Throughflow Progress Report
June 2011

“Neogene circulation patterns and biogeography of foraminifera in the Indonesian Throughflow”

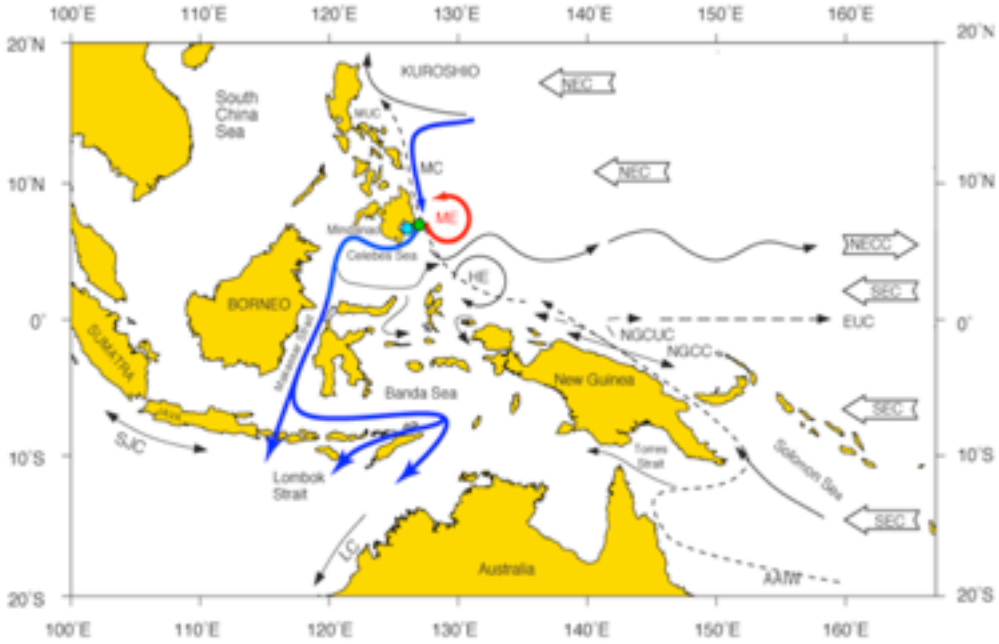
Nicholas Fraser

Christian-Albrechts Universität Kiel

Core MD06-3075 Recap

- Core located in the Davao Gulf, off coast of Mindanao, in the ITF inflow path. 1878m water depth.

- Represents oceanographic conditions (temperature, salinity, continental run-off) from the present day up to the LGM.



(Bolliet et al.)

- Applying a range of foraminiferal geochemical proxies. E.g. Mg/Ca, $\delta^{18}O$, $\delta^{13}C$, XRF core-scanning.

- Analogies can be drawn between glacial/interglacial conditions of the Quaternary and those of the Miocene.

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Why Quarternary?

- We do not yet fully understand the modern Throughflow – we need to do this before we can study the Miocene.

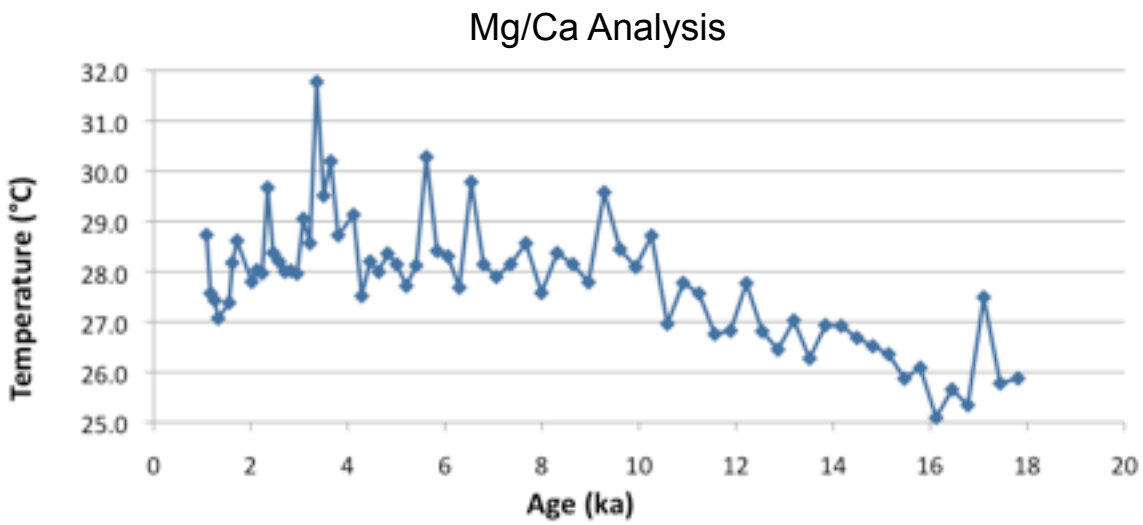
- Changes in sea level fluctuations between the LGM and present day are similar to fluctuations seen in the Miocene (approx. 120m).

