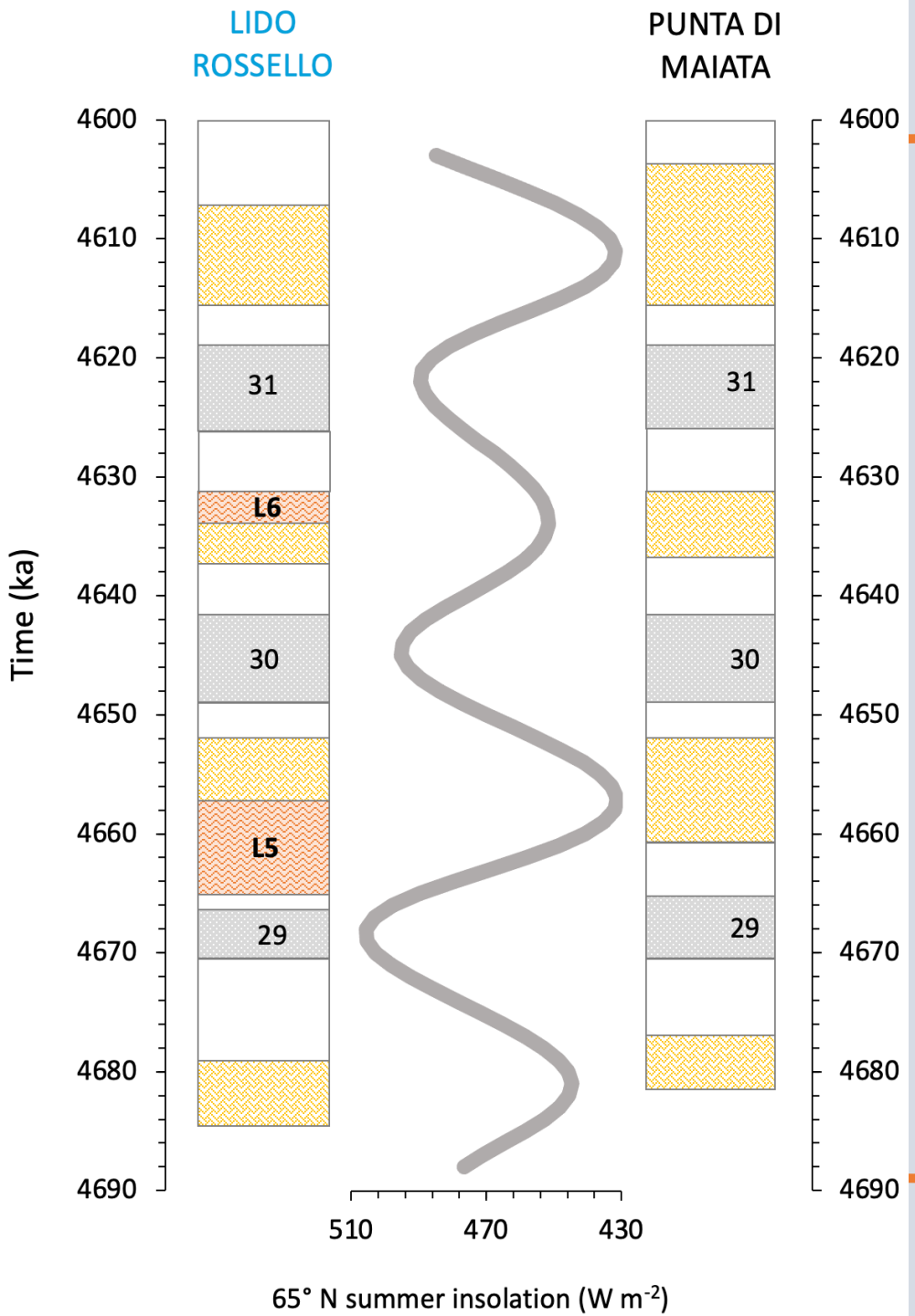
The origin of unusual Pliocene sapropel and diatomite layers

