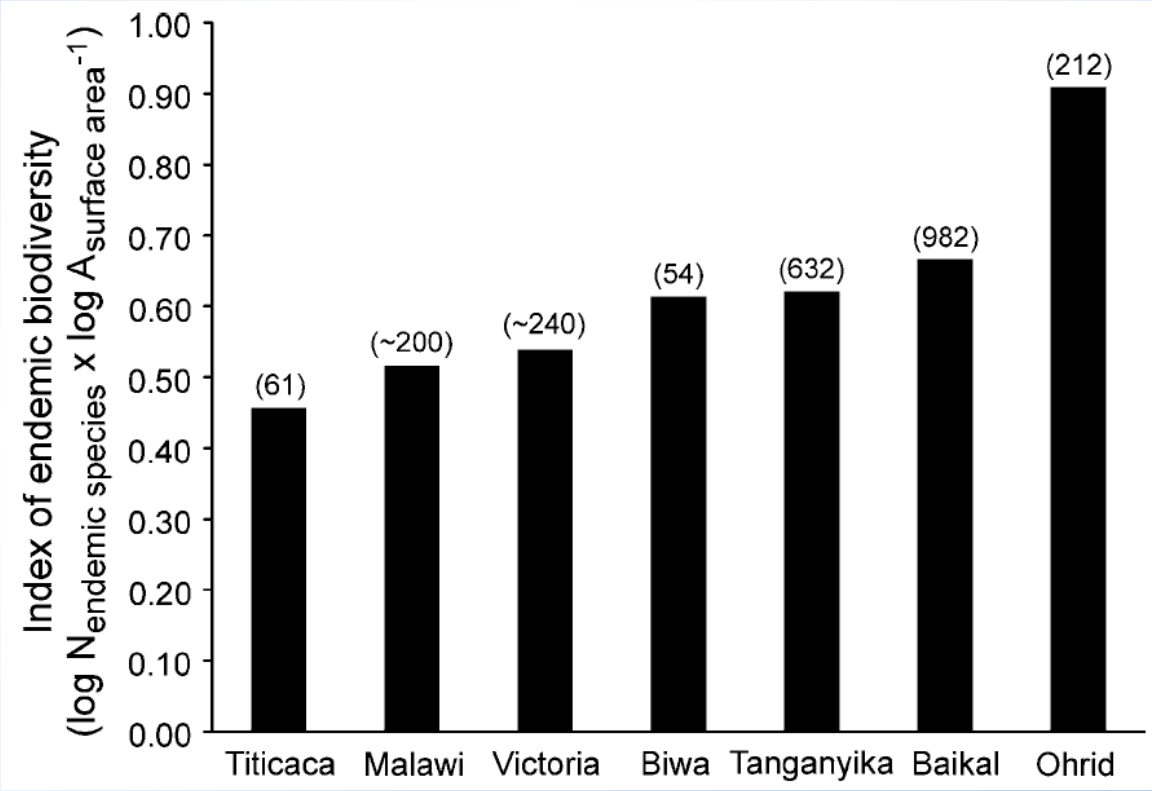
Damaschke et al. 2012



Sulpizio et al. 2010

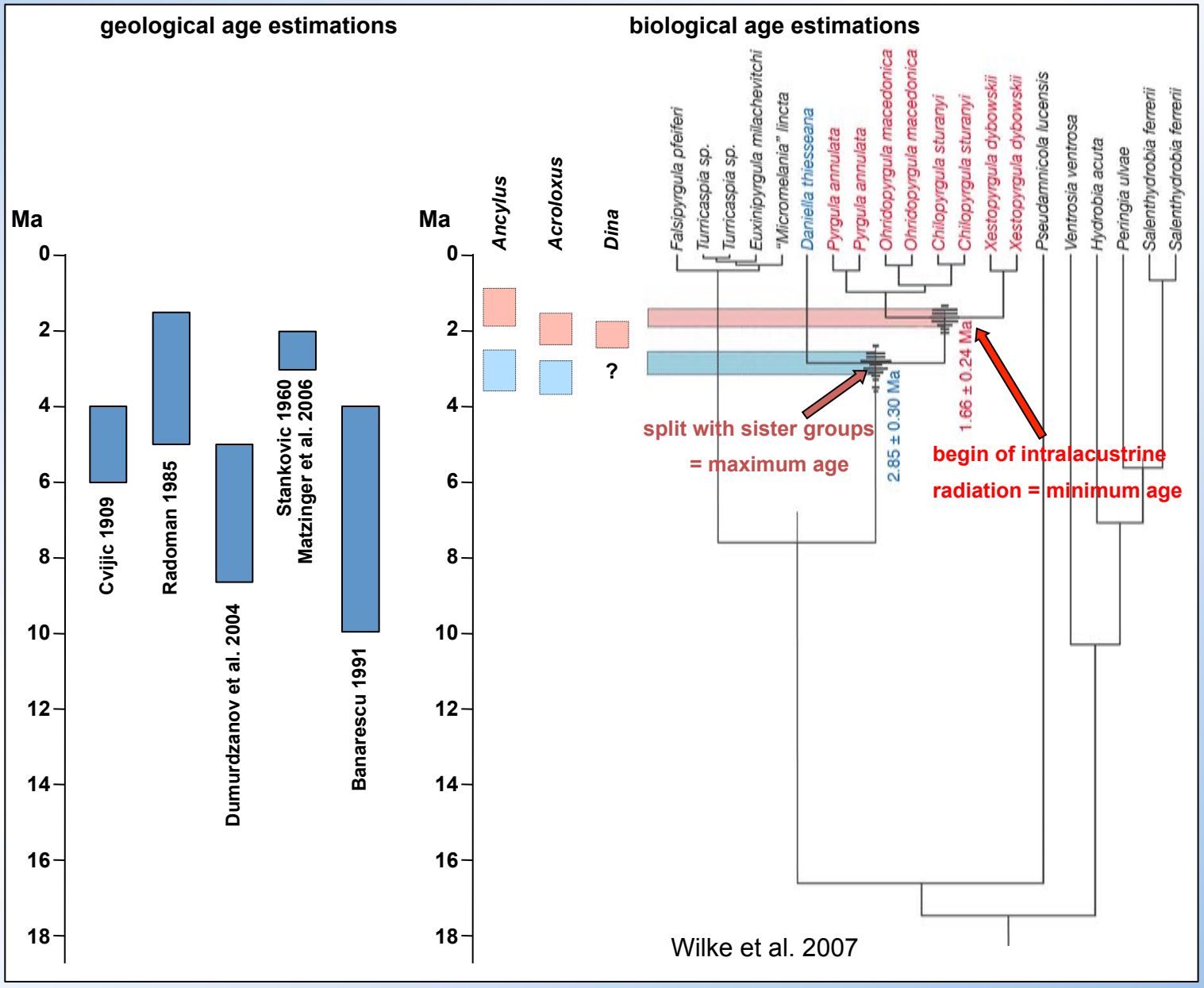
Endemism and Speciation:





Albrecht & Wilke 2008

Age and origin:



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definition of scientific goals:
- to obtain more information about the age and origin of the lake,
- to obtain a continuous record of tectonic and volcanic activities and climate changes
- to better understand the link between geological events and evolutionary processes

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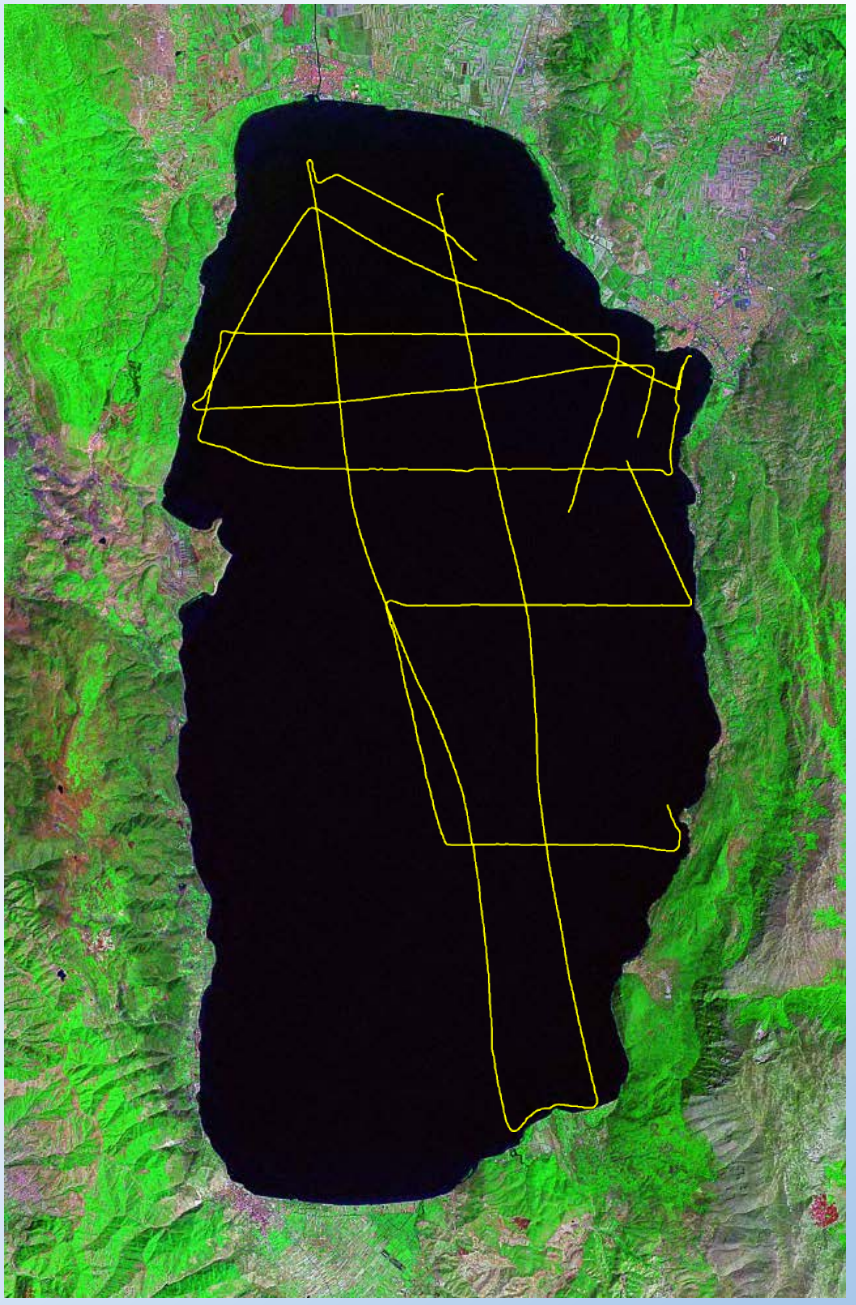
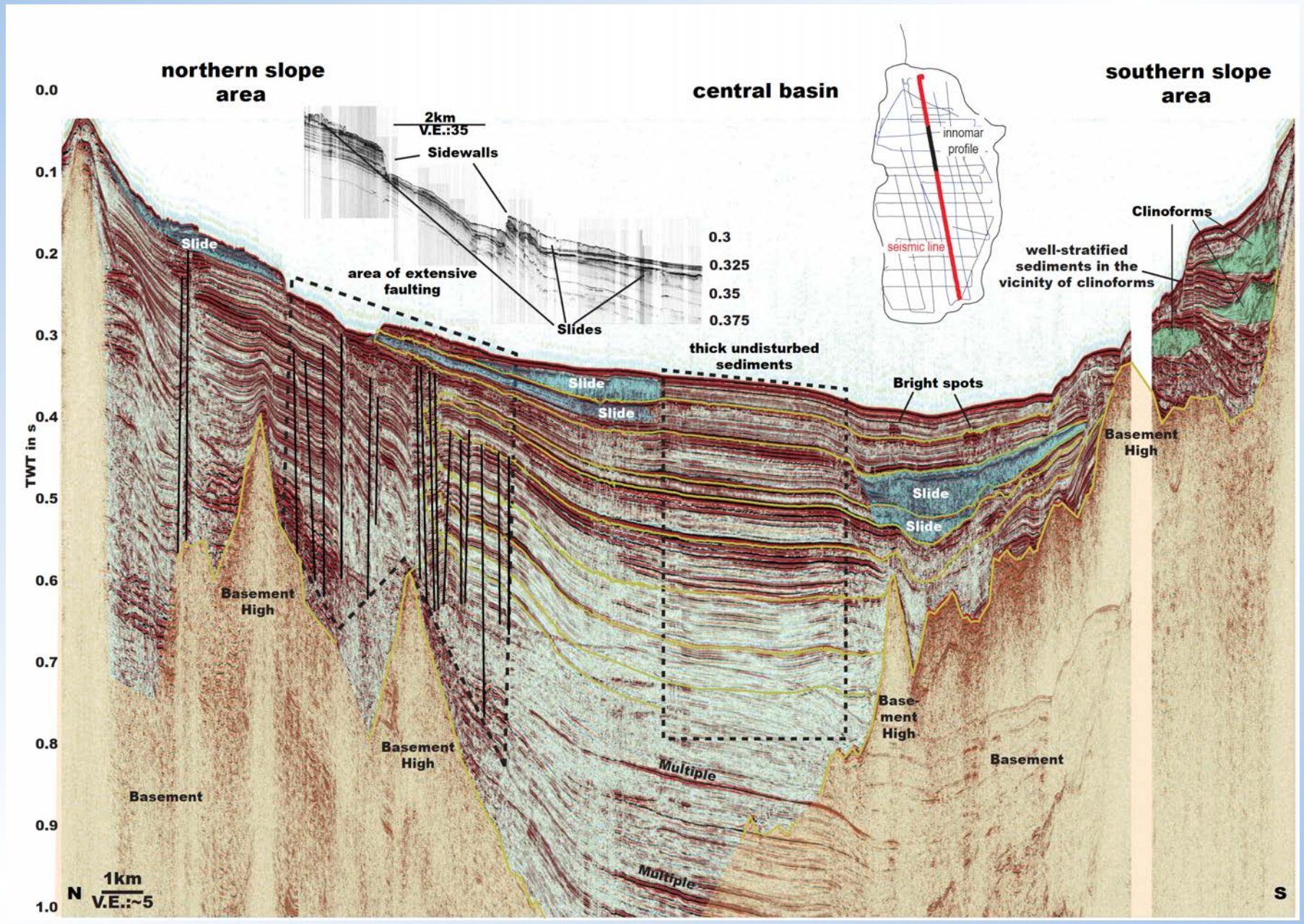
definition of scientific goals:

