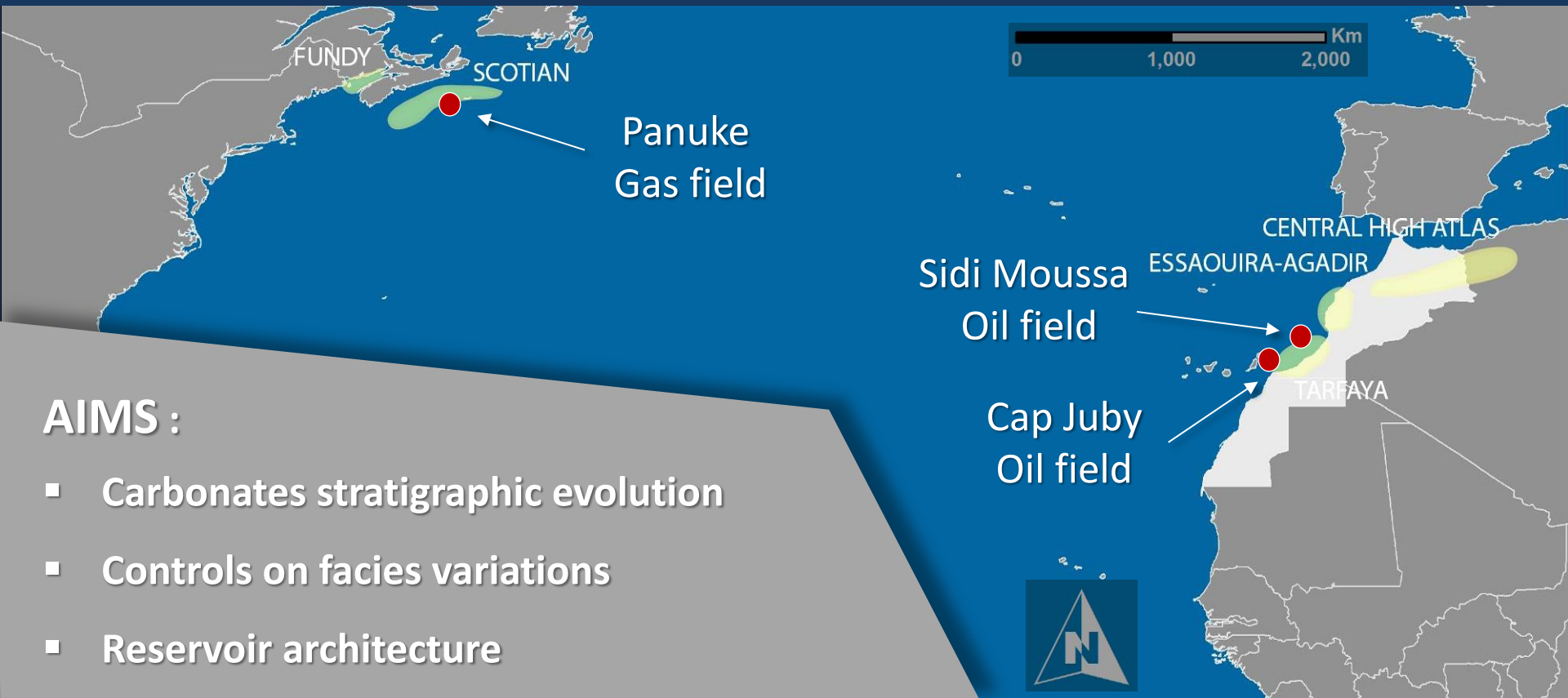


CARBONATE PLATFORM AND REEF DEPOSITS CALLOVIAN - OXFORDIAN IN THE AGADIR-ESSAOUIRA BASIN

A. Duval-Arnould; S. Schroeder; L. Bulot ; J. Redfern

AIMS OF THE STUDY



AIMS :

- Carbonates stratigraphic evolution
- Controls on facies variations
- Reservoir architecture