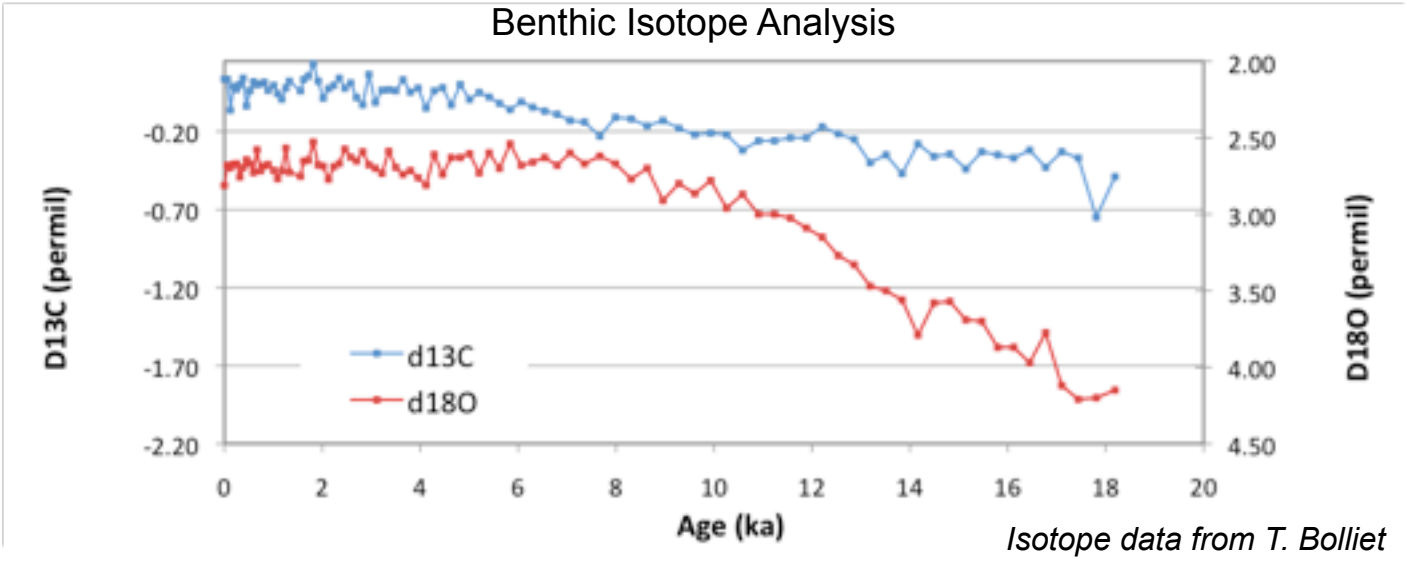
- Current monsoon conditions are also analogous to Miocene conditions.

- Development of WPWP and ENSO.