June: Proposal rejected, better seismic survey needed, re-submission proposed

Project history: 2007 field campaign



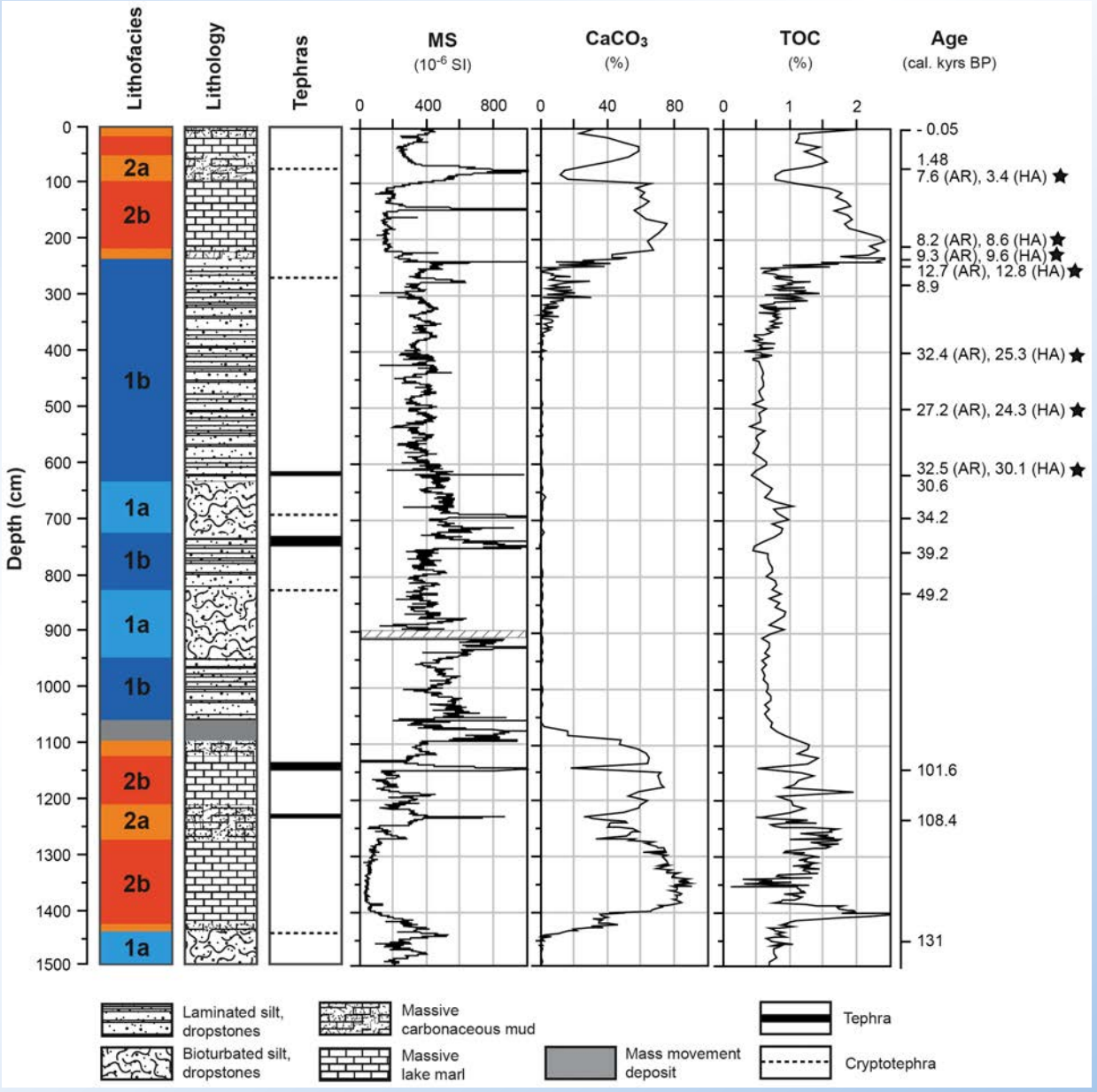
Project history: 2007 field campaign



Lindhorst et al. 2010

Project history: 2007 field campaign

Piston core Co1202



Vogel et al. 2010

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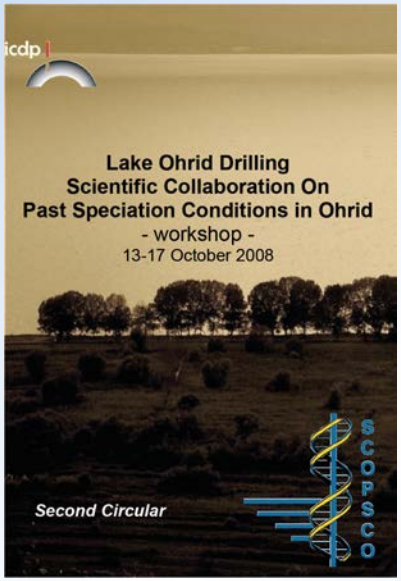
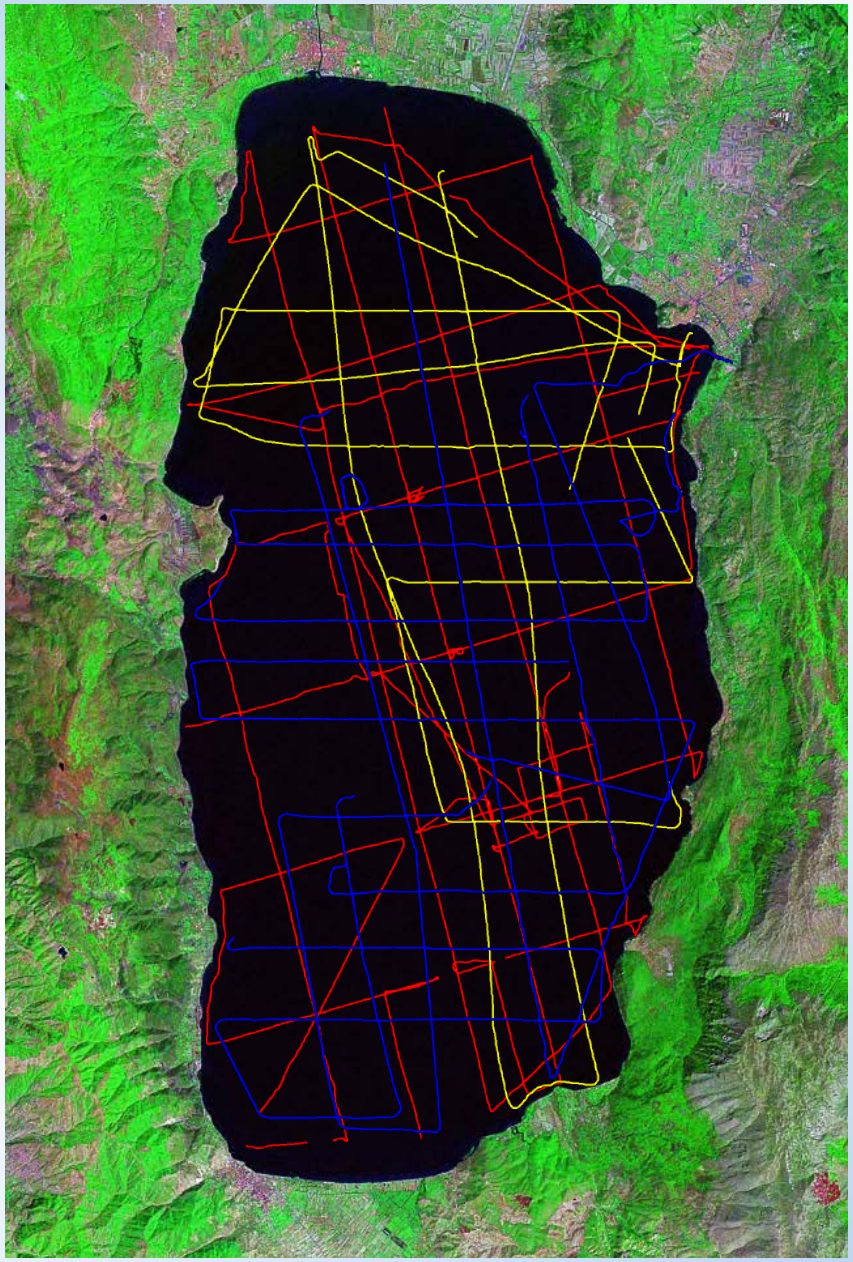
Project history: ICDP workshop