CONJUGATE ATLANTIC BASINS



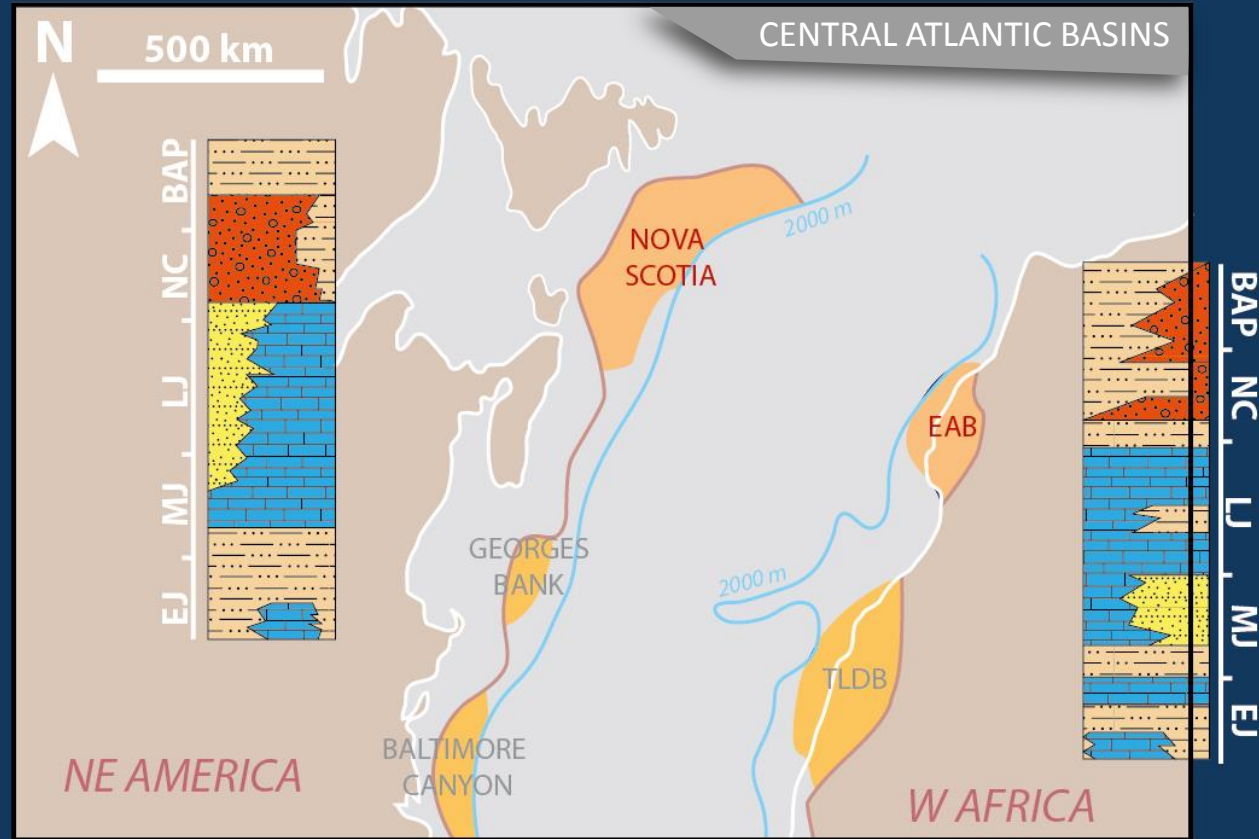
Comparison of **Middle Jurassic – Aptian** stratigraphic record of Central Atlantic Ocean conjugate passive margins