- <u>Boundary conditions.</u>

Core MD06-3075 Progress





Isotope data from T. Bolliet

Core MD06-3075: Next stages

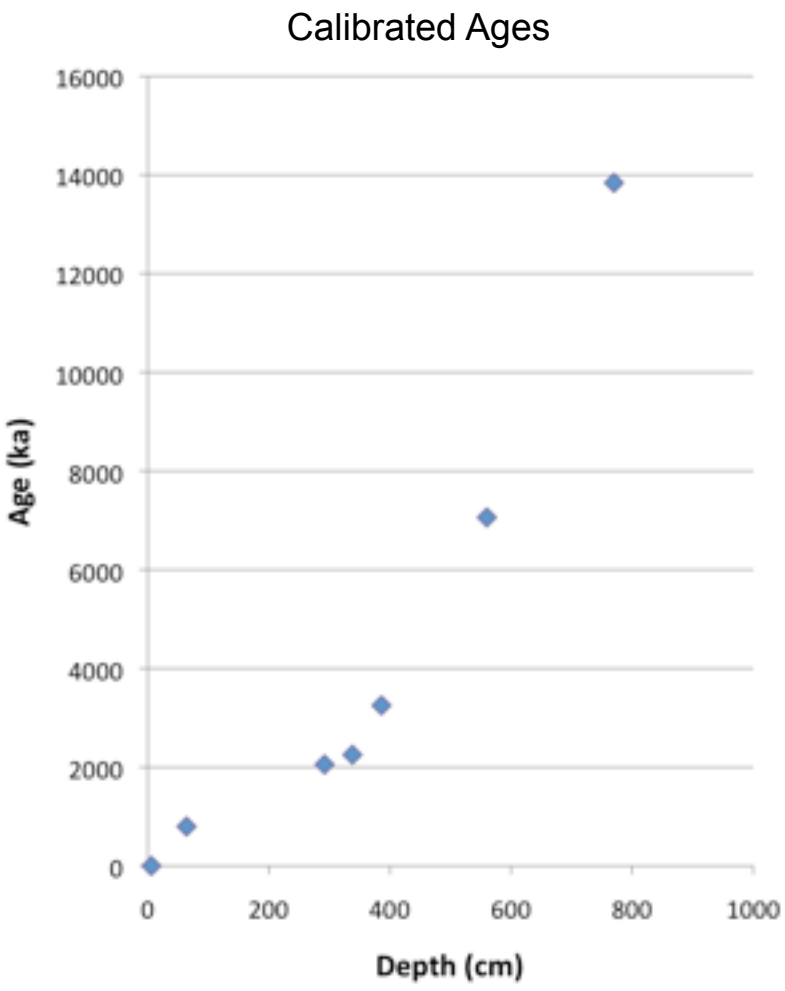
- High resolution planktonic stable isotope and Mg/Ca analysis. Currently have 360 samples of *G. ruber* at 2cm resolution ready to be analysed.