Project history: Hydroacoustic survey 2008



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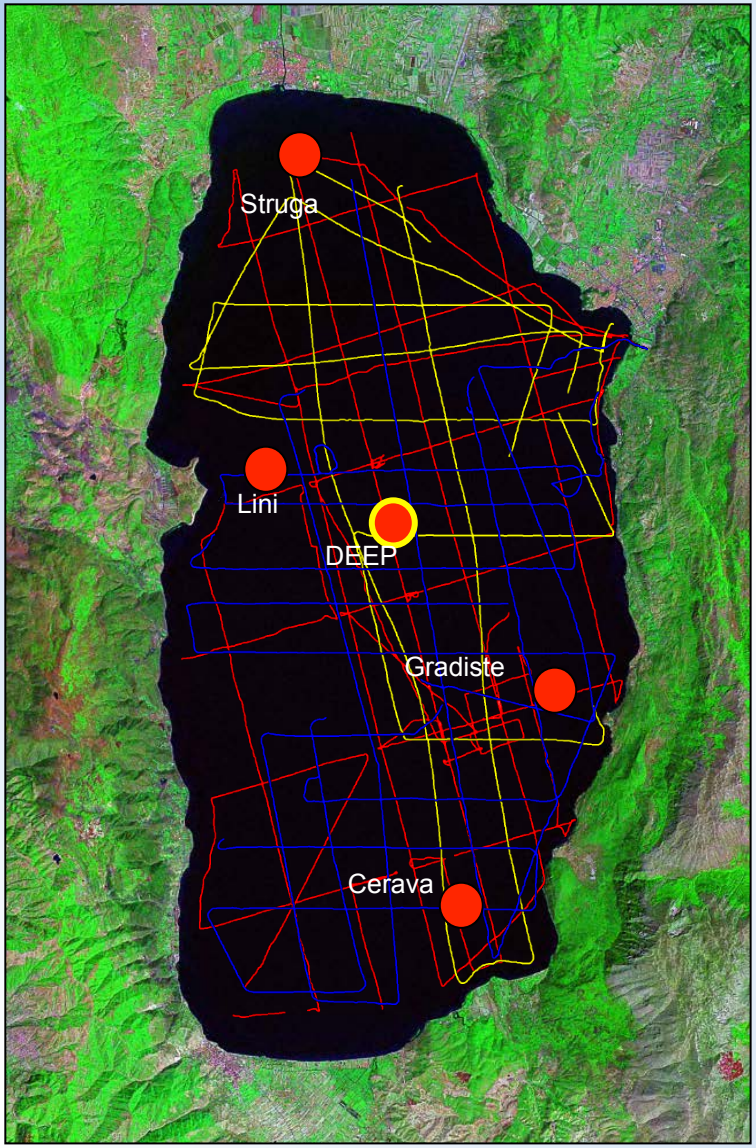
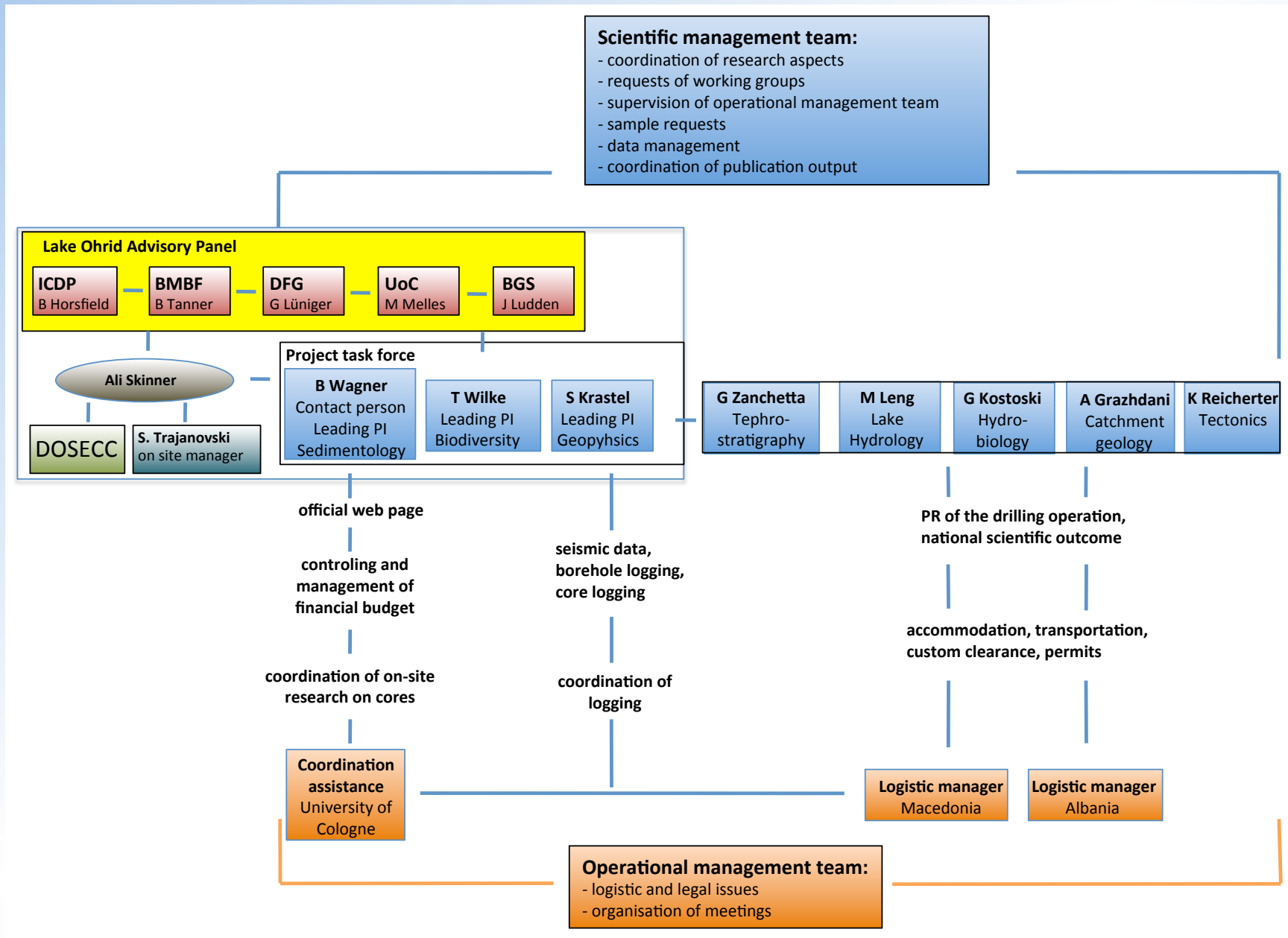
2009: January: Submission of Full proposal to ICDP (total budget : 2.37 Mio USD, budget requested : 1.67 Mio USD)
June: Proposal approved (0.75 Mio USD)

SCOPSCO – proposed drill sites



Drill site	water depth (m)	core length (m)	aims
DEEP	250	680	age/origin, master record, climate, tephras, evolution
Struga	80	160	hydrology, biodiversity, evolution
Cerava	125	130	lake level, catchment dynamics, biodiversity and evolution
Gradiste	130	80	active tectonics,spring dynamics biodiversity and evolution
Lini	260	20	active tectonics, mass wasting

Project history: ICDP Full proposal



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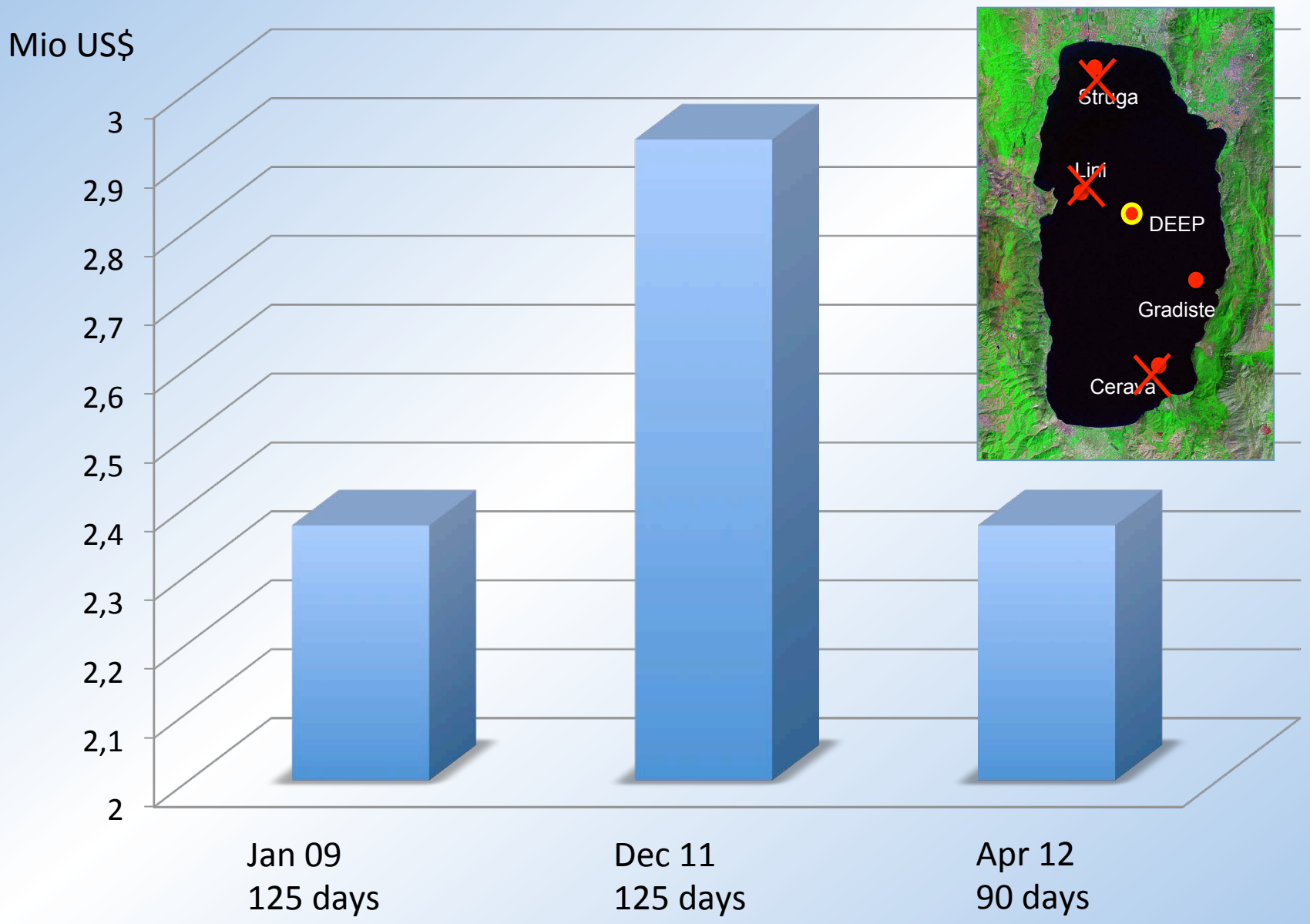
2009 – 2012: Seek for additional funding, logistic preparation

Project history: Costs

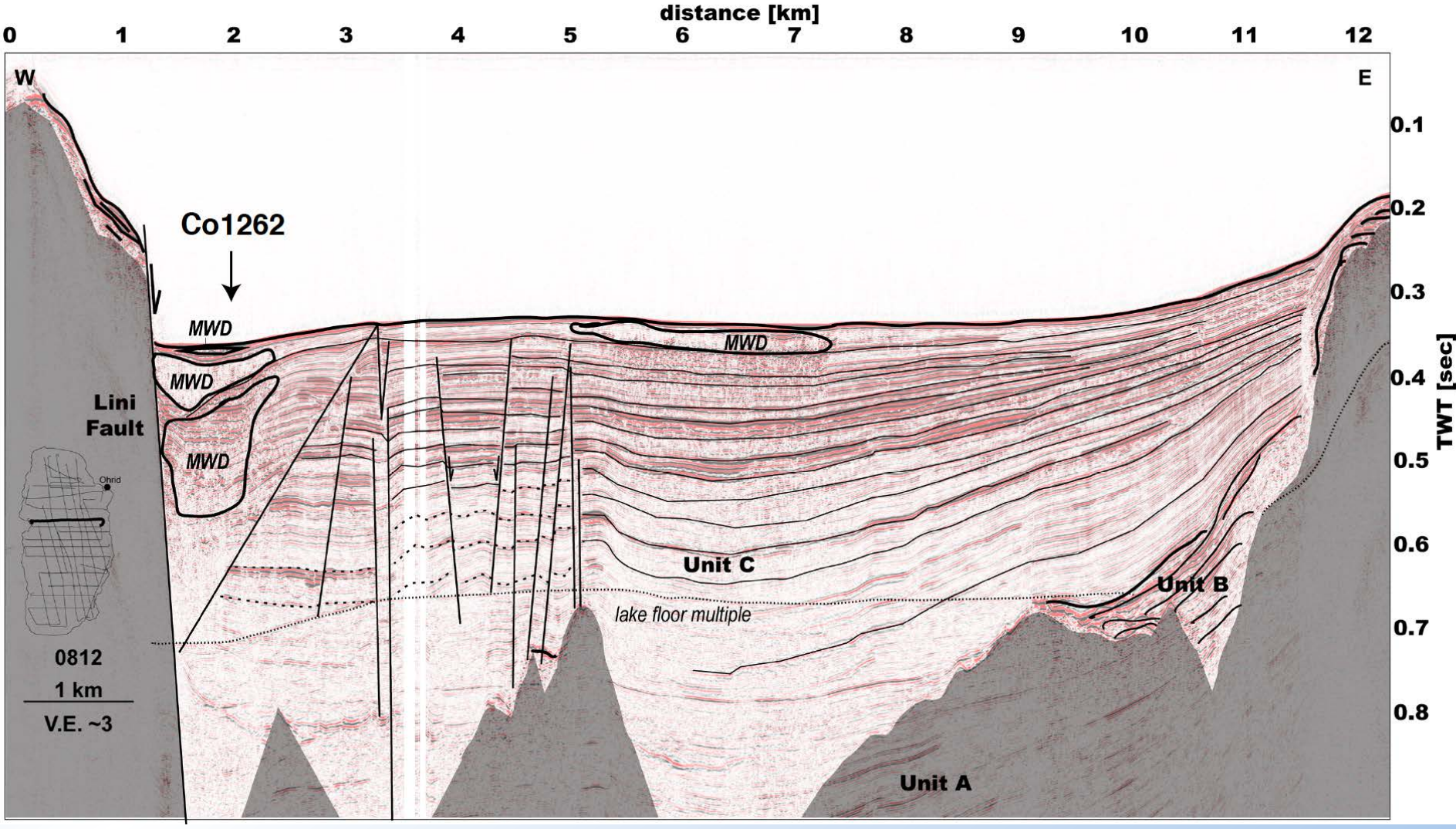


Project history: Setbacks

Field campaign 2011 :