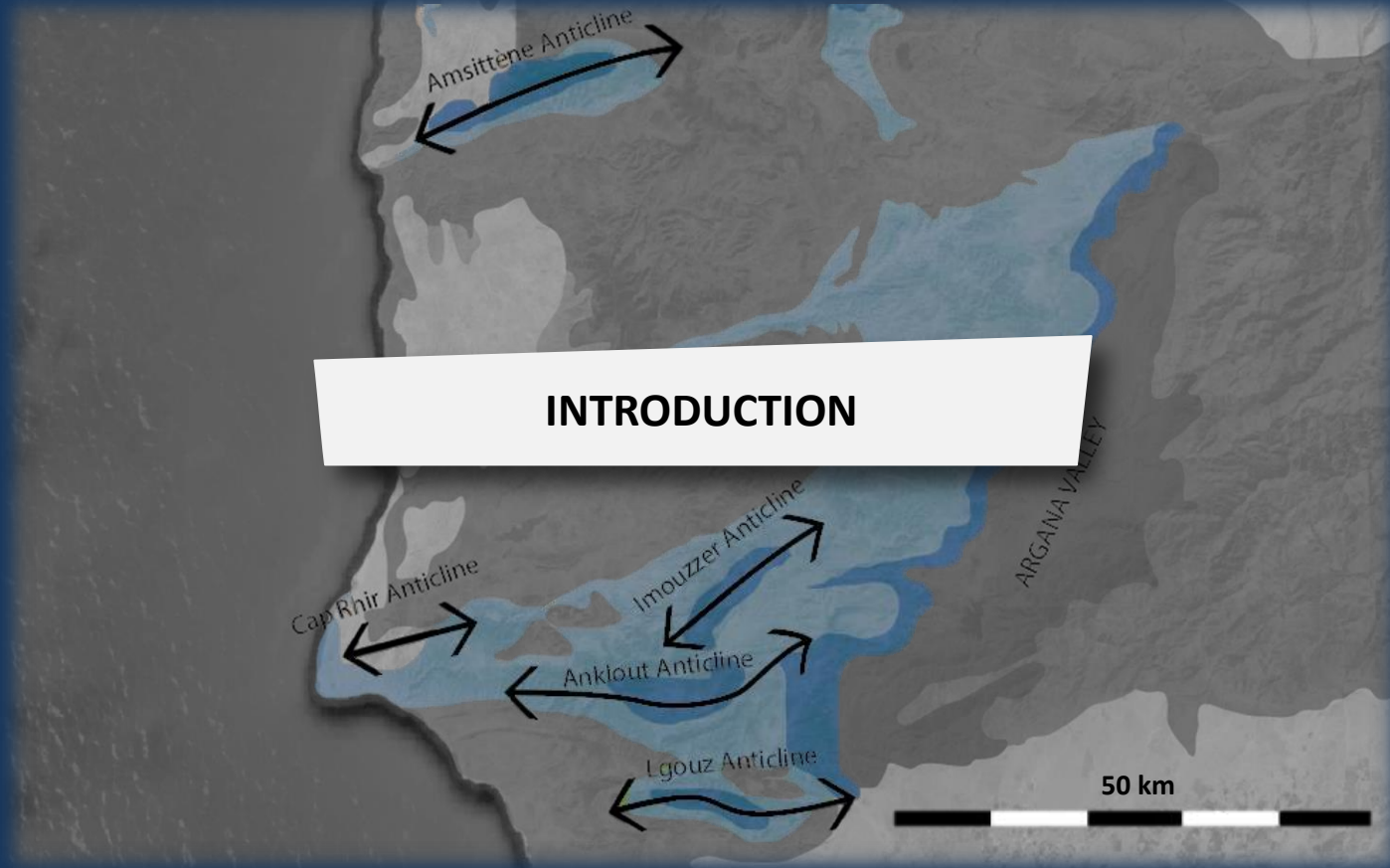
Jurassic:

- Stable carbonate platform
- Interrupted by siliciclastic deposition during the Cretaceous

