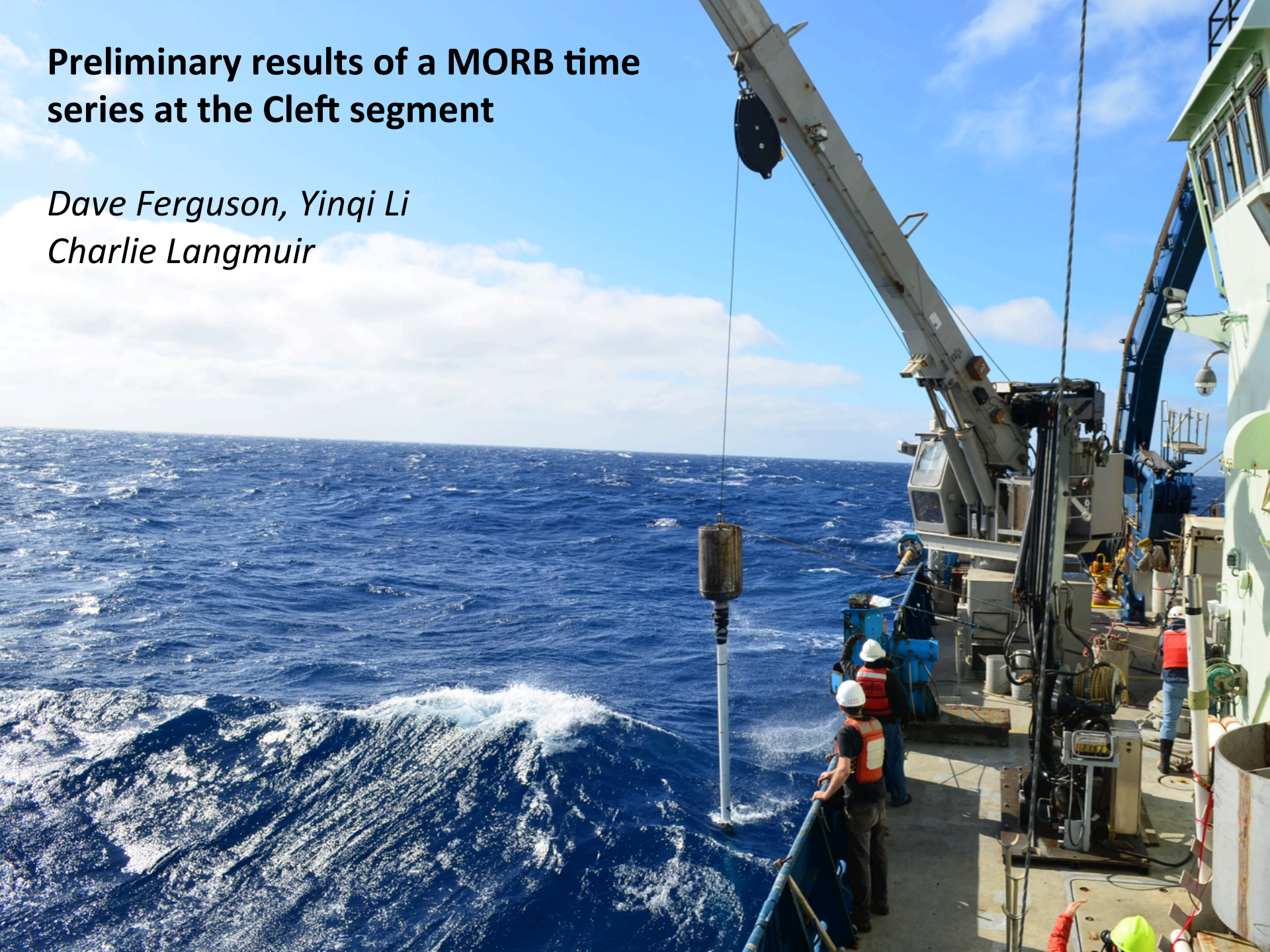


Preliminary results of a MORB time series at the Cleft segment

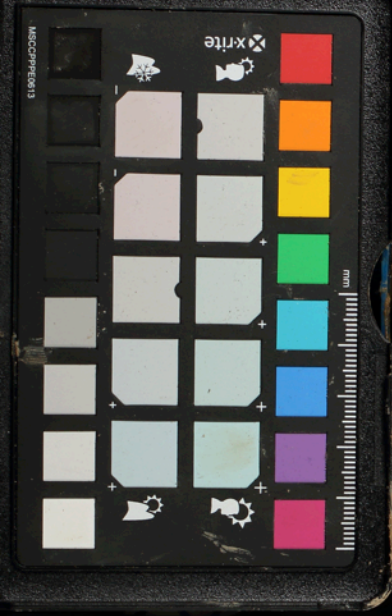
*Dave Ferguson, Yinqi Li
Charlie Langmuir*



AT26-19

27BB

Section 2 643.1593^{cm}





Once carbonates are dissolved and silicate sediment separated, a small fraction of glass chips (<5% wt) can be collected