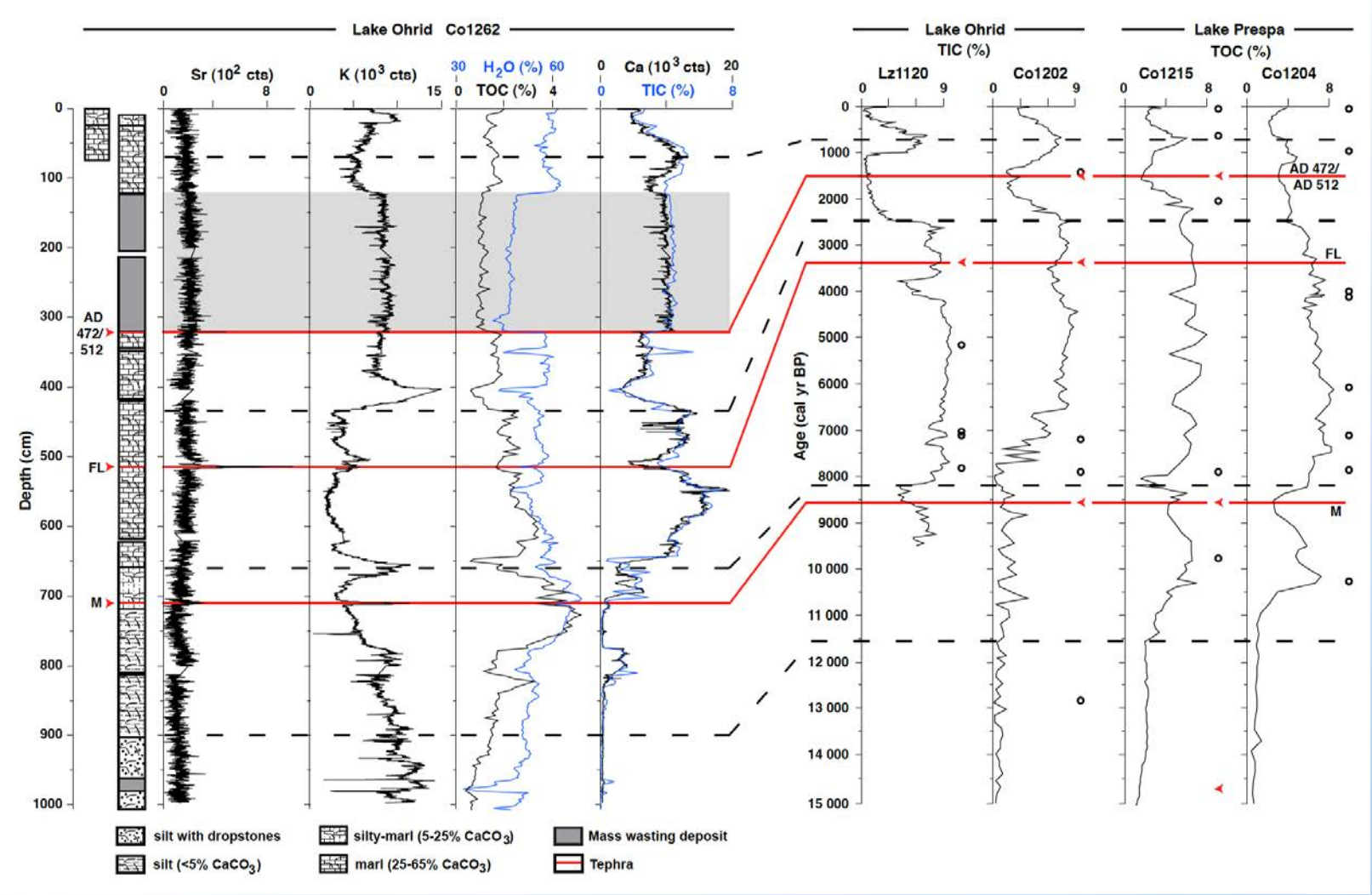
Loss of platform at Lini site

Tectonic history:



Wagner et al. 2012

Tectonic history:



Wagner et al. 2012

Project history: Setbacks

Summer 2012 :

Shipping in June

Fire on MSC Flaminia

Start of the drilling operation

Photo: Wilke (2013)

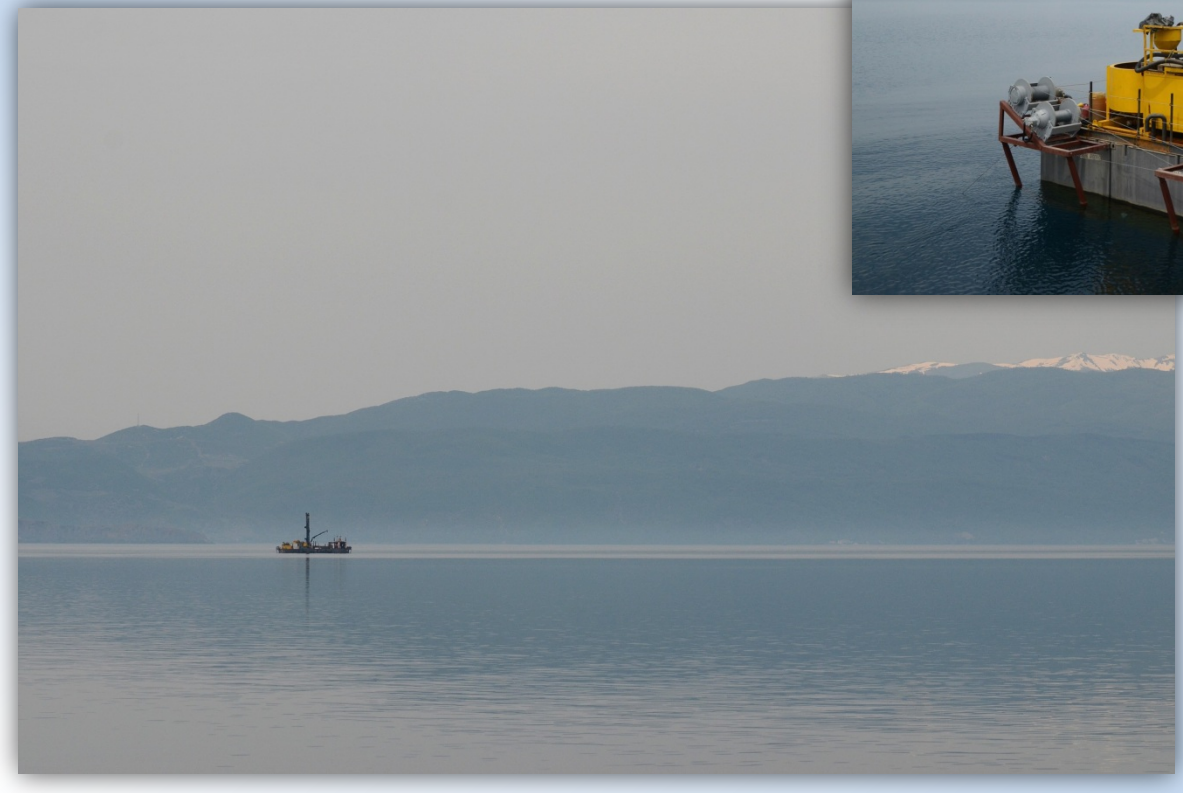
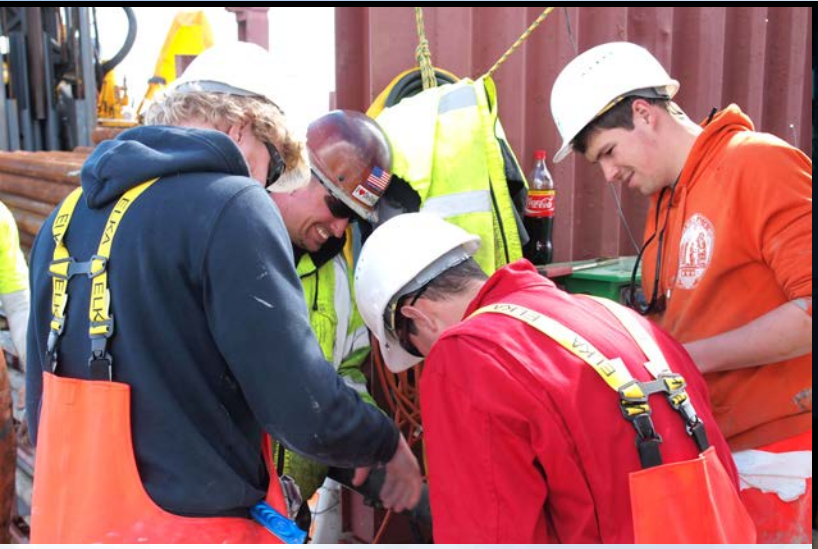
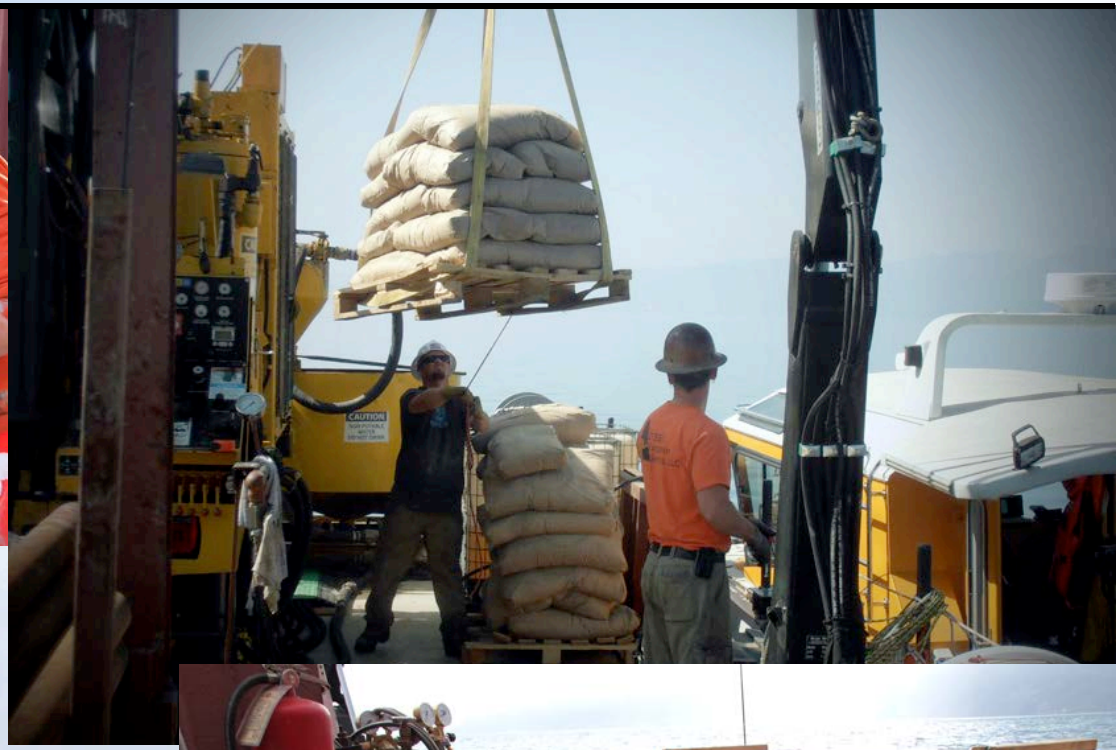
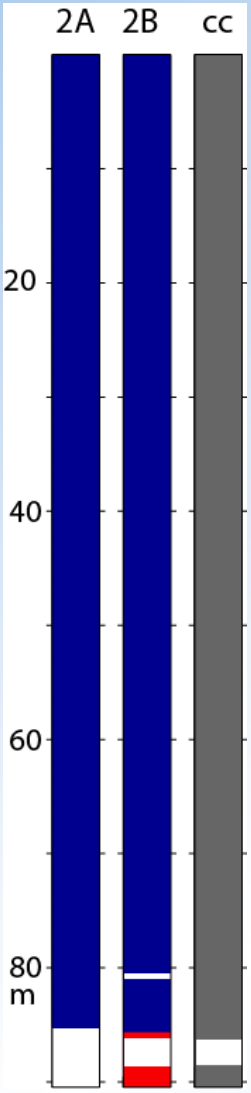


