IMMAGE - Investigating Miocene Mediterranean-Atlantic Gateway Exchange

– an amphibious drilling proposal that complements DREAM

IODP Proposal 895-Pre

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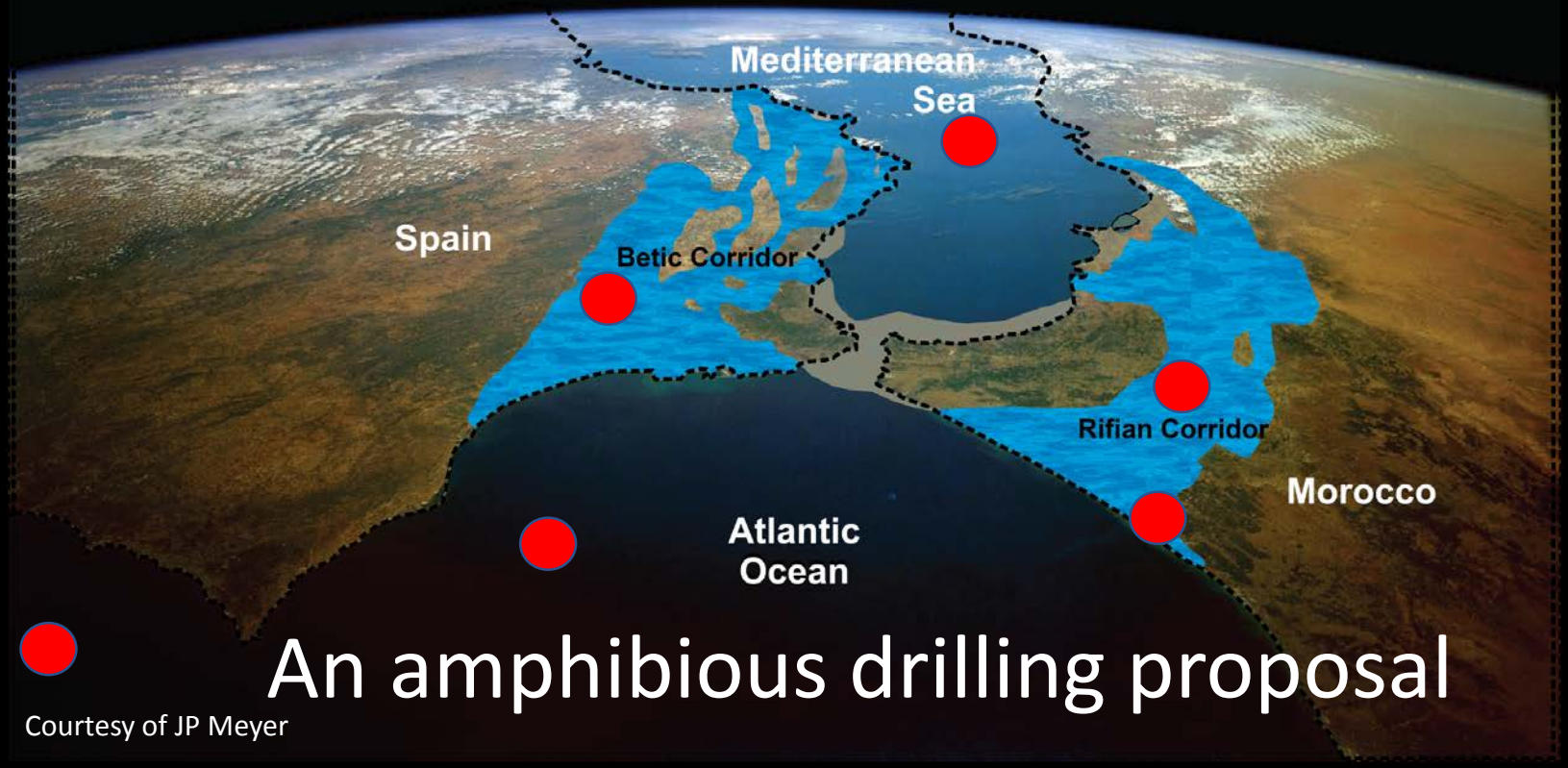
IMMAGE