from each 1 cm of core - Large enough to analyze with EMPA and LA-ICP-MS

Provides a time series of lava compositions over 10's kyr

Origin of glass.....

Glass shards created by fragmentation, mixed into eruption plume



“The Huybers Core”

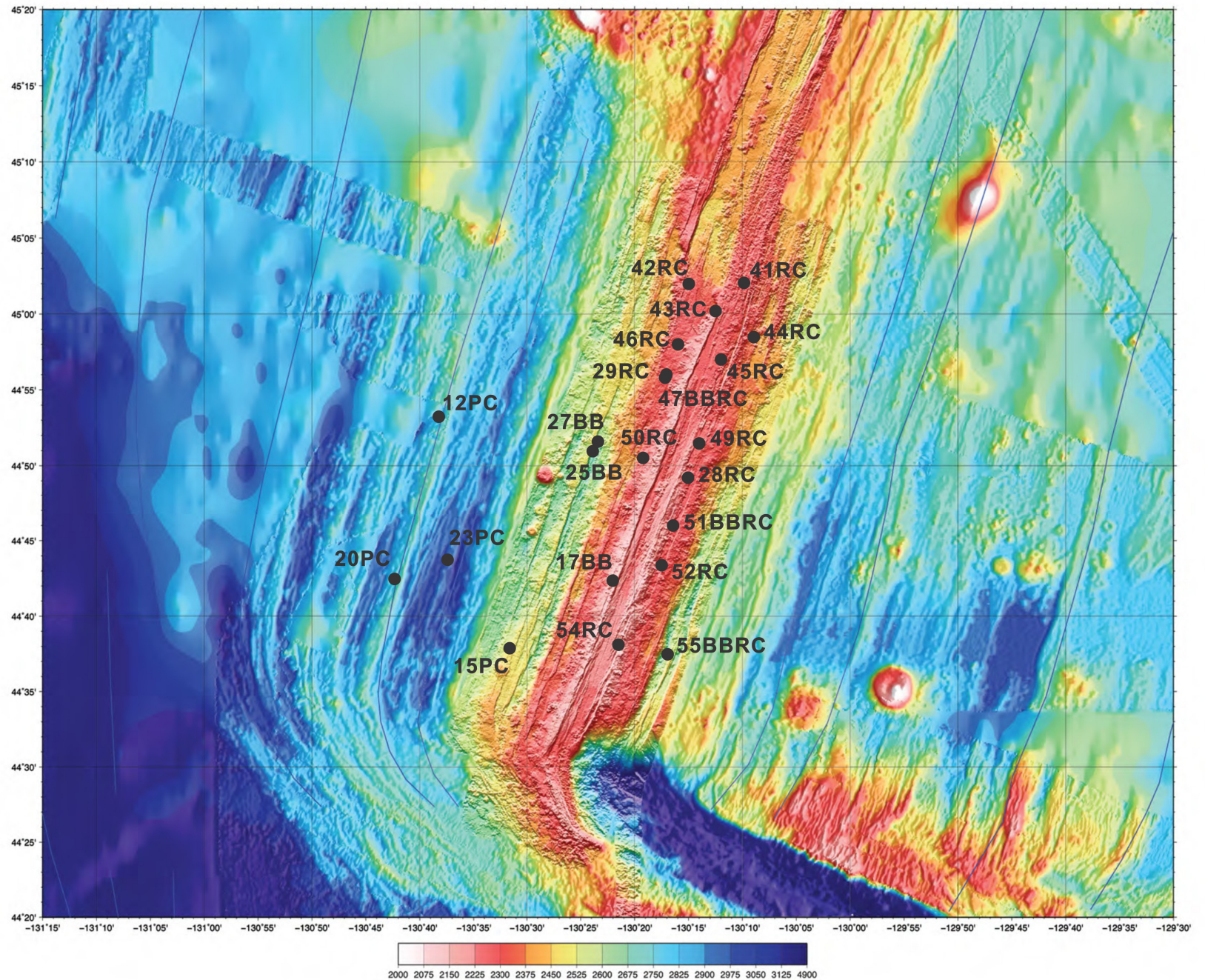
We also have sea-floor glasses from wax rock cores and core-cutters