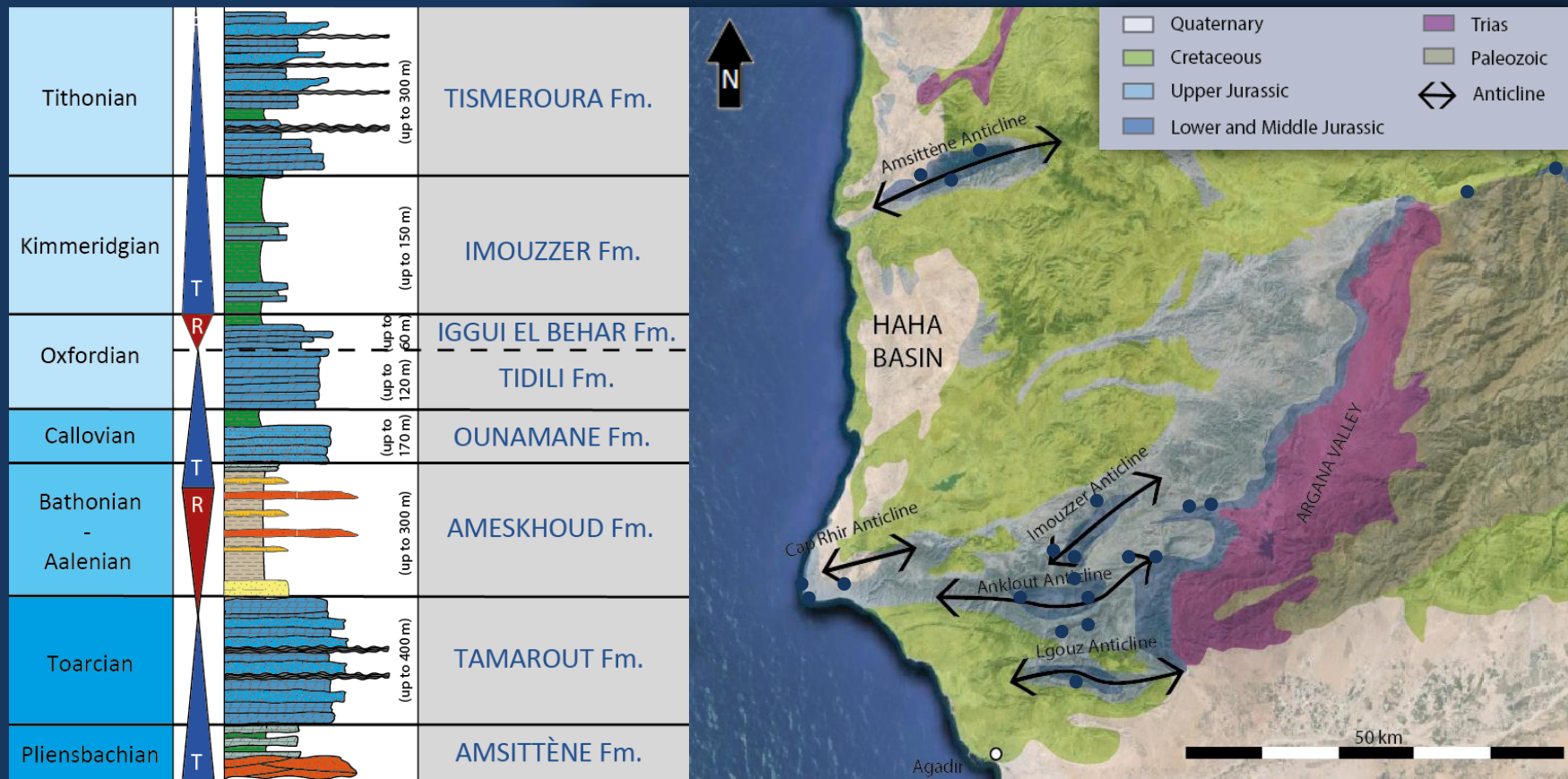
➤ Potential **reservoir**