Investigating Miocene Mediterranean-Atlantic Gateway Exchange



An amphibious drilling proposal

Courtesy of JP Meyer

IMMAGE objective 1

To recover a complete record of Mediterranean-Atlantic exchange before, during and after the Messinian Salinity Crisis and to evaluate the causes and consequences of this extreme oceanographic event

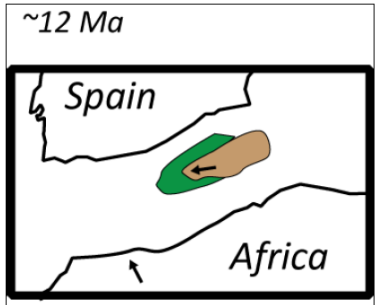
Gypsum, from the Primary Lower Gypsum unit at Sorbas, Spain

Photo courtesy of Stefano Lugli

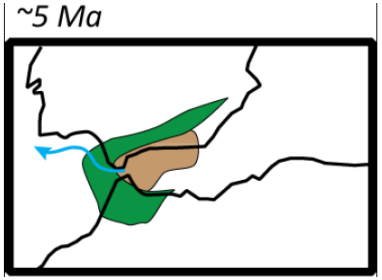
IMMAGE objective 2

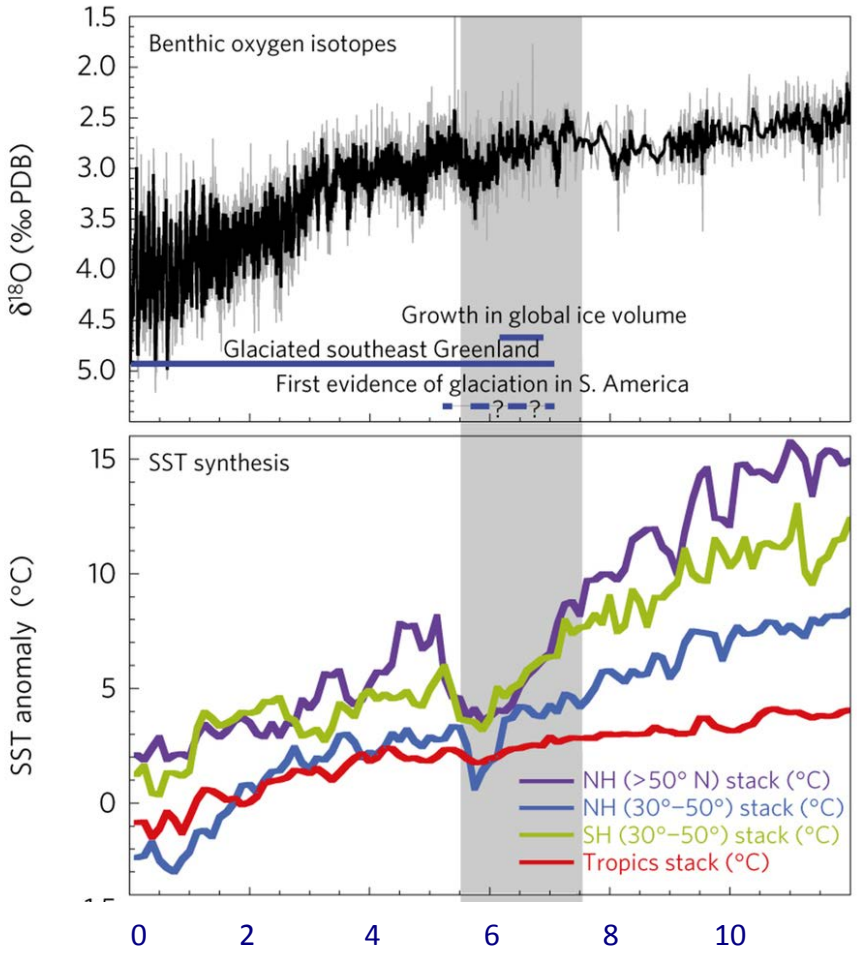
To document the time at which the Mediterranean first started to contribute a distinctly more saline outflow to the Atlantic and to assess its role in triggering global cooling in the Late Miocene