Photo: Wilke (2013)

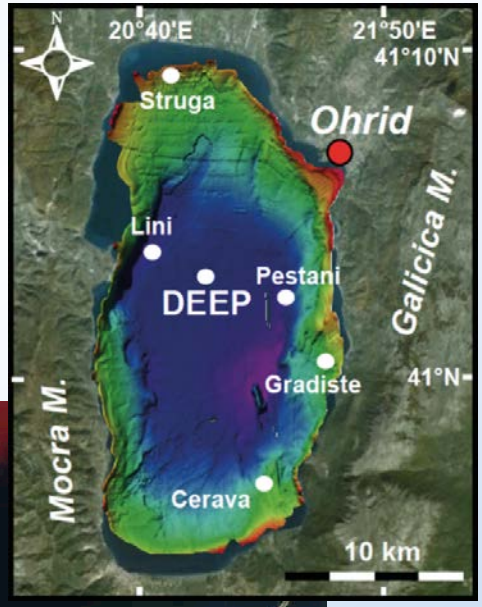
SCOPSCO – drilling operation April / May 2013





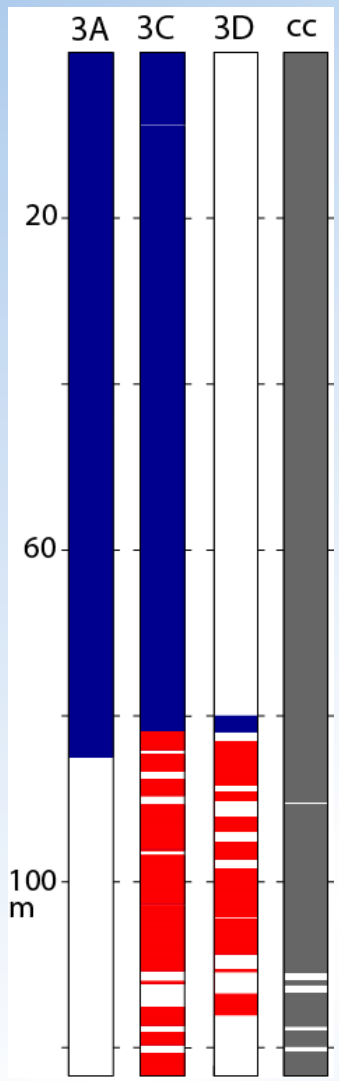


- lake level fluctuations, catchment dynamics, biodiversity and evolution processes
- Target depth: 130 m
- Water depth: 118 m
- Deepest drilled depth: 90.5 m
- Composite field recovery: 87.9 m (97%)

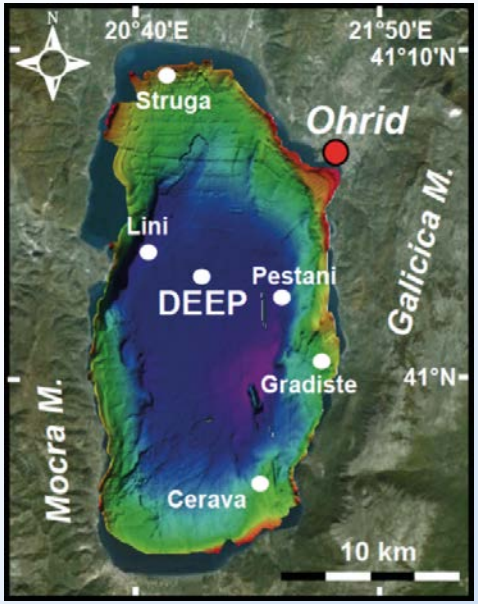


HPC XTN ALN composite recovery

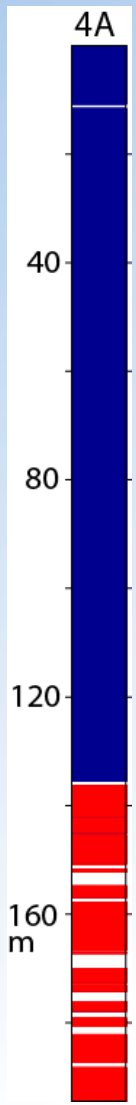
Gradiste



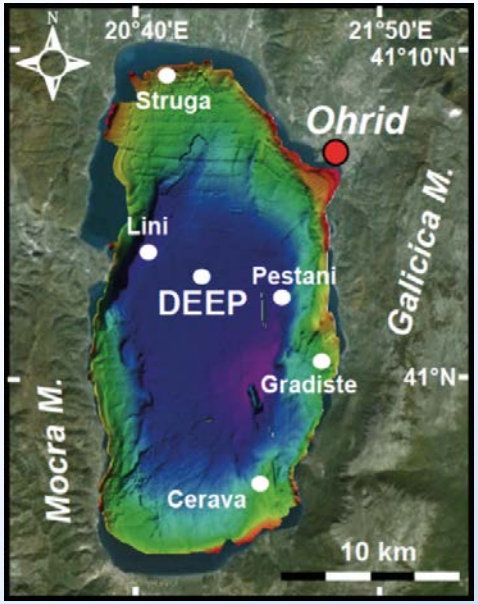
- active tectonics and spring dynamics
- Target depth: 80 m
- Water depth: 130 m
- Deepest drilled depth: 123.4 m
- Composite field recovery: 114 m (92%)

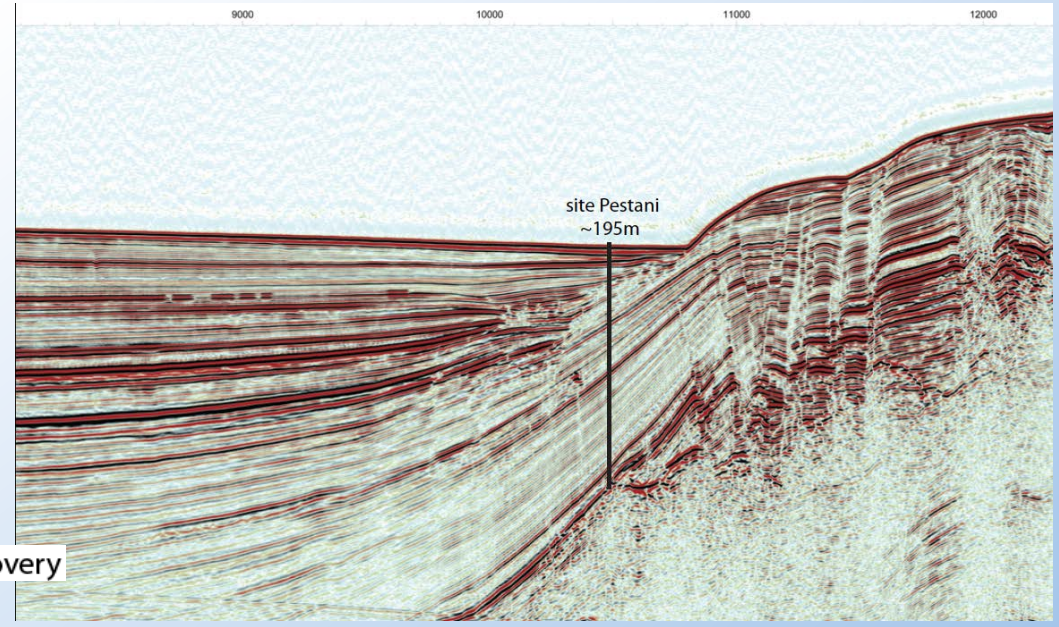


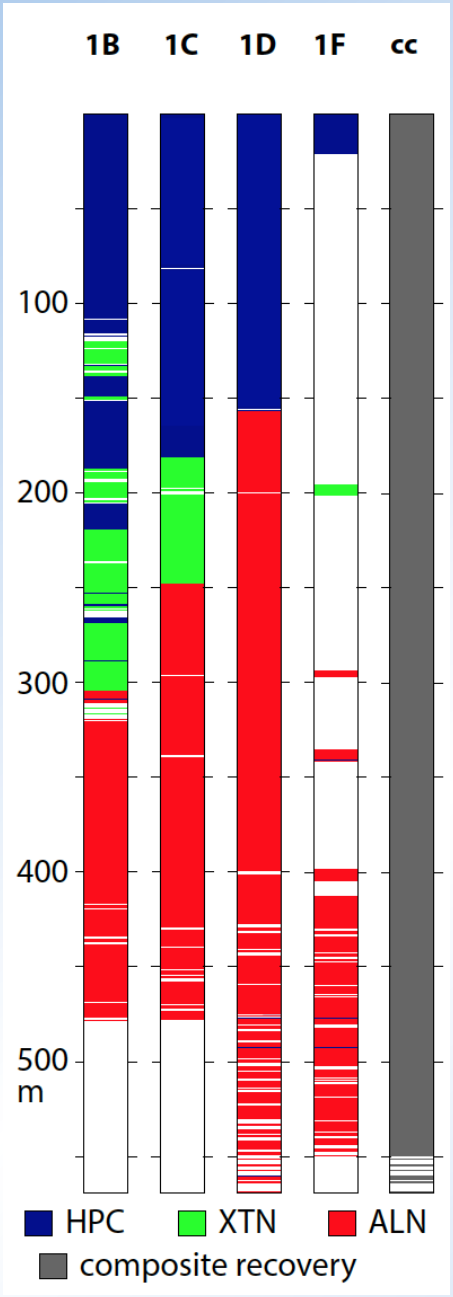
HPC XTN ALN composite recovery



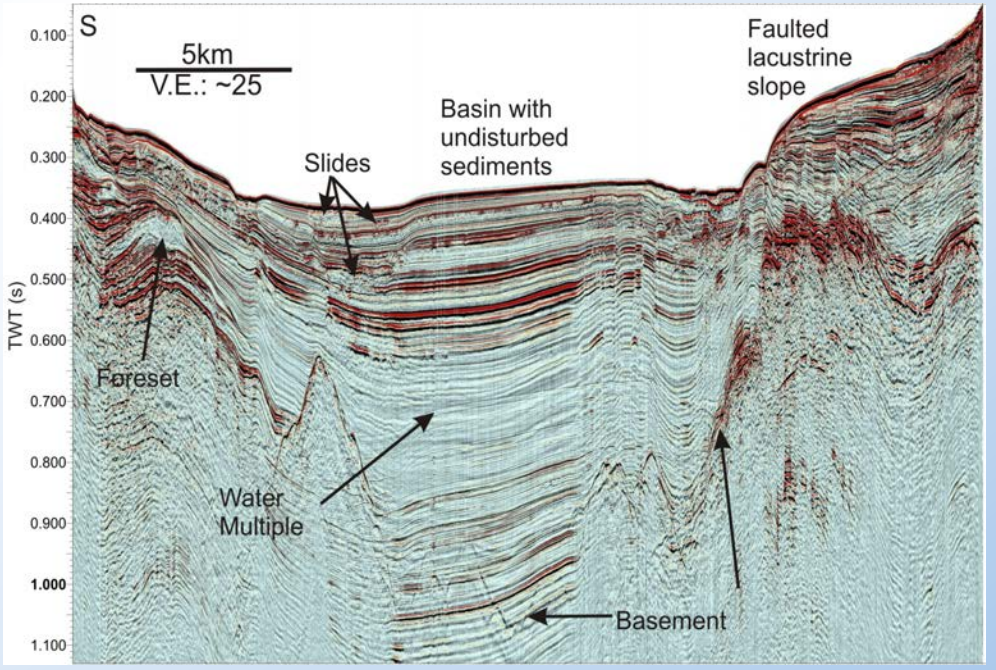
- Early development of the Lake Ohrid basin
- Target depth: hit basement
- Water depth: 260 m
- Deepest drilled depth: 194.5 m
- Composite field recovery: 177.9 m (91%)