‘Zero-age’ samples from rock cores along the axis, samples from older crust from the base of some sediment cores

Hybrid “Big Bertha-Rock Core”

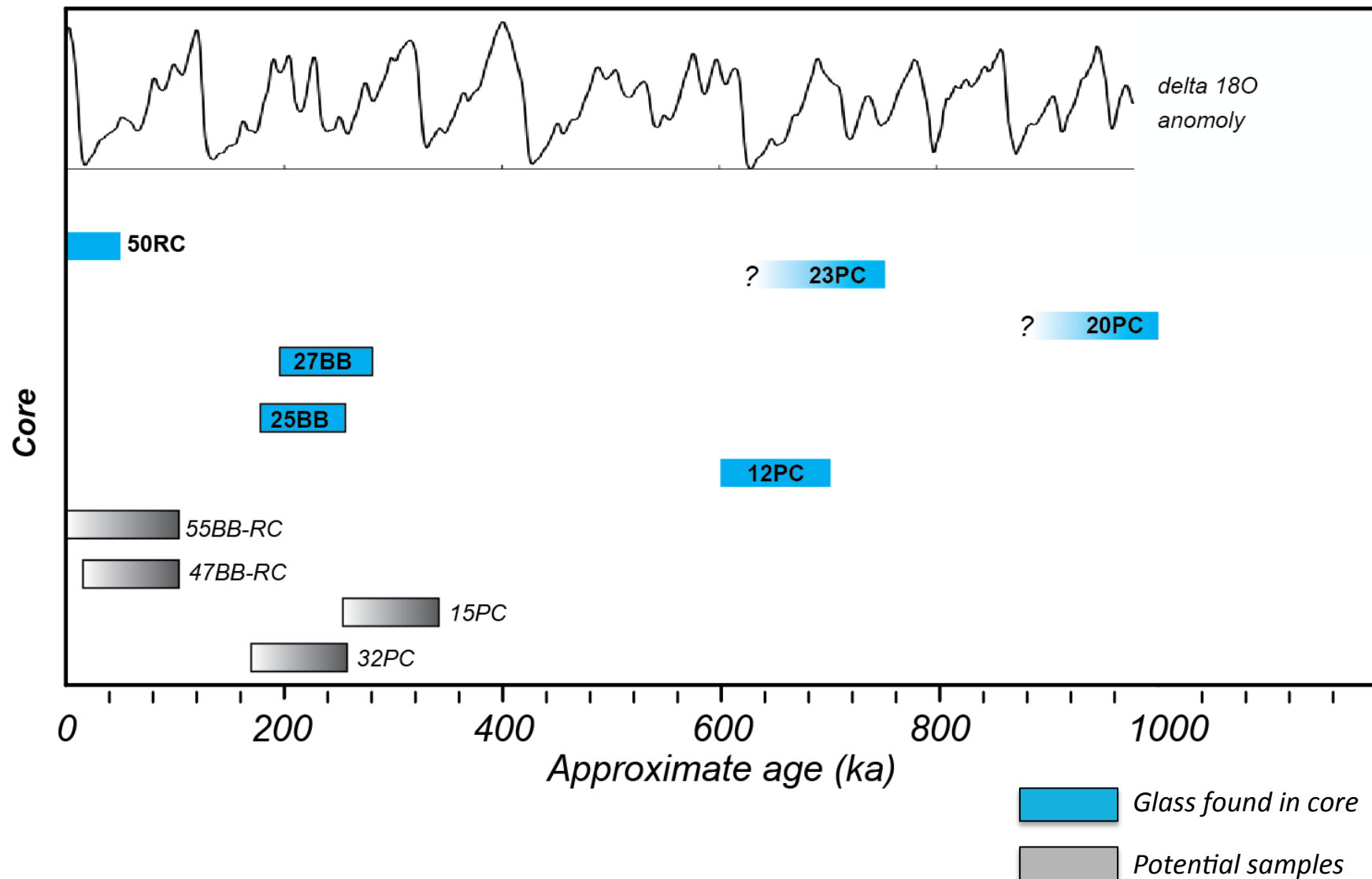


Current sample locations



Temporal distribution

Current and potential sample distribution for MORB glass time-series



Potential effects of glacial cycles on MORB chemistry

Higher sea level during interglacial may:

- 1. Decrease mantle melting – lower melt volumes and increase in incompatible element concentrations in primary magma. Magnitude and response time depends on total pressure change and melt migration timescale.***