Wide connecting seaway



Narrow marine gateway



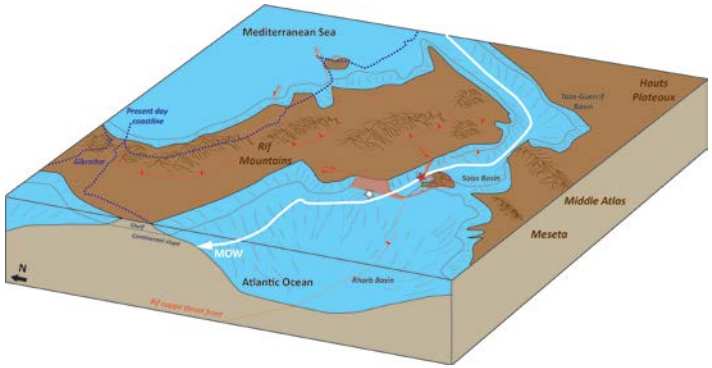


Herbert et al 2016

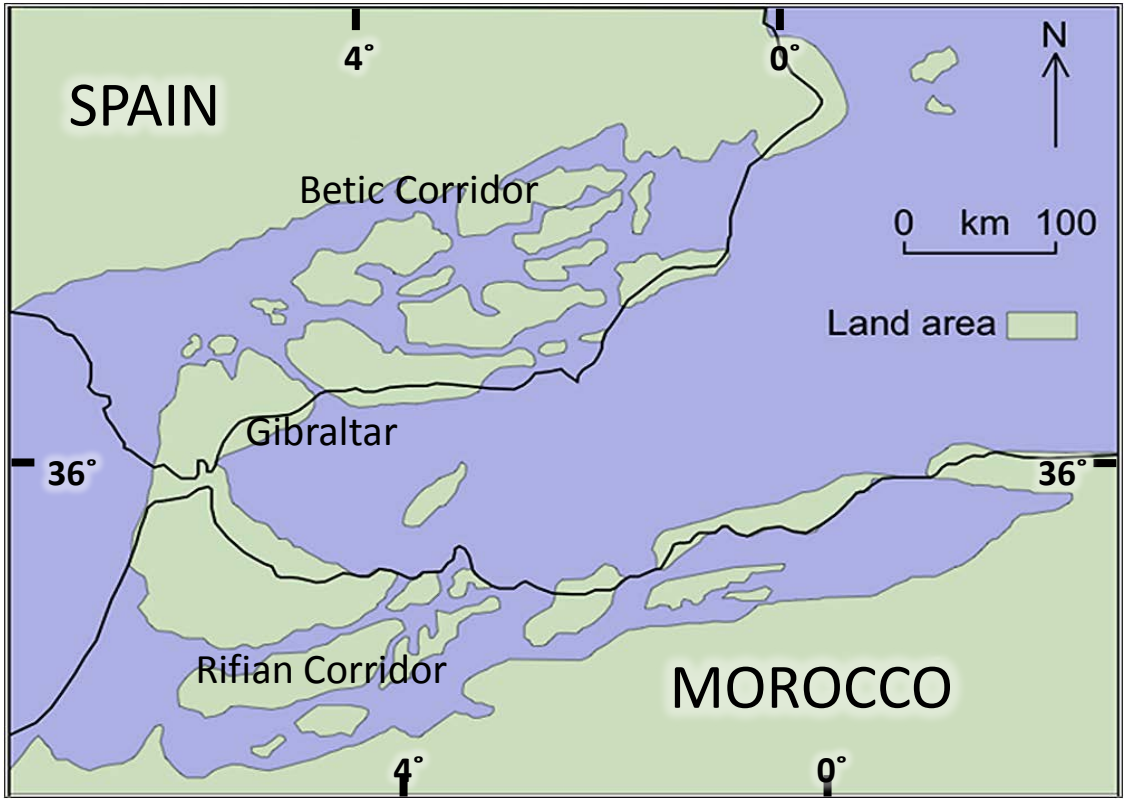
IMMAGE objective 3

To establish through which of the three possible conduits (Gibraltar, Rifian Corridor or Betic Corridor) exchange occurred during the Late Miocene;