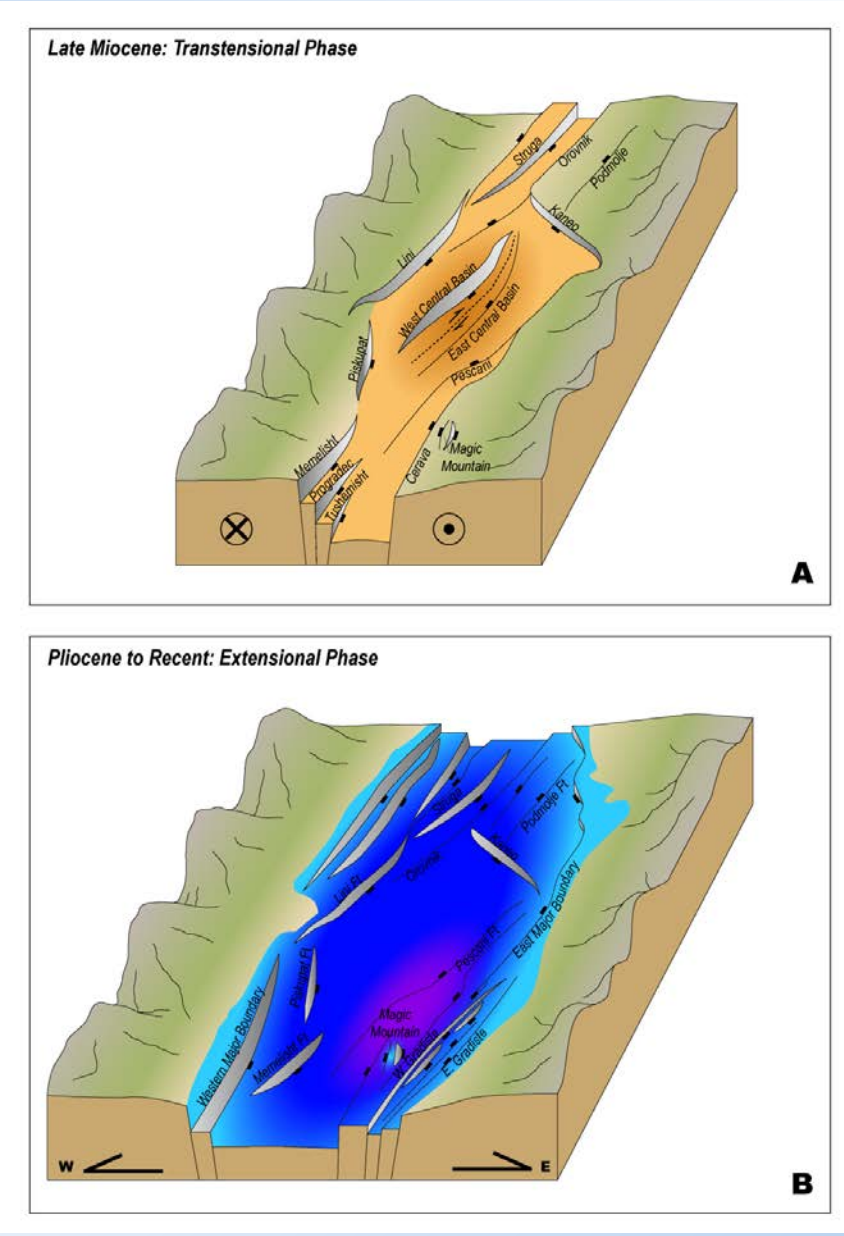




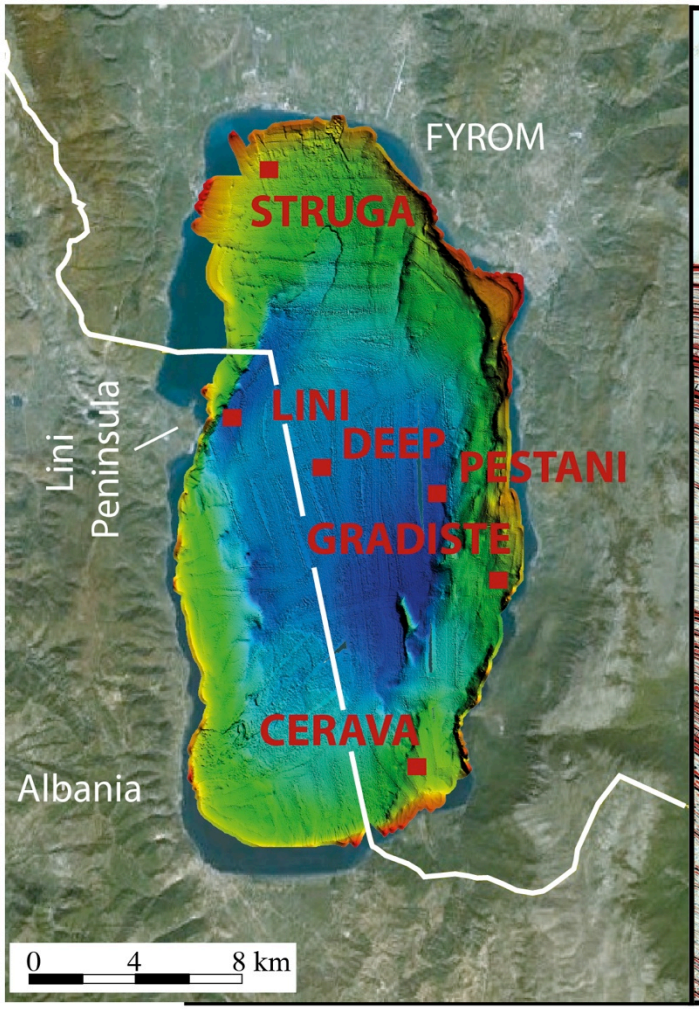


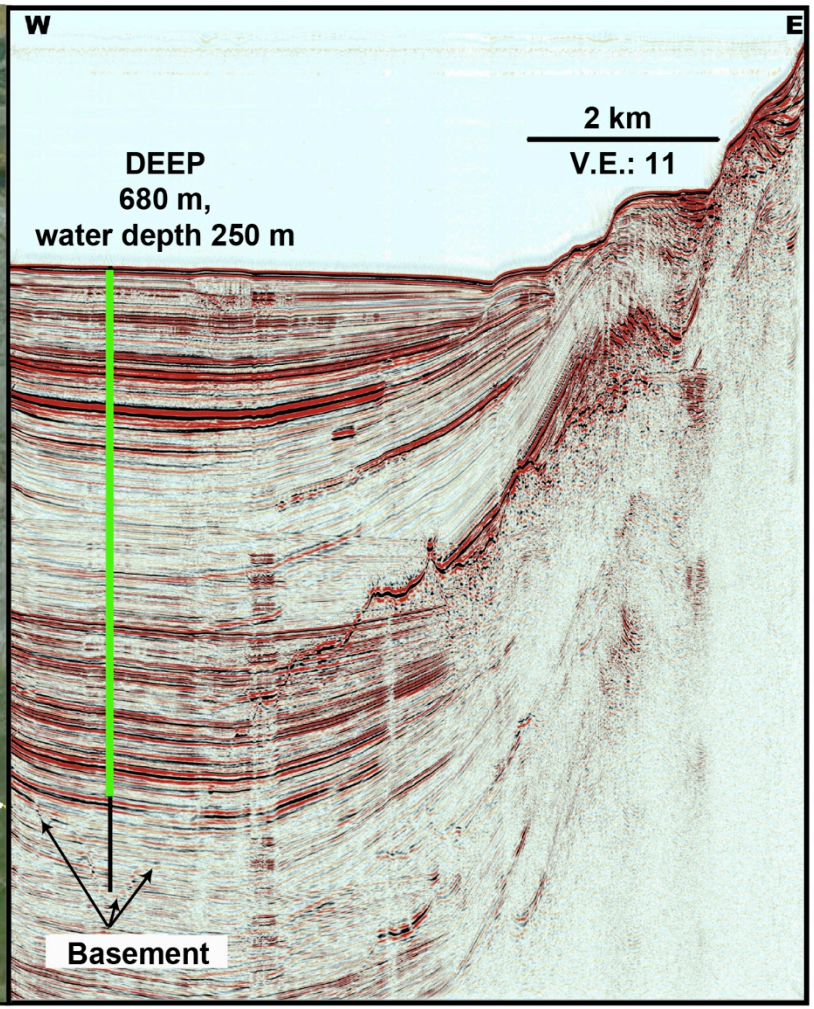
- main drill site, paleoclimate, tephrostratigraphy, biodiversity, sedimentology, age of Lake Ohrid
- 680 m sediment thickness indicated by seismic data
- Water depth: 240 m
- 568 m deepest hole (1D)
- 1526 m of cores
- 95% recovery