- 2. Lower eruption rate, less extensive volcanism (?) and increased crustal residence times – more diversity in erupted melts wrt crustal fractionation processes.***
Controlled by crustal stresses (fracture systems etc) and mantle melt supply

.....And vice versa during glacial periods

- 3. Plus/minus other unknown intermediate time-scale trends/cycles in magmatism***

Current data

Core 12PC

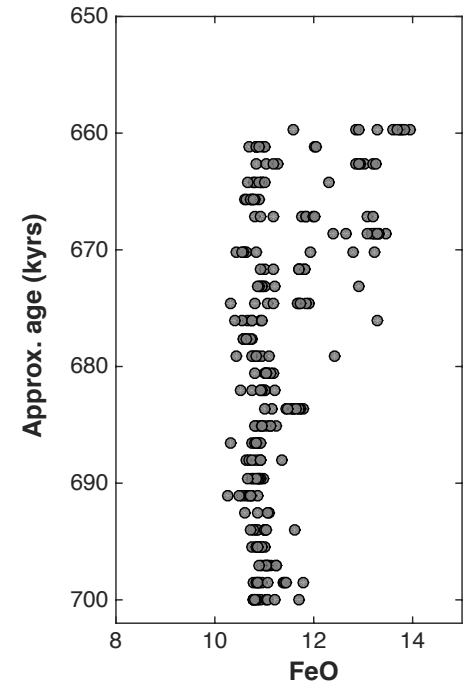
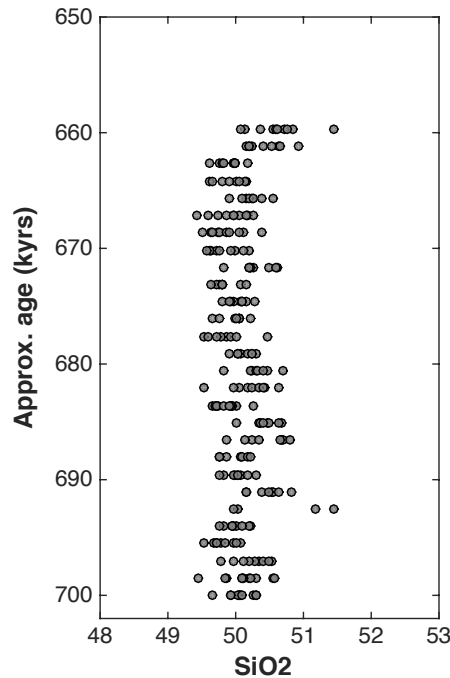
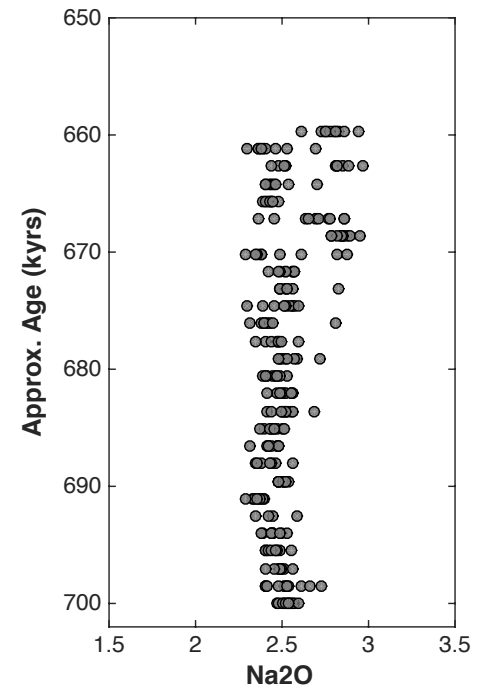
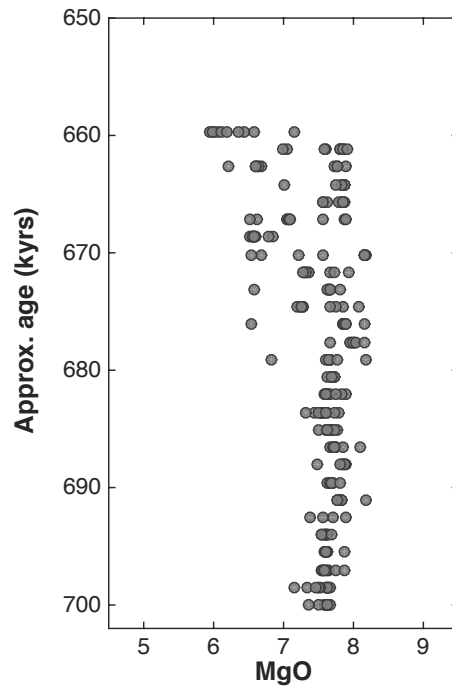
Bottom 67 cm
of core 12PC
contains glass –
depending on
sedimentation
rate this should
give a time
series of up to
100 ka