Photograph courtesy of Paul Meijer



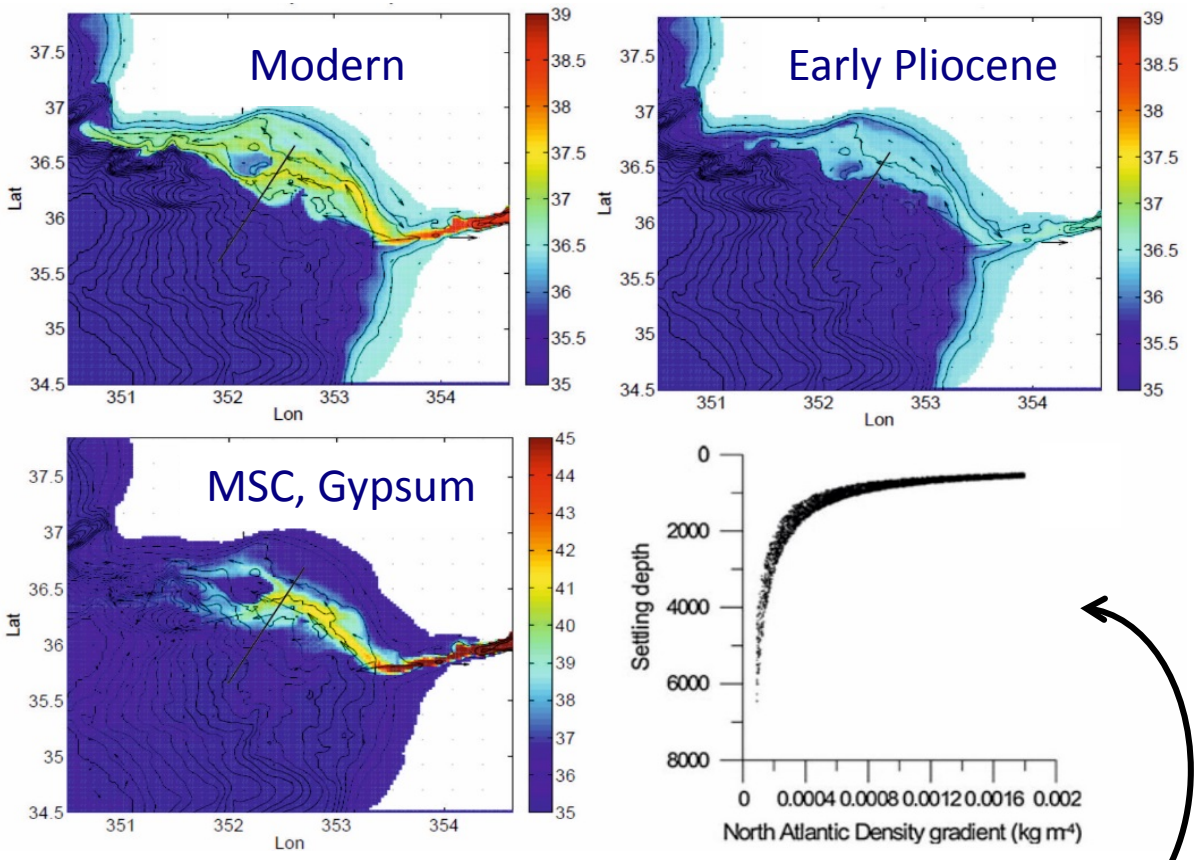
Capella et al in prep.