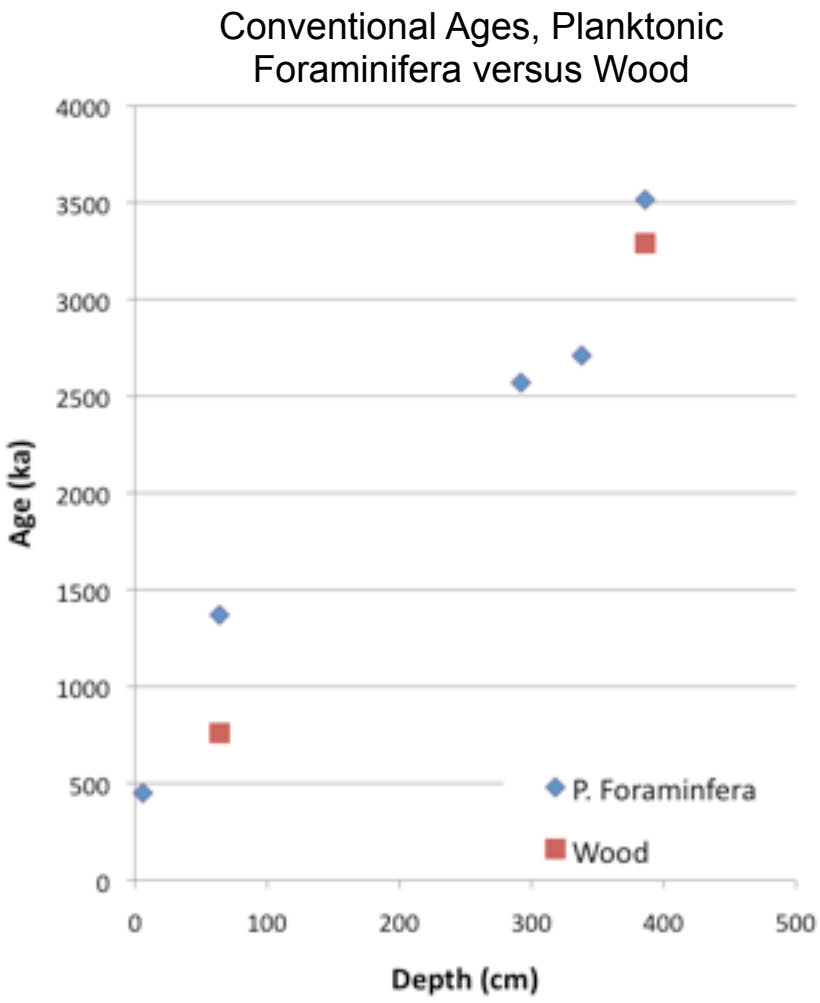
- Development of robust age model using AMS ^{14}C dating techniques.

- Further work on radiocarbon reservoir ages from wood samples found within core.

- Publish!