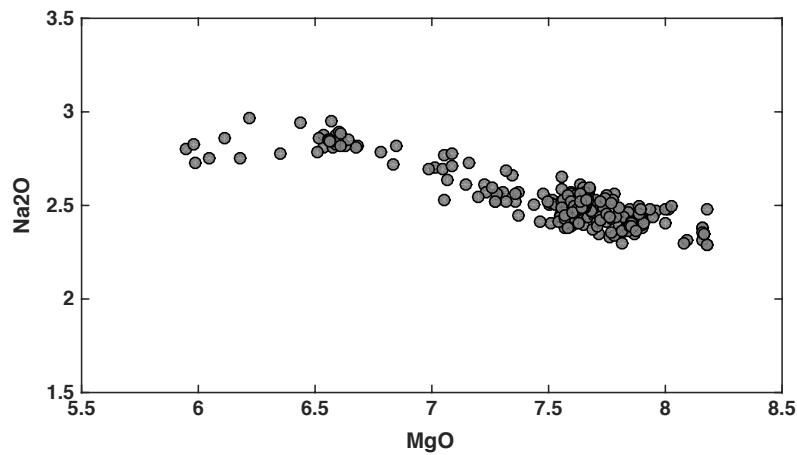
Currently have
major element
data for lower
27 cm