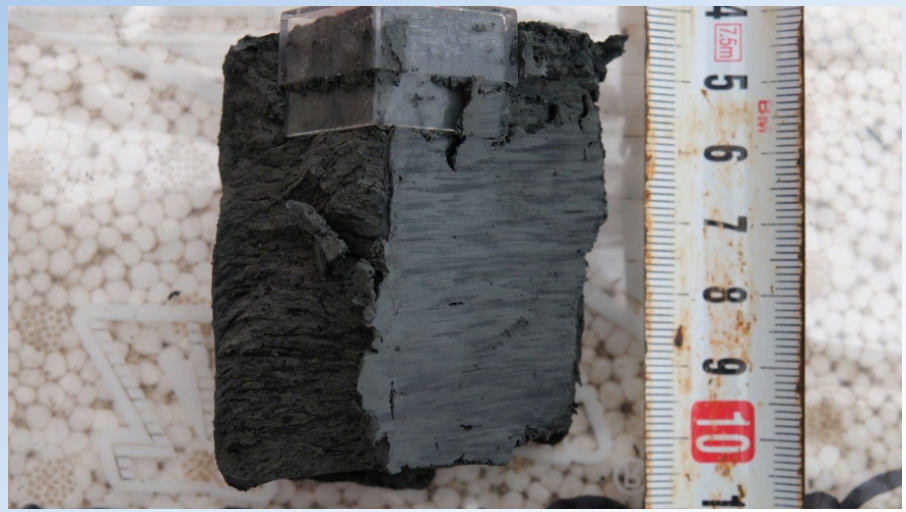


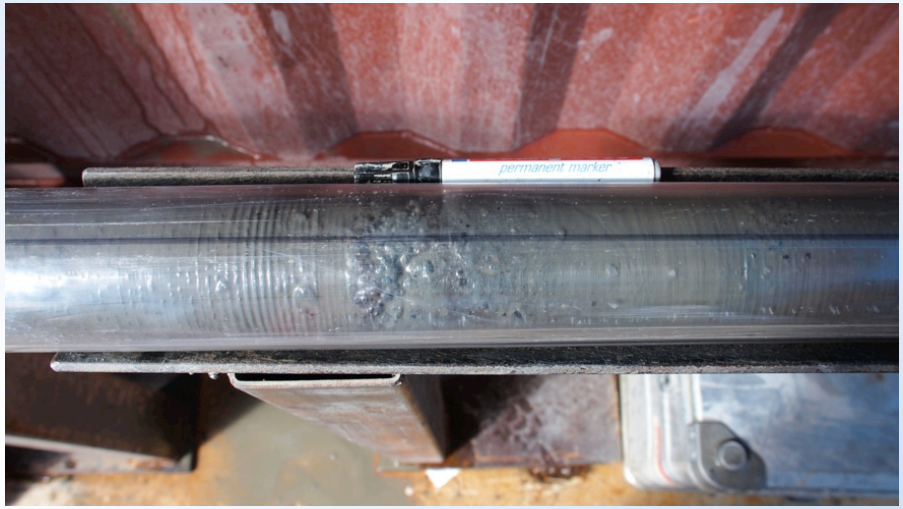
Lindhorst et al. 2015


FYROM
STRUGA
LINI
DEEP
PESTANI
GRADISTE
CERAVA
Albania
Lini
Peninsula
0
4
8 km


W
E
2 km
V.E.: 11
DEEP
680 m,
water depth 250 m
Basement

DEEP





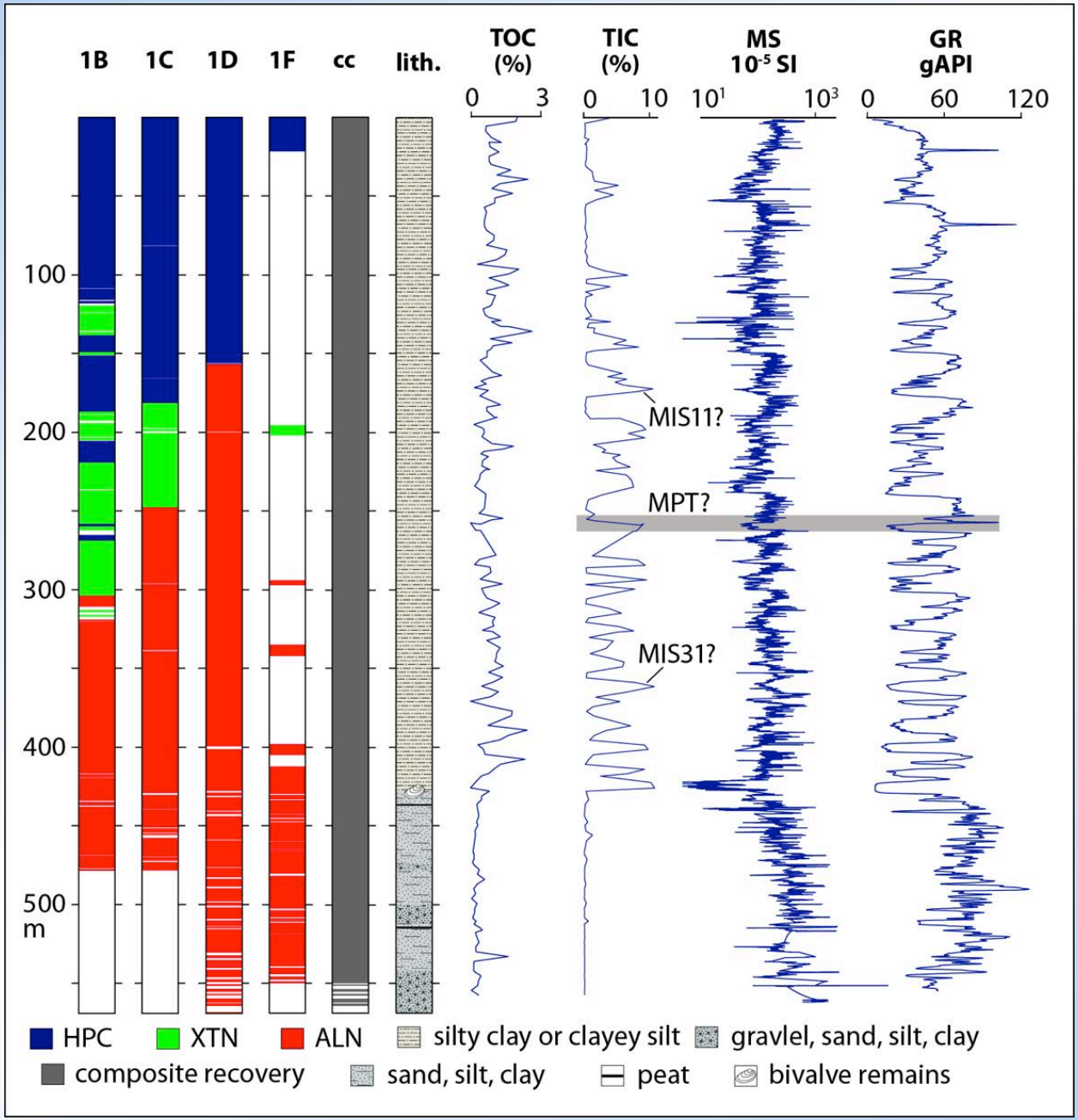
SCOPSCO Drilling operation 2013 – the team

Site	Water depth (m)	# of holes	Total drill meters (m)	Total recovery (m)	Deepest drill depth (m blf)	Composite field recovery * (m)	remarks
DEEP	243	6	2088.71	1526.06	568.92	544.88 (95.77 %)	spot coring
Cerava	119/131	2	175.71	172.20	90.48	87.86 (97.10 %)	site on a slope
Gradiste	131	3	327.35	224.46	123.41	114.07 (92.43 %)	
Pestani	262	1	194.50	177.90	194.50	177.90 (91.45 %)	

* composite field recovery is estimated based on field depths and magnetic susceptibility measurements

SCOPSCO Drilling operation 2013

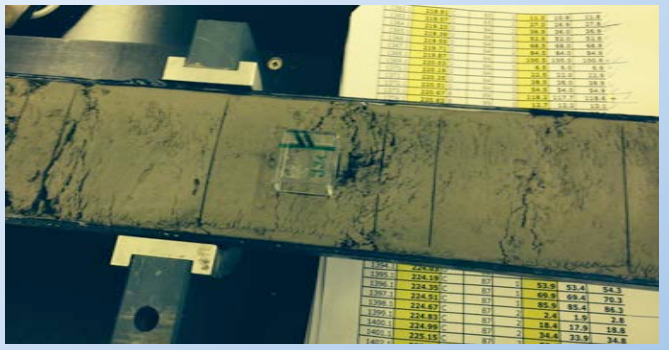
DEEP – coring results



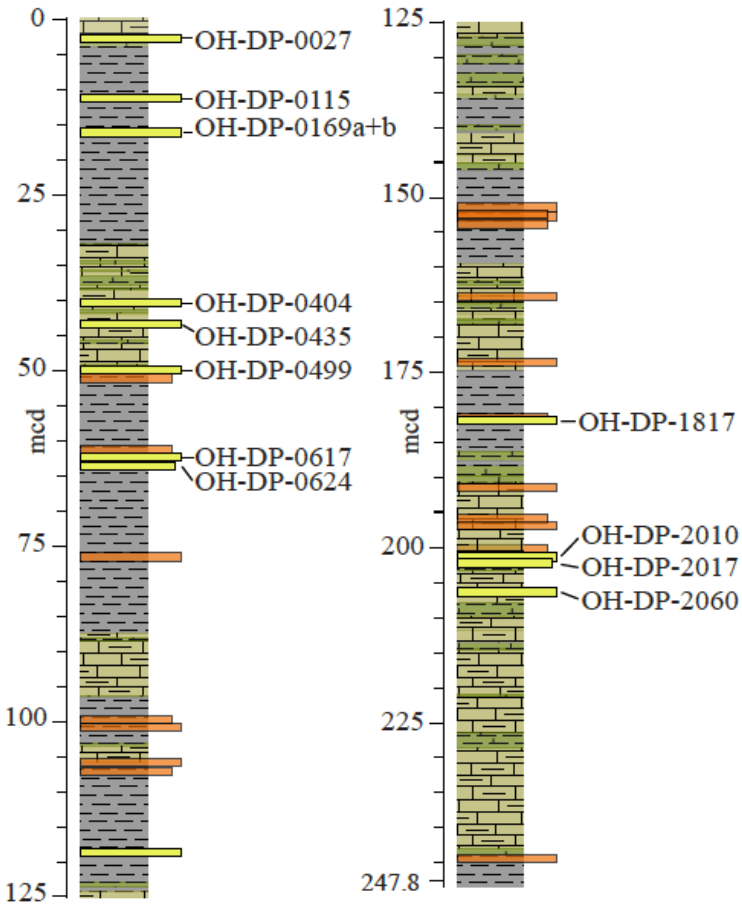
Wagner et al. 2014

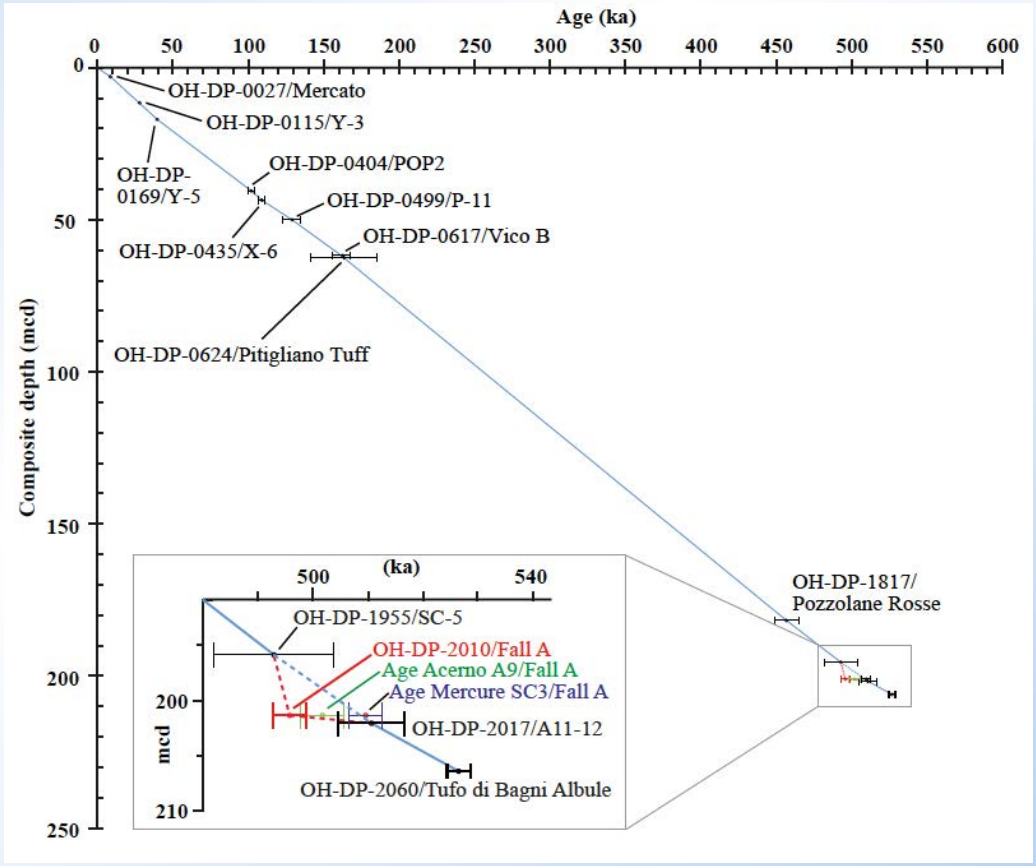
- XRF scanning
- MSCL scanning

- 2cm thick samples: 16 cm resolution
- Cylindrical vials: 16 cm resolution
- Paleomagnetic sampling: 48 cm resolution