Age Model

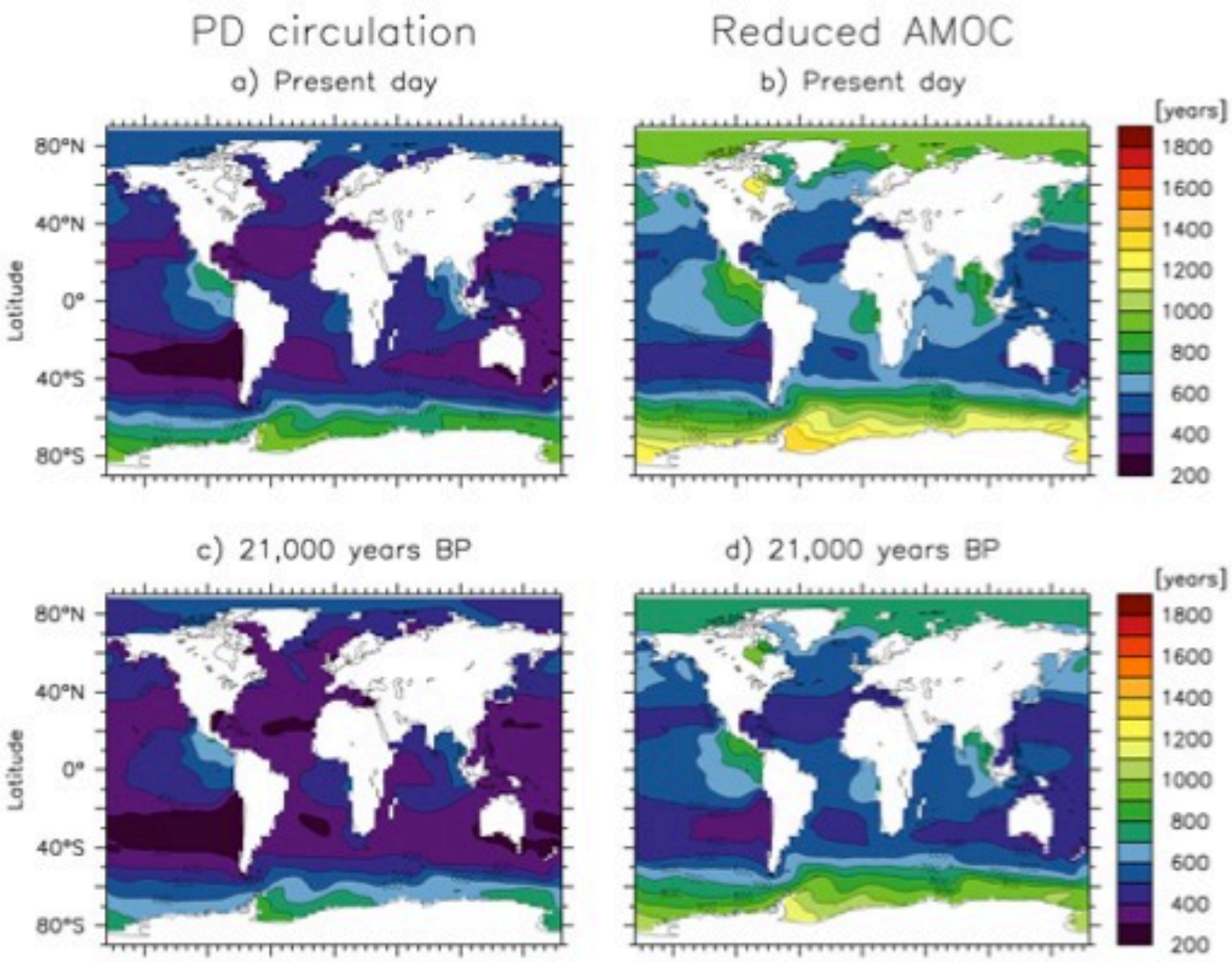

Calibrated Ages
16000
14000
12000
10000
8000
6000
4000
2000
0
Age (ka)
0
200
400
600
800
1000
Depth (cm)


Conventional Ages, Planktonic Foraminifera versus Wood
4000
3500
3000
2500
2000
1500
1000
500
0
Age (ka)
0
100
200
300
400
500
Depth (cm)
P. Foraminfera
Wood

Radiocarbon Reservoir Ages

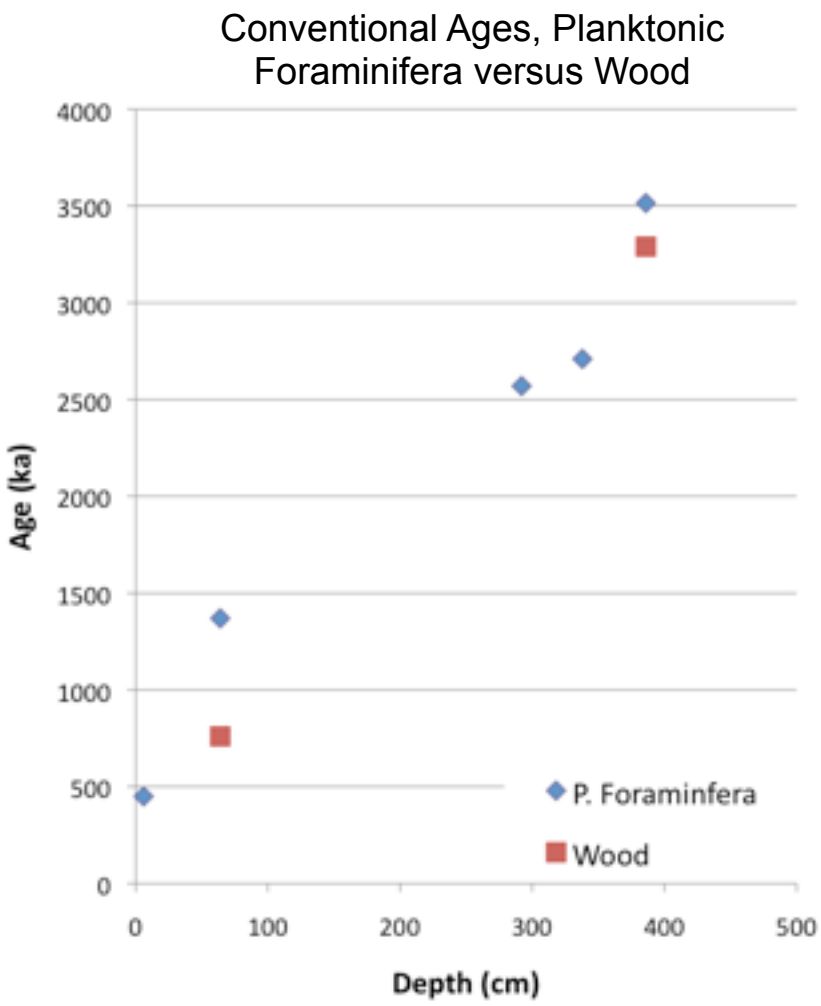
- ^{14}C is produced in the upper atmosphere, then exchanges with atmosphere and ocean.
- The rate of exchange between atmosphere and ocean causes marine samples to have a higher radiocarbon age than that of an atmospheric sample.
- Therefore, it is necessary, and important, to correct marine samples with a radiocarbon reservoir age.
- Present day global average of 400 years. Varies spatially and temporally. Temporal reconstructions mainly rely on modelling approaches due to lack of date-able material.