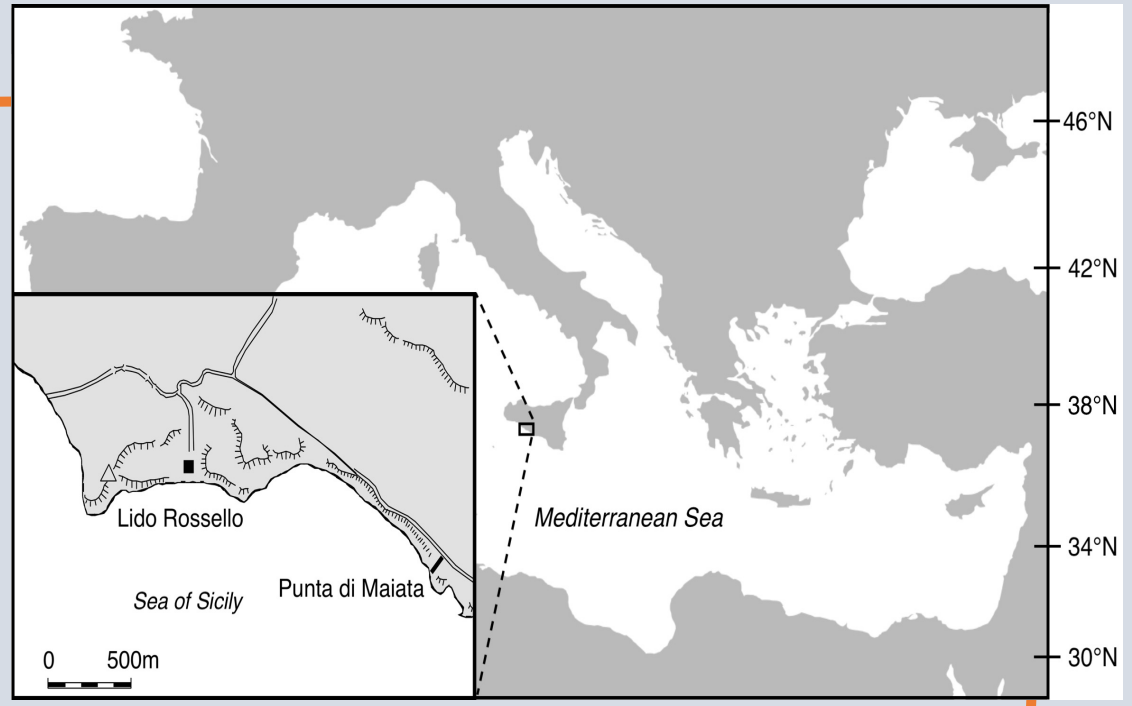
Anna Cutmore[1], Nicole Bale[1], Ellen Hopmans[1], Darci Rush[1], Stefan Schouten[1,2], and Lucas Lourens[2]

[1]*Royal Netherlands Institute for Sea Research, Marine Microbiology & Biogeochemistry, Geography, Texel, Netherlands*

[2]*Department of Earth Sciences, Universiteit Utrecht, Utrecht, 3484 CB, Netherlands*