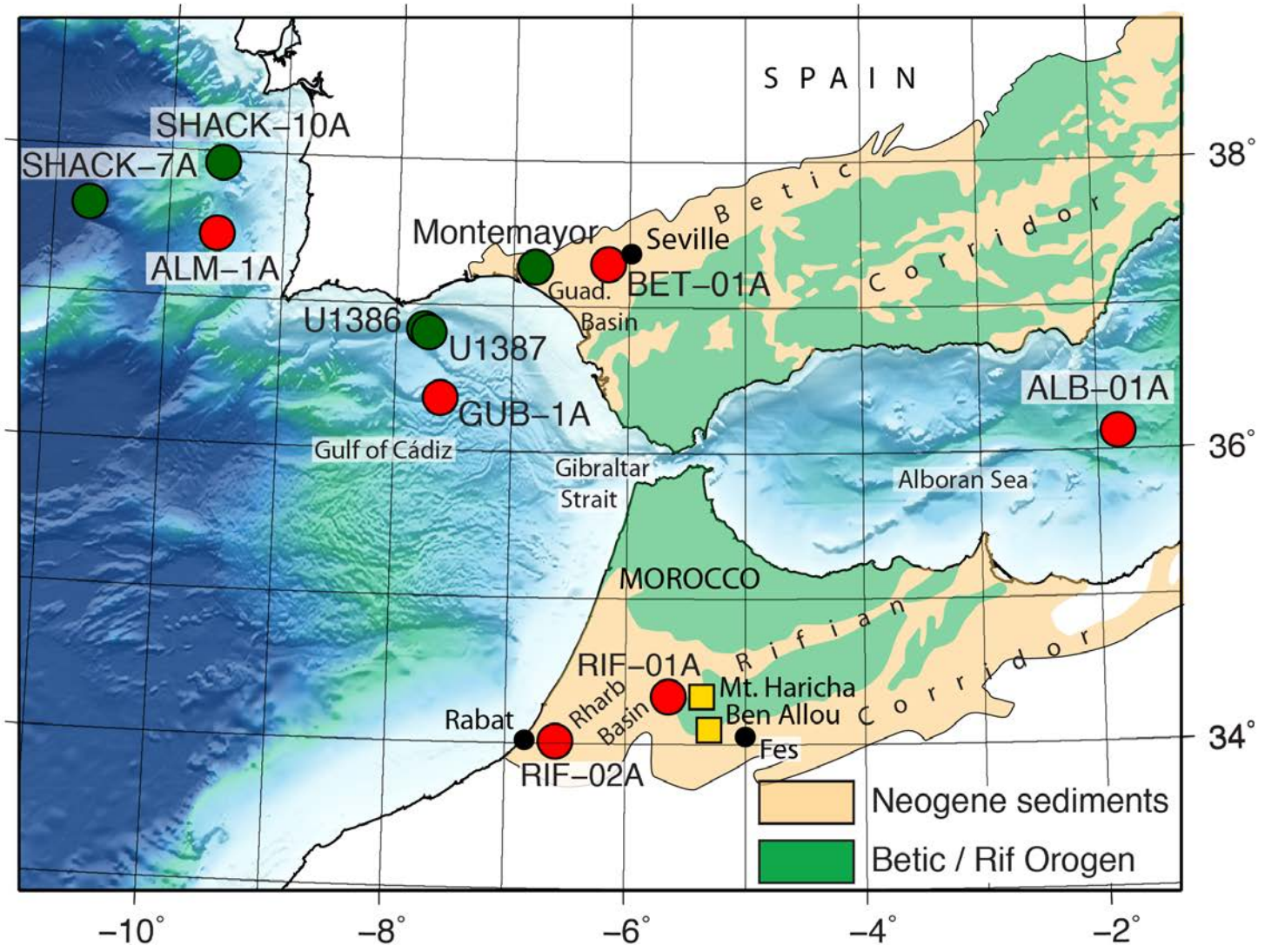
IMMAGE objective 4

To test our quantitative understanding of the behaviour of oceanic overflows under the exceptionally wide range of conditions that occurred at the Mediterranean gateway during the Late Miocene.

We do not really know what happens when you have really saline outflow



Impact of altering the Atlantic vertical density gradient on the settling depth of Mediterranean Overflow water