Radiocarbon Reservoir Ages



(Franke et al., 2008)

Radiocarbon Reservoir Ages



Reservoir ages of:

- 610 years at 760 BP
- 225 years at 3290 BP

Significant changes in reservoir ages over time. Further samples still to be dated.

RV Sonne Cruise, July/August 2011

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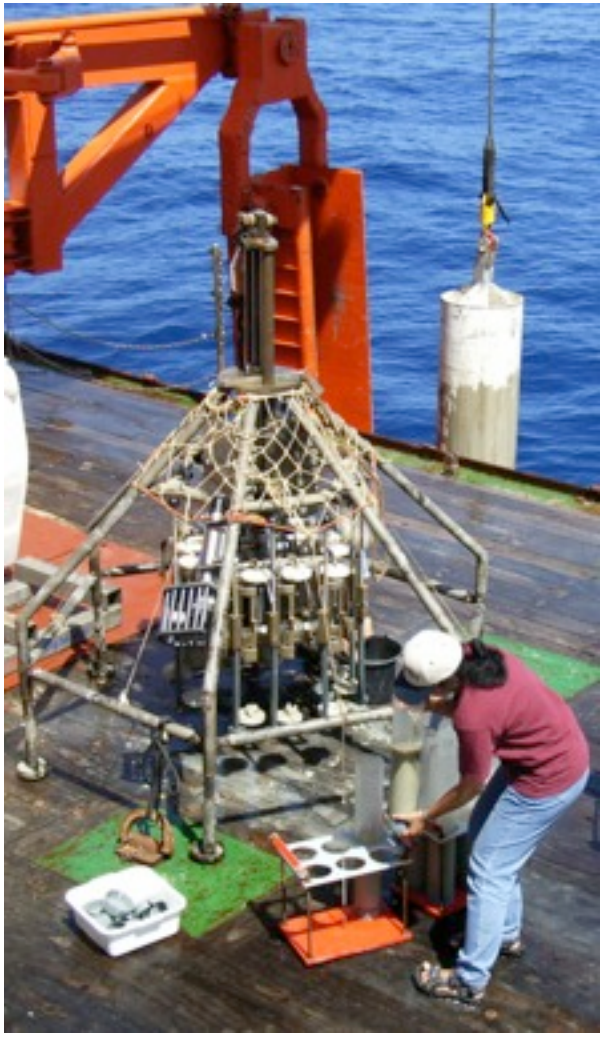
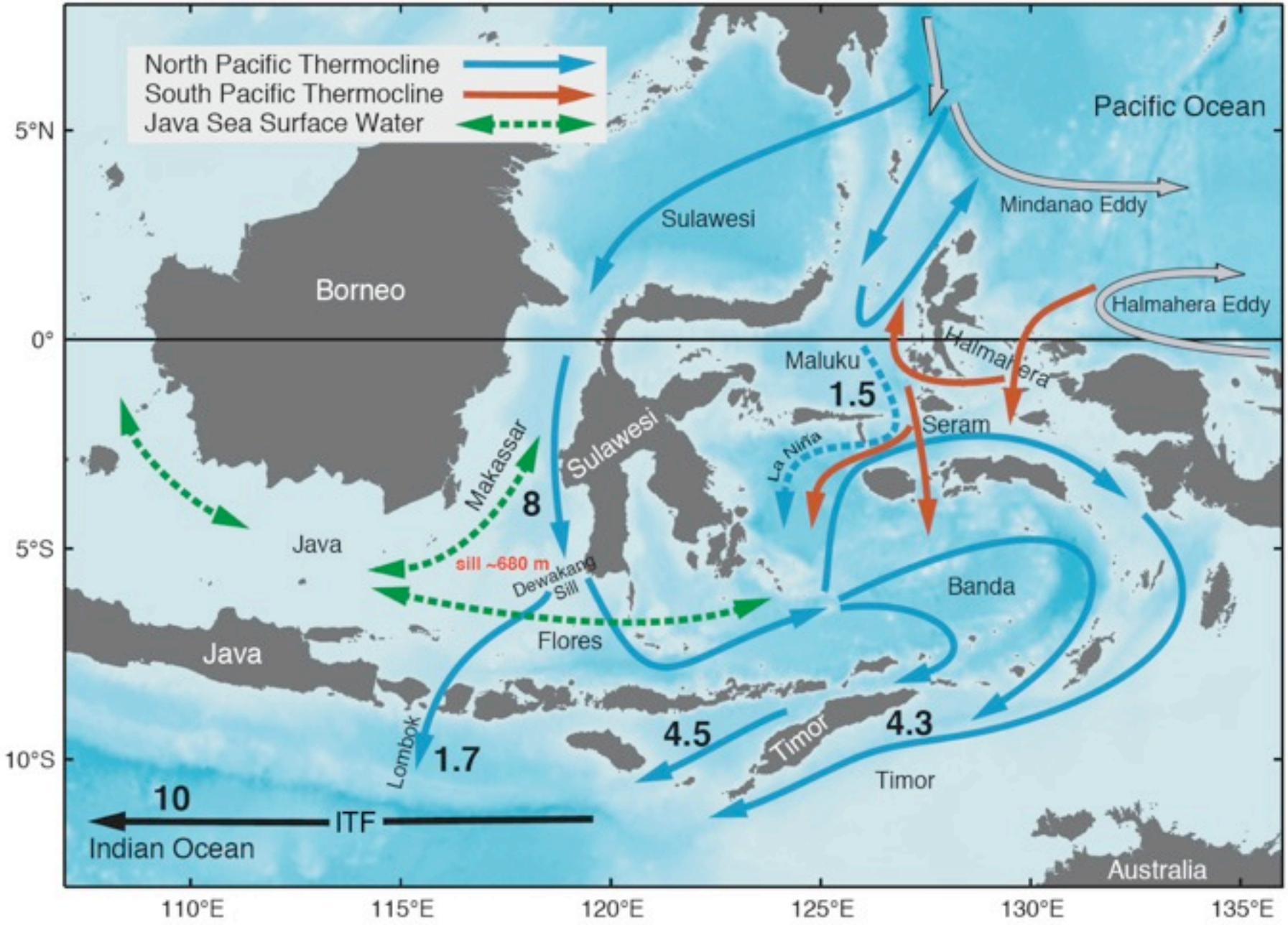