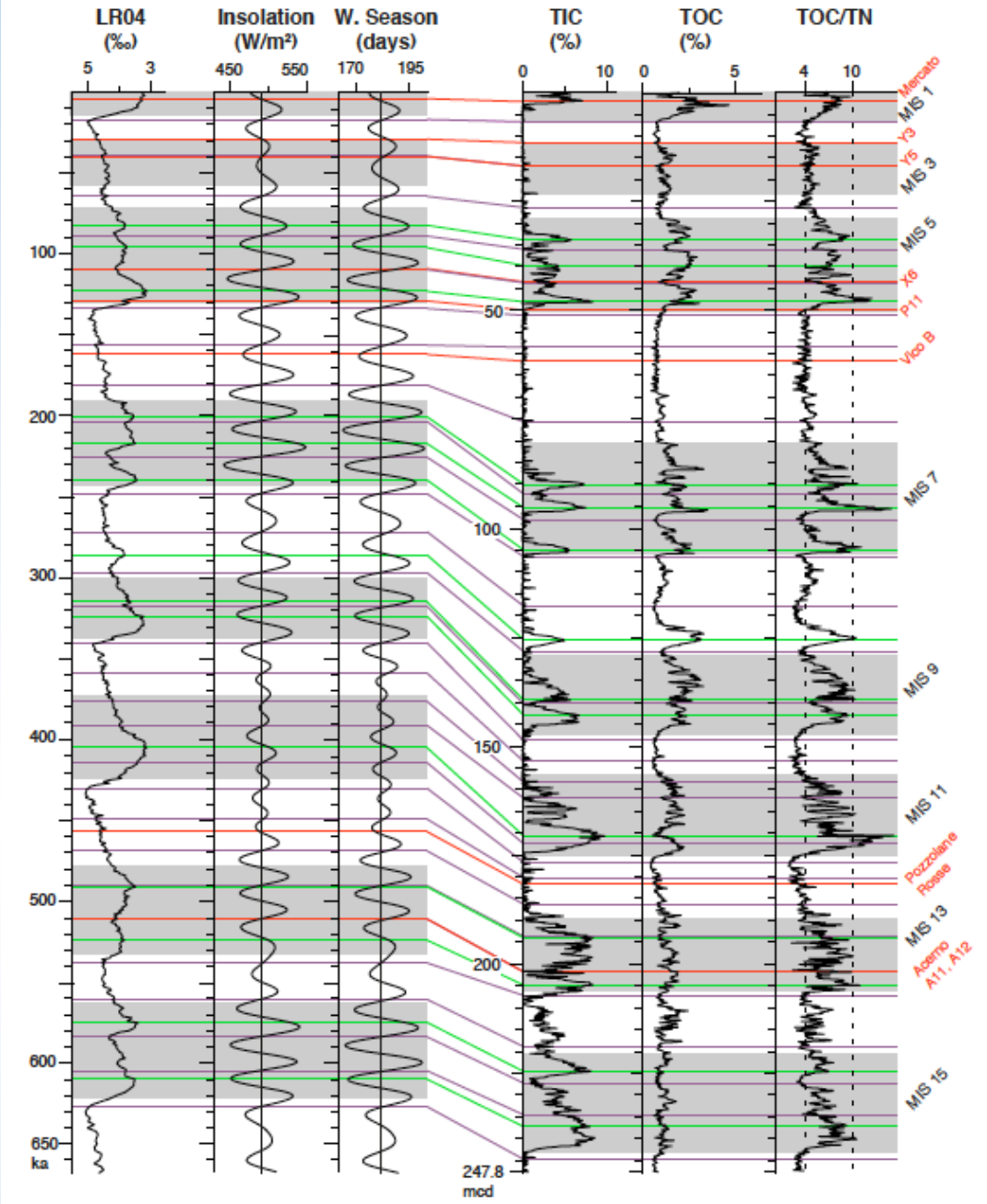
DEEP – results





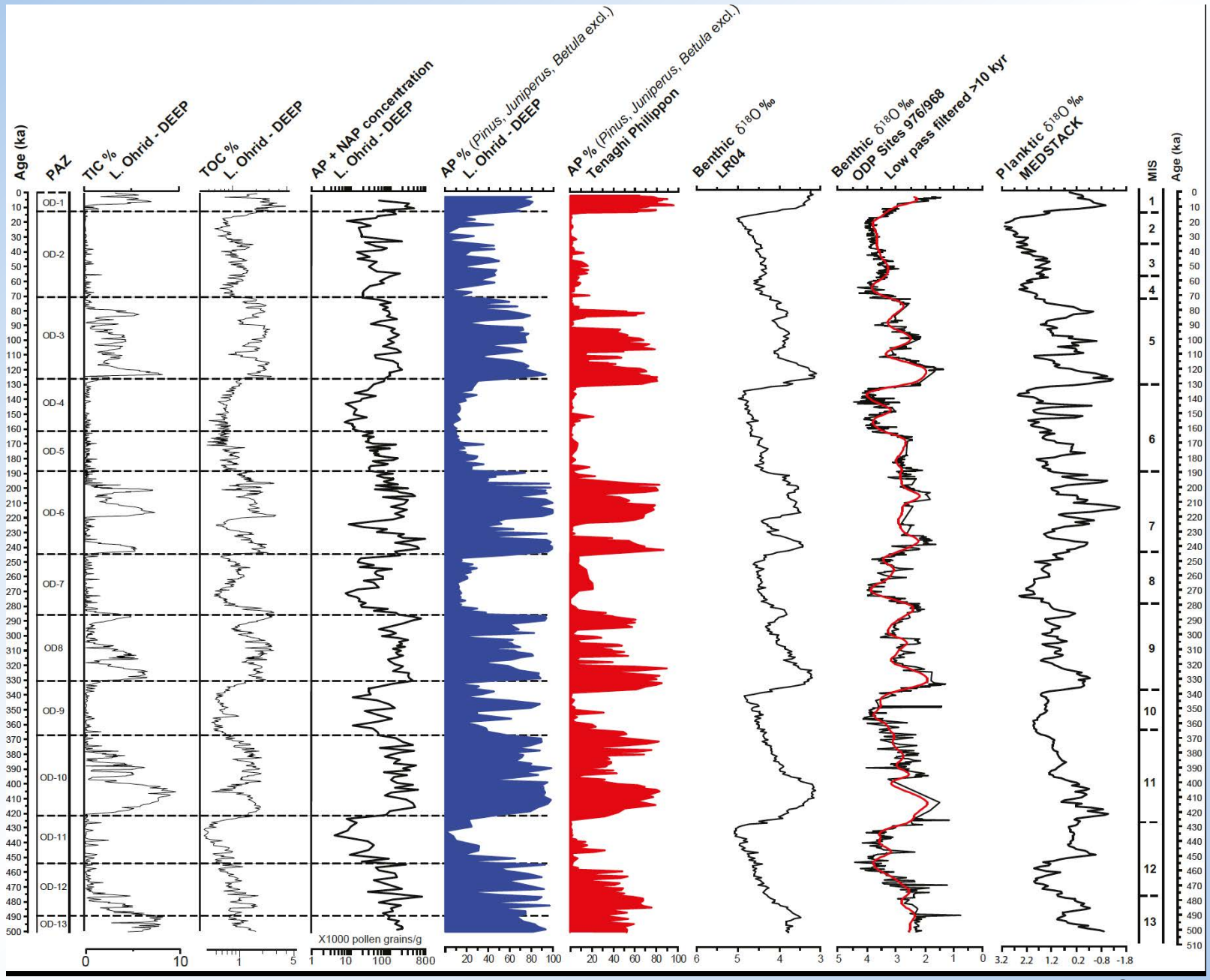
Leicher et al. 2015

DEEP – results



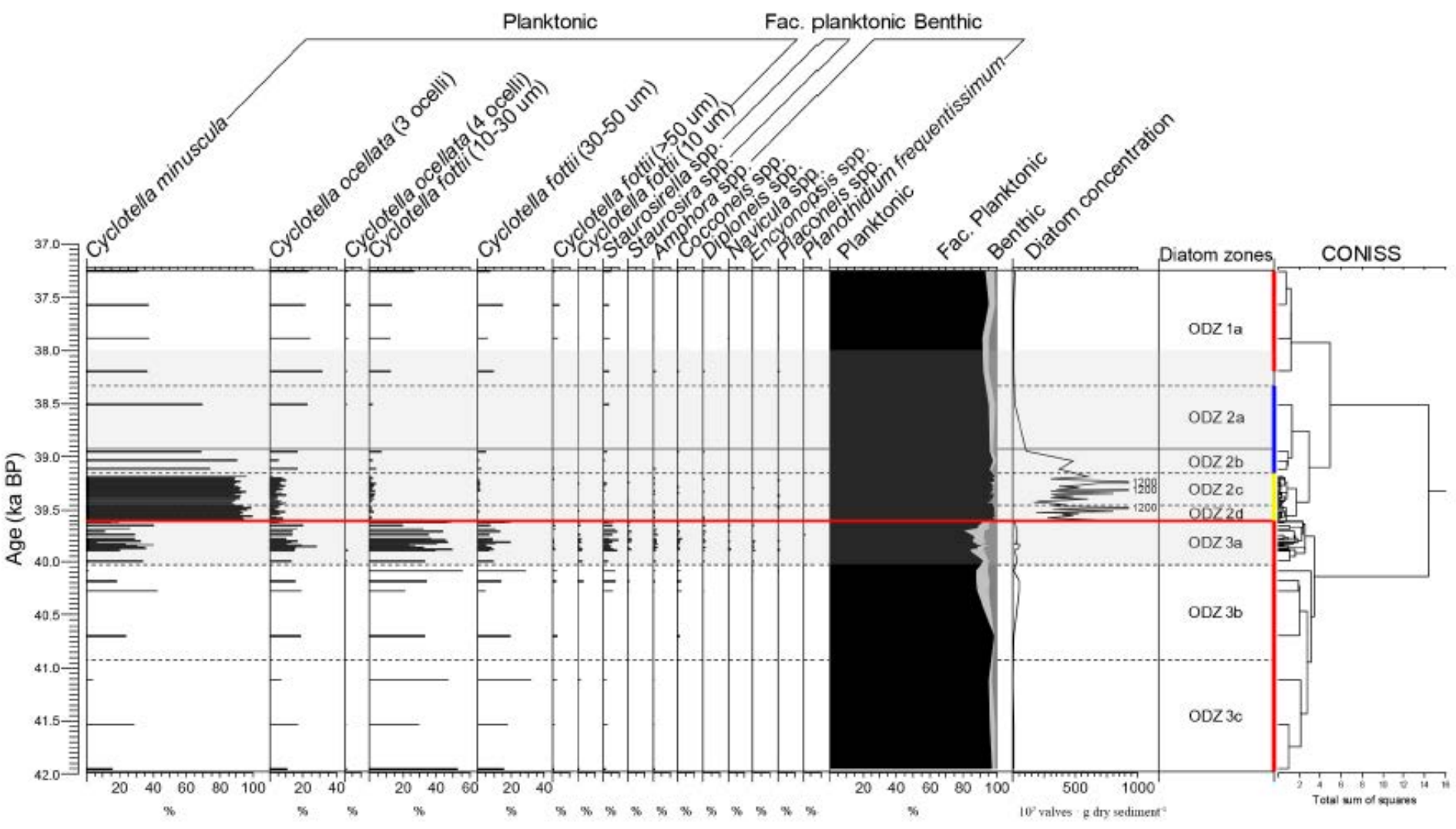
Francke et al. 2015

DEEP – results



Sadori et al. 2015

DEEP – results



Jovanovska et al. 2015

DEEP – results

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BGD - Special issue

Integrated perspectives on biological and geological dynamics in ancient Lake Ohrid
Editor(s): B. Wagner, T. Wilke, F. Wagner-Cremer, and J. Middelburg

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Constant diversification rates of endemic gastropods in ancient Lake Ohrid: ecosystem resilience likely buffers environmental fluctuations Summary — 31 Aug 2015
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Biogeosciences Discuss., 12, 14343-14375, 2015
Abstract | Discussion Paper (PDF, 4583 KB) | Interactive Discussion (Open, 0 Comments)
Manuscript under review for BG

Aims of a deep drilling

(1) to obtain more information about the age and origin of the lake, ☑

(2) to obtain a continuous record of volcanic (and tectonic) activity and climate changes, ☑

(3) to better understand the link between geological events and evolutionary processes ☑

Linking geological and biological information is the only way to figure out why there is such a high endemism in Lake Ohrid

The outcome of the project is key to a better understanding of the biodiversity and of global importance

Take home messages - Skills

- idea
- enthusiasm
- confidence
- patience
- assertiveness
- communication
- friends
- good team

Thank you!

icdp

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