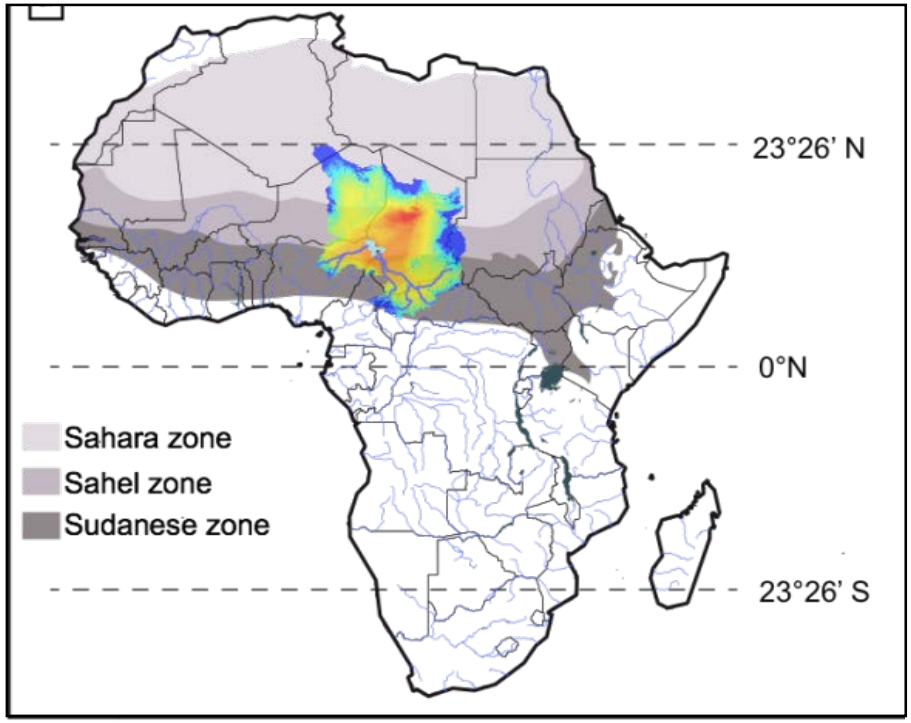
ICDP workshop November 2016

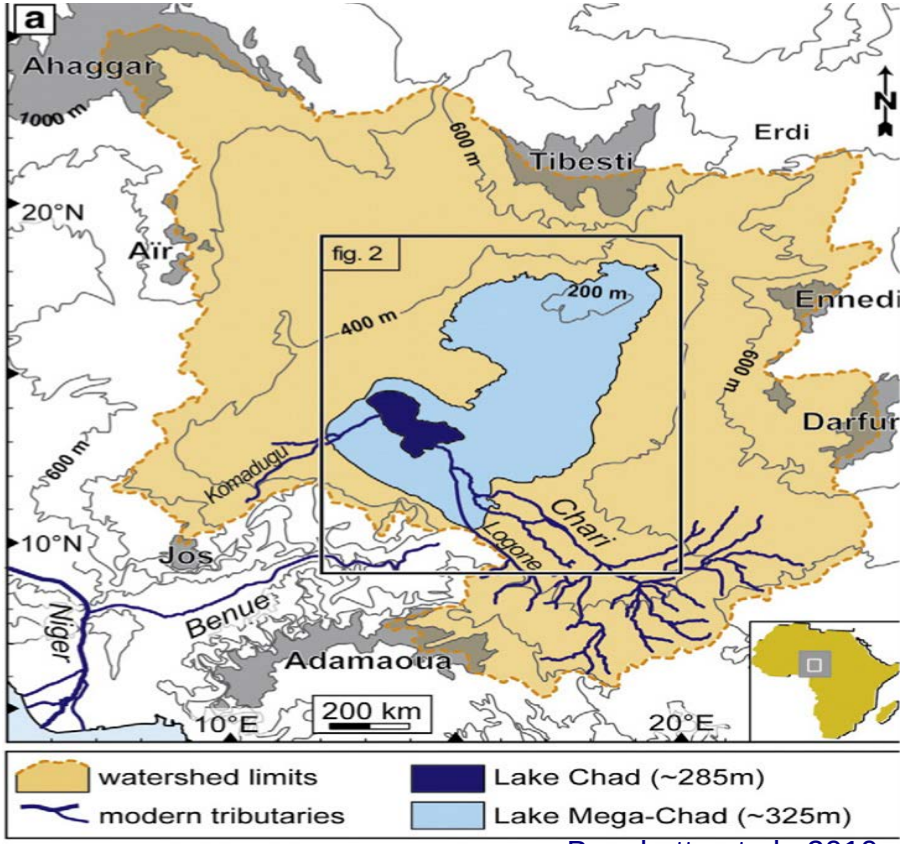
CHADRILL – ICDP drilling to recover a 10 million year record of the North African Monsoon

http://chadrill.icdp-online.org (icdp web)

Florence Sylvestre, Mathieu Schuster, Ousmane Moussa Abdheramane, David Nicolas Waldmann, Rachel Flecker, Hendrik Vogel, Daniel Raul Ariztegui