Deutsche Forschungsgemeinschaft
DFG

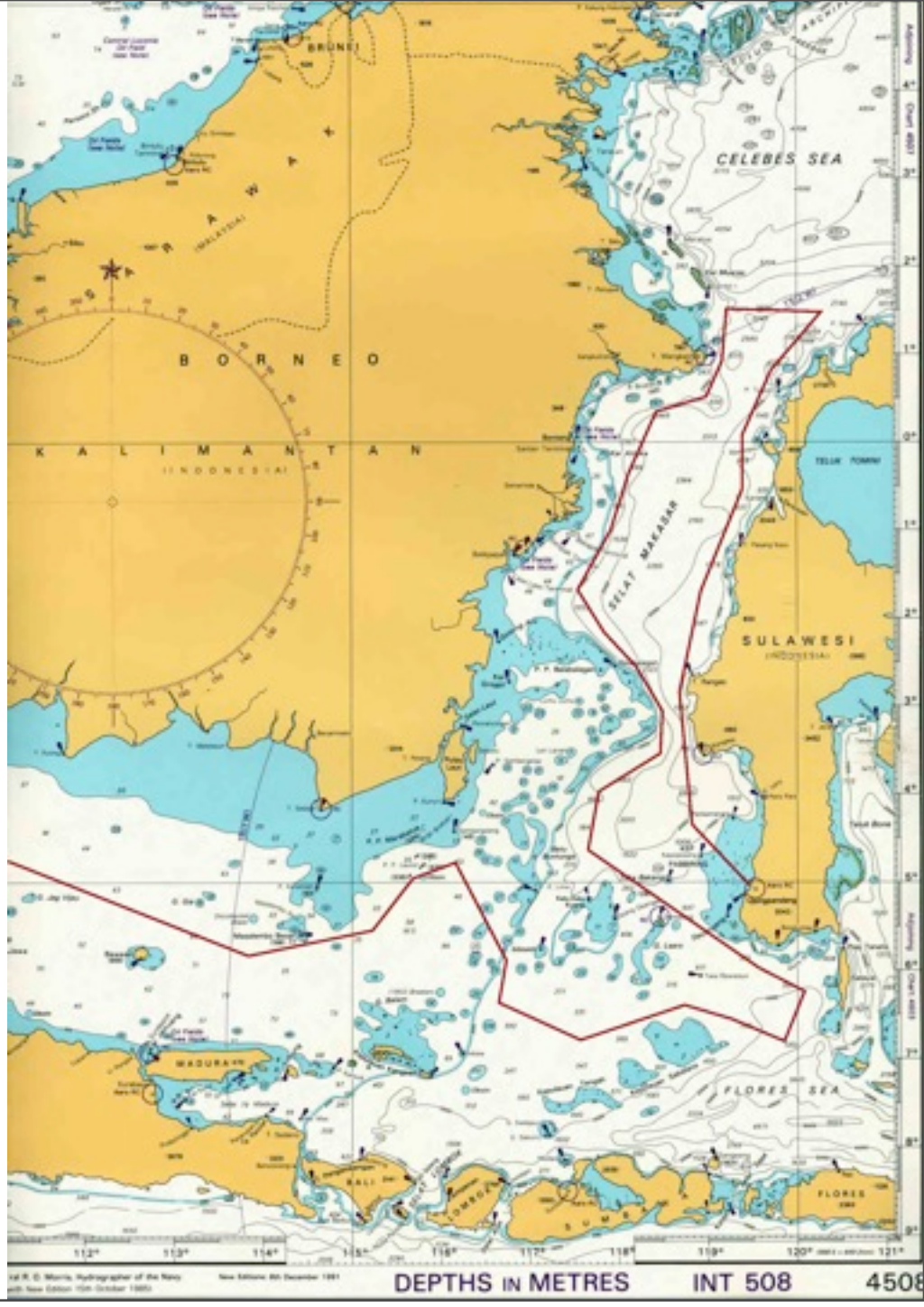
Federal Ministry of Education and Research


North Pacific Thermocline
South Pacific Thermocline
Java Sea Surface Water
Pacific Ocean
Mindanao Eddy
Halmahera Eddy
Sulawesi
Borneo
Halmahera
Maluku
1.5
Seram
La Niña
Sulawesi
Makassar
8
Java
sill ~680 m
Dewakang Sill
Flores
Banda
Java
Lombok
1.7
4.5
Timor
4.3
Timor
10
ITF
Indian Ocean
Australia
5°N
0°
5°S
10°S
110°E
115°E
120°E
125°E
130°E
135°E

(Gordon, 2005)

Proposed Route

- Beginning in Makassar (SW Sulawesi), to the North through the Makassar Strait.
- Sampling from Mahakam Delta.
- Finishing in Java Sea and towards Singapore.



R/V Sonne Scientific Equipment