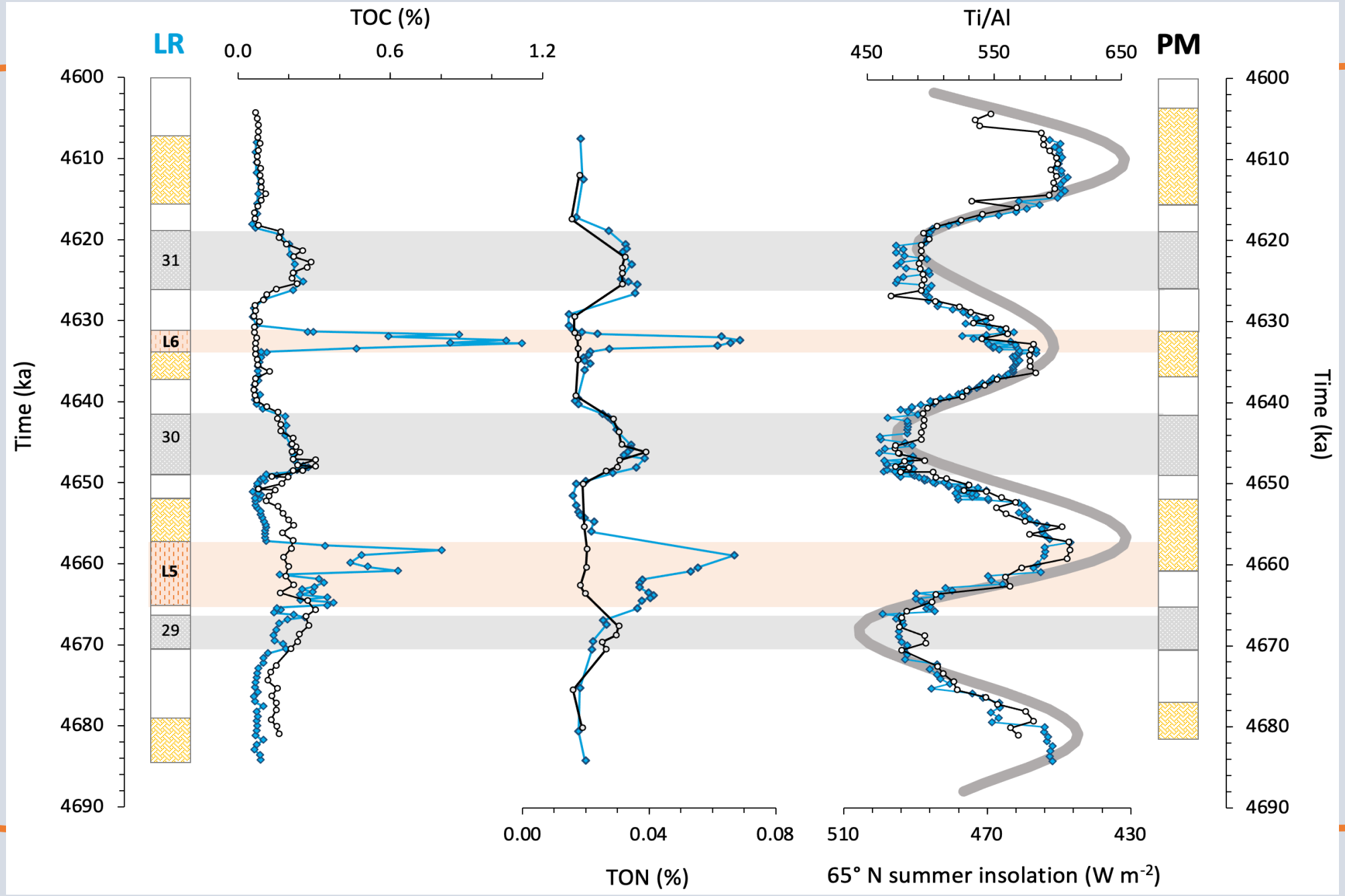
anna.cutmore@nioz.nl

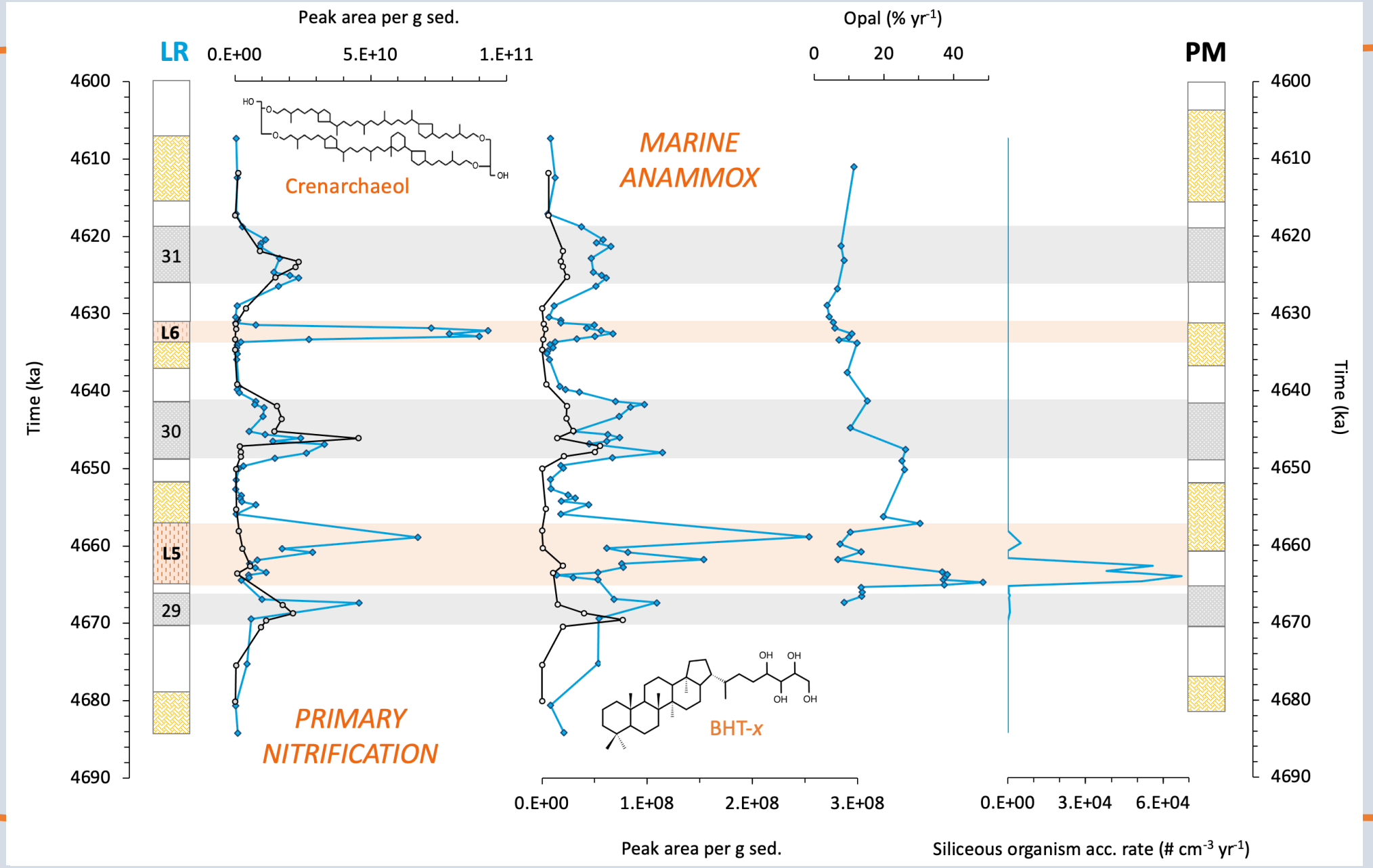




AIM: Explore potential changes in anoxia and/or export productivity over three mid-Pliocene precession-forced climate cycles using lipid biomarker, geochemical, and sedimentological records

NIOZ
Utrecht University
NESSC


LR
TOC (%)
0.0
0.6
1.2
Ti/Al
450
550
650
PM
4600
4610
4620
4630
4640
4650
4660
4670
4680
4690
Time (ka)
31
L6
30
L5
29
0.00
0.04
0.08
TON (%)
510
470
430
65° N summer insolation (W m-2)


Peak area per g sed.
LR
0.E+00
5.E+10
1.E+11
Opal (% yr-1)
0
20
40
PM
4600
4610
4620
4630
4640
4650
4660
4670
4680
4690
Time (ka)
31
L6
30
L5
29
Crenarchaeol
MARINE
ANAMMOX
PRIMARY
NITRIFICATION
BHT-x
0.E+00
1.E+08
2.E+08
3.E+08
Peak area per g sed.
0.E+00
3.E+04
6.E+04
Siliceous organism acc. rate (# cm-3 yr-1)

Conclusions:

- Low oxygen conditions at both sites during the deposition of the grey marls (summer insolation maximum), and at the LR site during deposition of laminated layers

- The laminated layers likely caused by local depression which led to intermittent presence of a hypersaline pool which acted as a geochemical buffer, enhancing preservation of organic matter, lipid biomarkers, and siliceous opaline skeletons

- Productivity signal preserved in laminated layers offers rare insight into productivity conditions during the deposition of sediments in the eastern Mediterranean during summer insolation minimum (beige marls) and insolation maximum (grey marls)

anna.cutmore@nioz.nl

NIOZ Utrecht University NESSC

Planned analysis:

- Amino BHPs (i.e. carbamoyl-type BHT):
  - Exploration of potential methanotrophy at these sites over over three Pliocene precession-forced climate cycles
- Clumped isotope (D47) technique:
  - Enable the constraint of surface water salinity & temperature changes on a precession time-scale
  - Comparison of the results of this method with reconstructed SST values on the same samples using TEX86 and UK'37

NIOZ Utrecht University NESSC