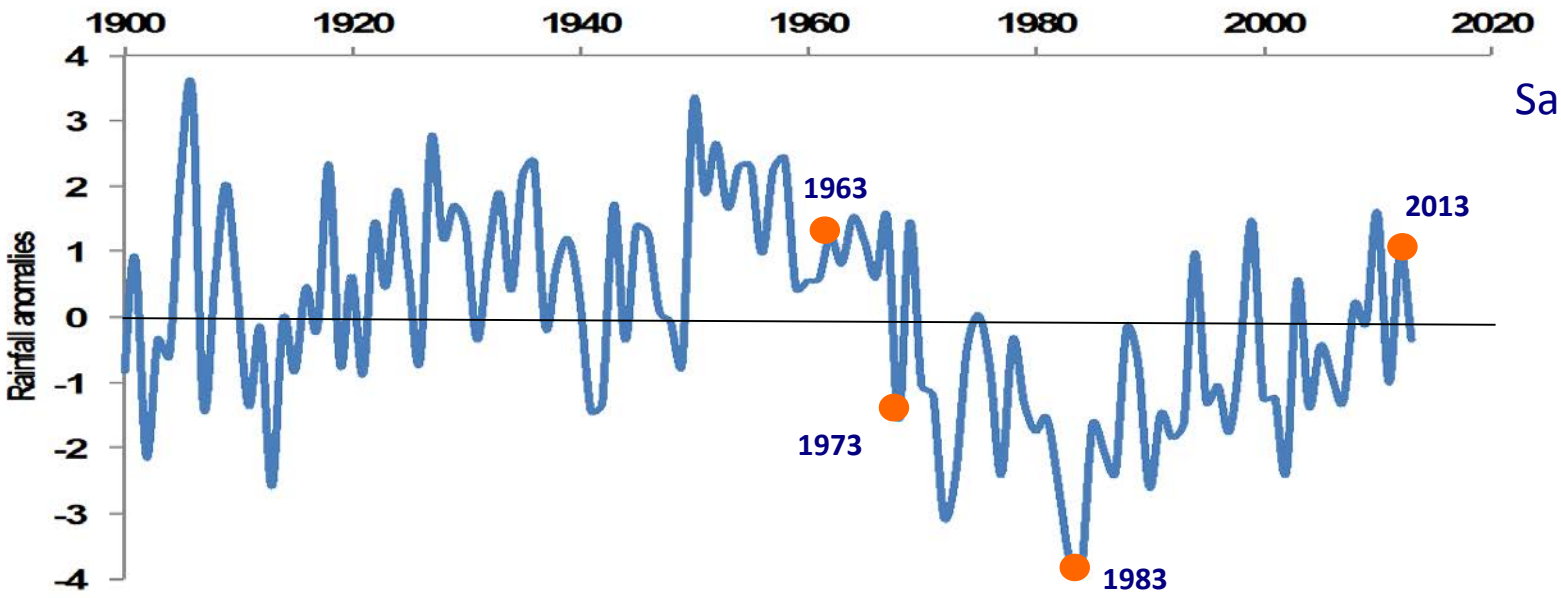
workshop successfully done: September 21 to 23, 2016