67 cm

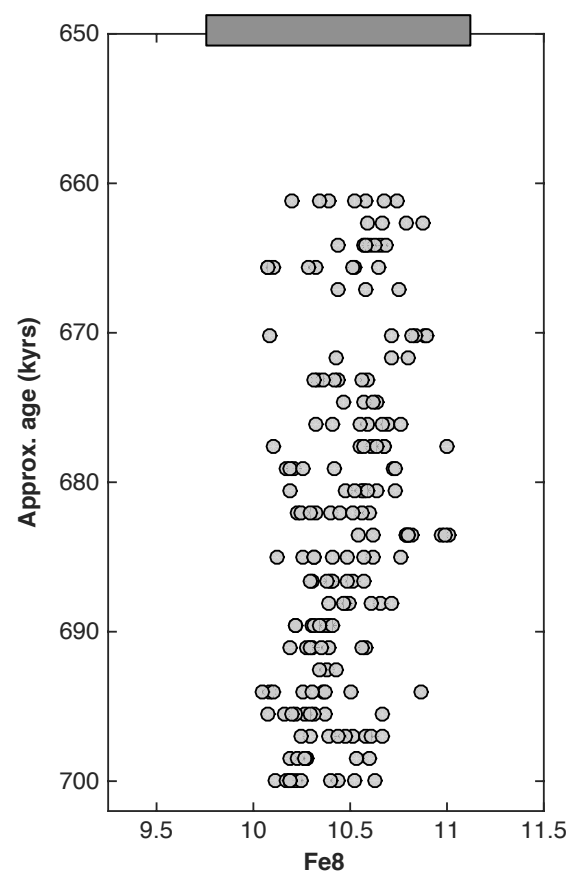
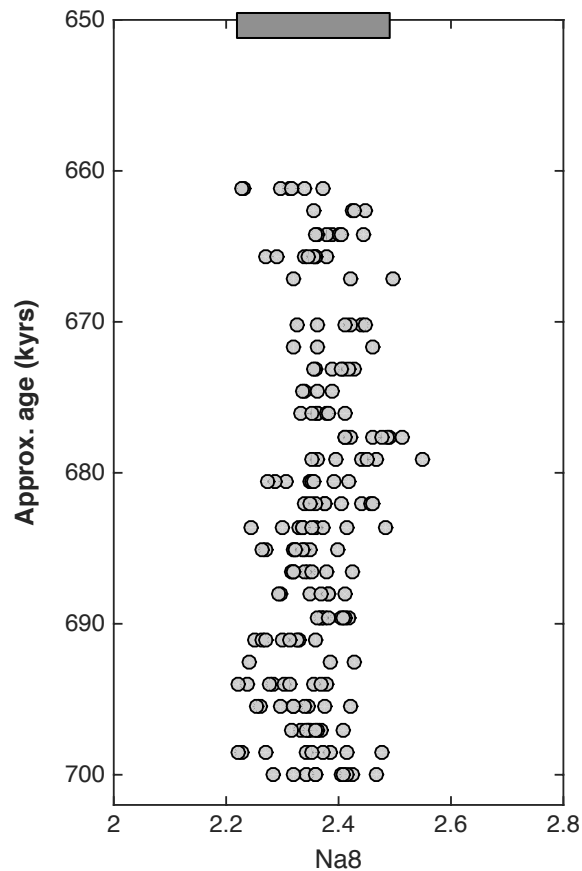
27 cm

~700 ka seafloor





Most glasses are high MgO (>7.5 wt%), but many have been affected by crustal fractionation