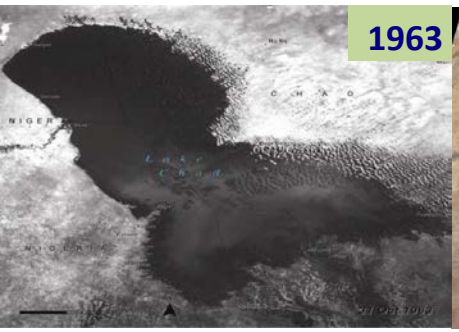


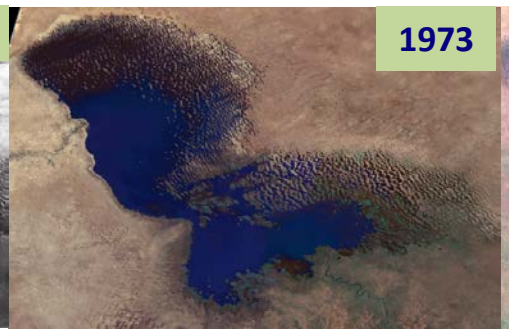
Bouchette et al., 2010

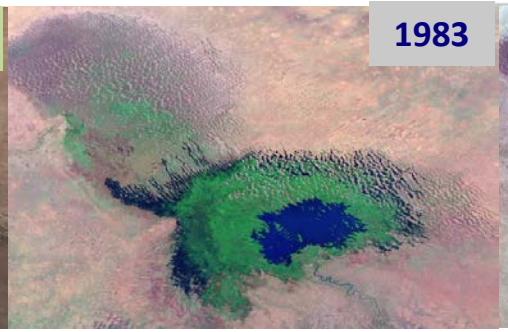
Lake and precipitation variability

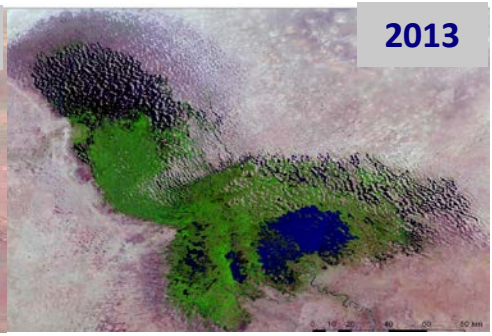


Sahel index









From 25000 km^2…… to <2500 km^2…… at 14 000 km^2

Megalake Chad 350,000km^2

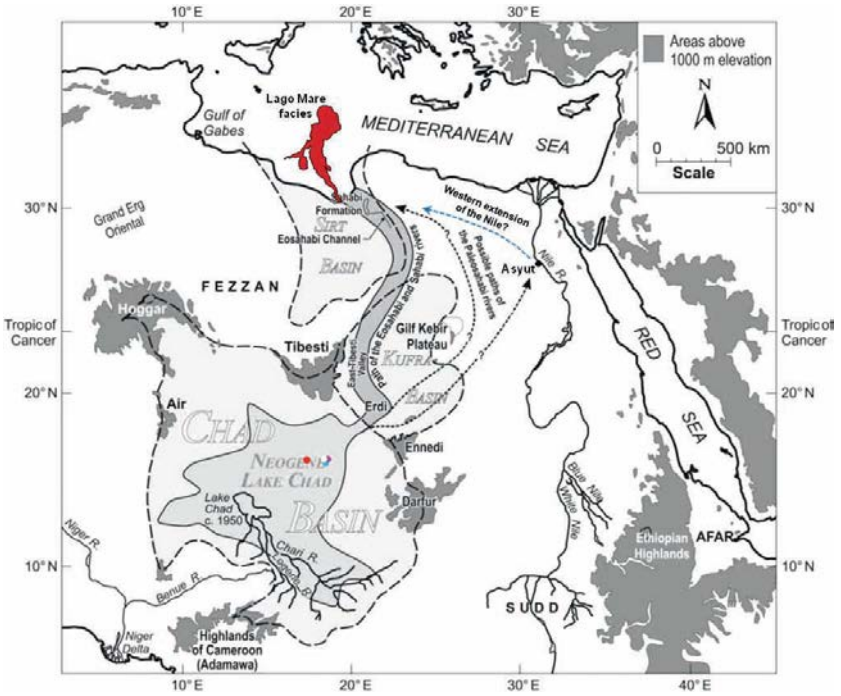
CHADRILL

Scientific Objectives

Implement the first scientific drilling project to recover the longest sediment record from Central Northern Africa back to ~10 Myr
Document the mechanisms by which orbital forcing influences north African climate under different climate boundary conditions
Identify the climatic context that shaped environmental conditions favourable for human migration(s) into northern Africa
Identify the depositional context of the early stages of basin formation and explore the possible link to the Mediterranean Sea
Explore the limit of deep life and the factors controlling the abundance and activity of microbes at depth

OGS

Transferring the monsoon signal to the Mediterranean Sea



Bowmann et al., 2012, modified after Griffin, 2011

CHADRILL – DREAM – IMMAGE
Co-ordinated, complementary drilling initiatives

The opportunity to correlate precession and sub-precessional records of the North African Monsoon with the Mediterranean's amplified response to changes in its freshwater budget and its consequence for thermohaline circulation in the North Atlantic.