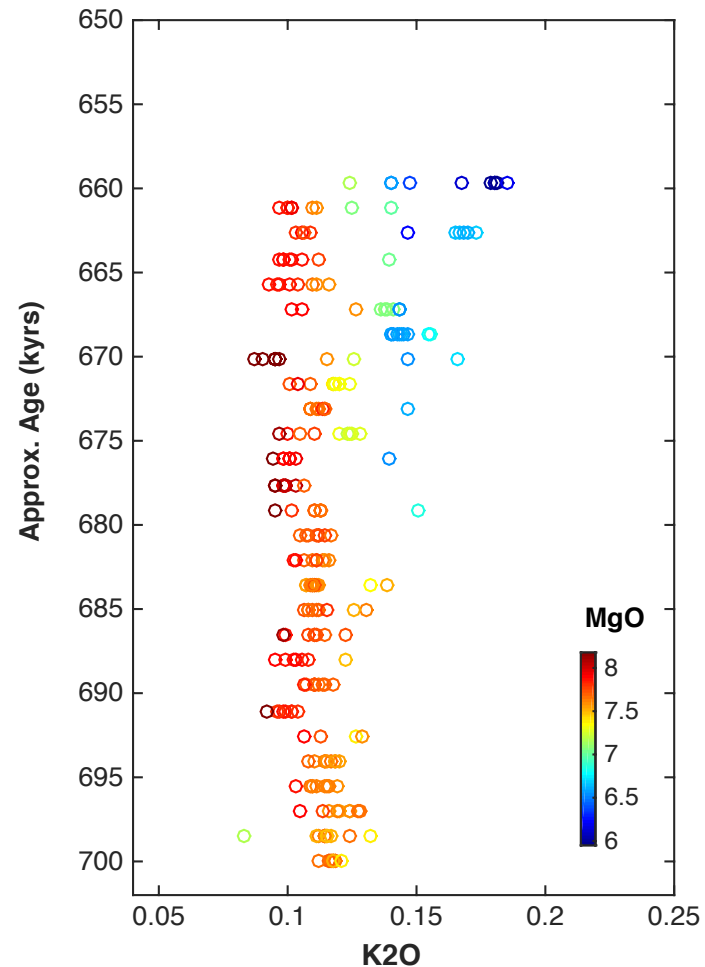
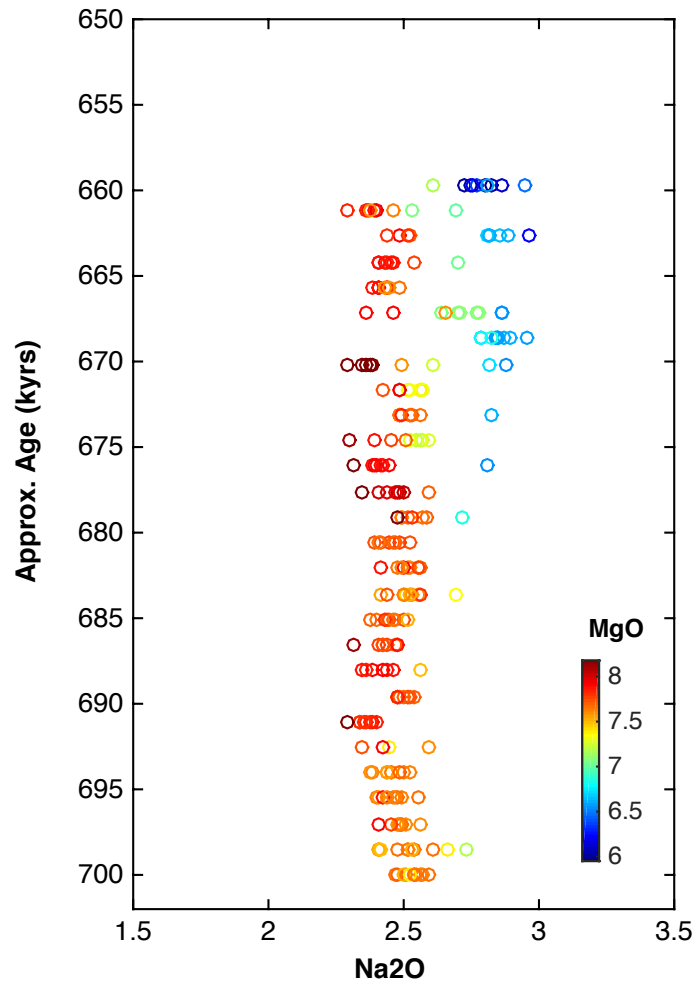


Remove fractionation signal by correcting Na and Fe in glasses with higher MgO concentrations to a common MgO value (8 wt%)
(after Klein and Langmuir, 1987)

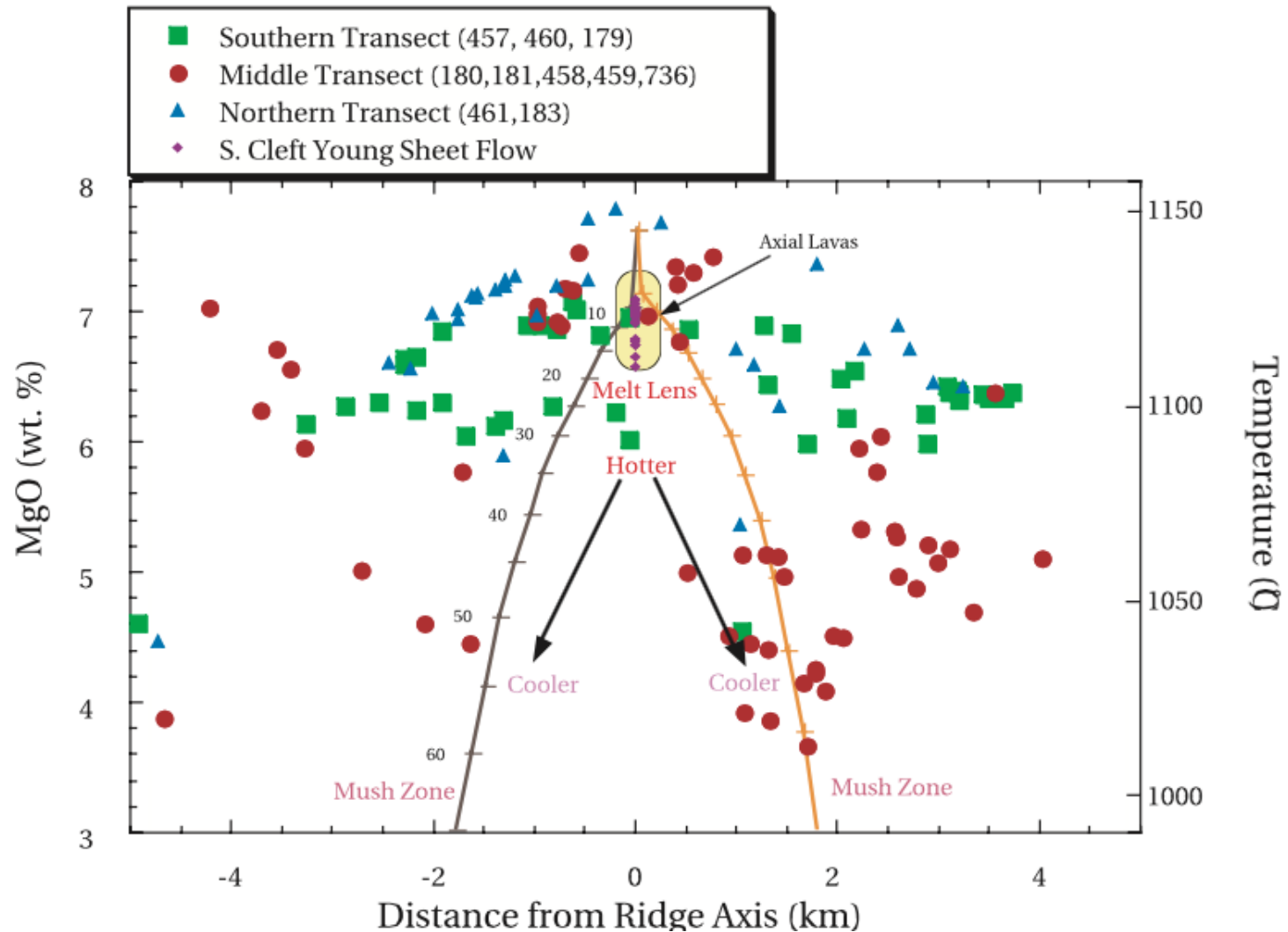
No clear trend in primary Na or Fe contents, similar to range for recent axial samples (Stakes et al. 2006)

Compositional variability observed over ~40 kyrs due to varying amounts of crustal fractionation. After ~680 ka the range of compositions sampled by the core becomes more diverse

Change occurs around transition between MIS 17 to 18, one possibility is a change in confining pressure, melt flux etc.



Another is as steady-state neovolcanic zone that we are sampling as the sediment pile moves across the ridge (if more off-axis eruptions are lower MgO)



Future work etc.....

- ***Analyze current samples with EMPA and (where possible) LA-ICP-MS***
 - 12PC, 25BB, 27BB, 23PC, 15PC
- ***Collect more samples from other cores that hit bottom***
- ***Analyze sediments for hydrothermal signals***

Collaboration:

- ***Sedimentation rates? Important for ages – ^{10}Be etc?***
- ***Sedimentologists - if you see glass chips, please save them!***
- ***Compare data to models of mantle melting, sea level change etc***