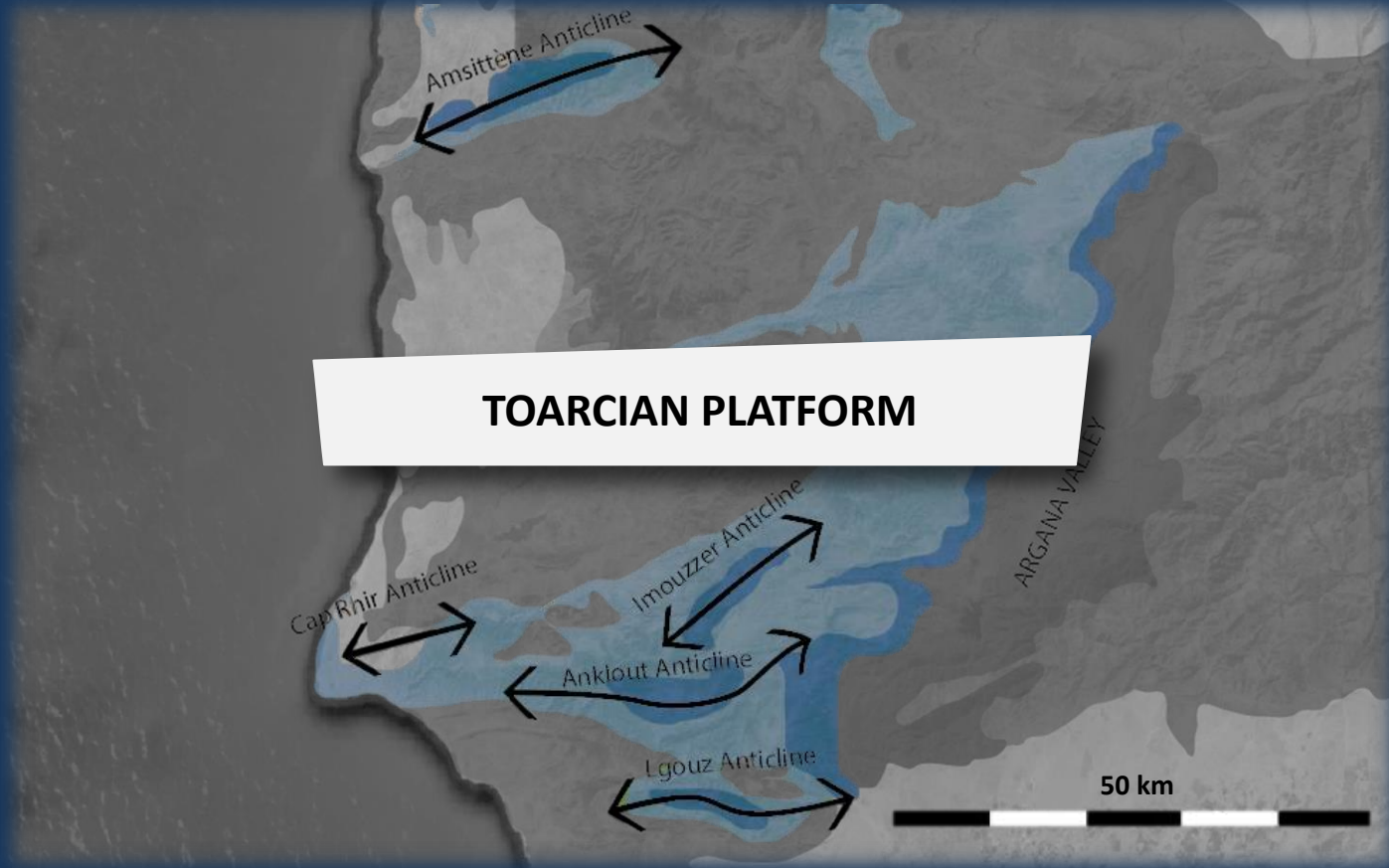
*Modified after
Leprêtre et al, 2017*



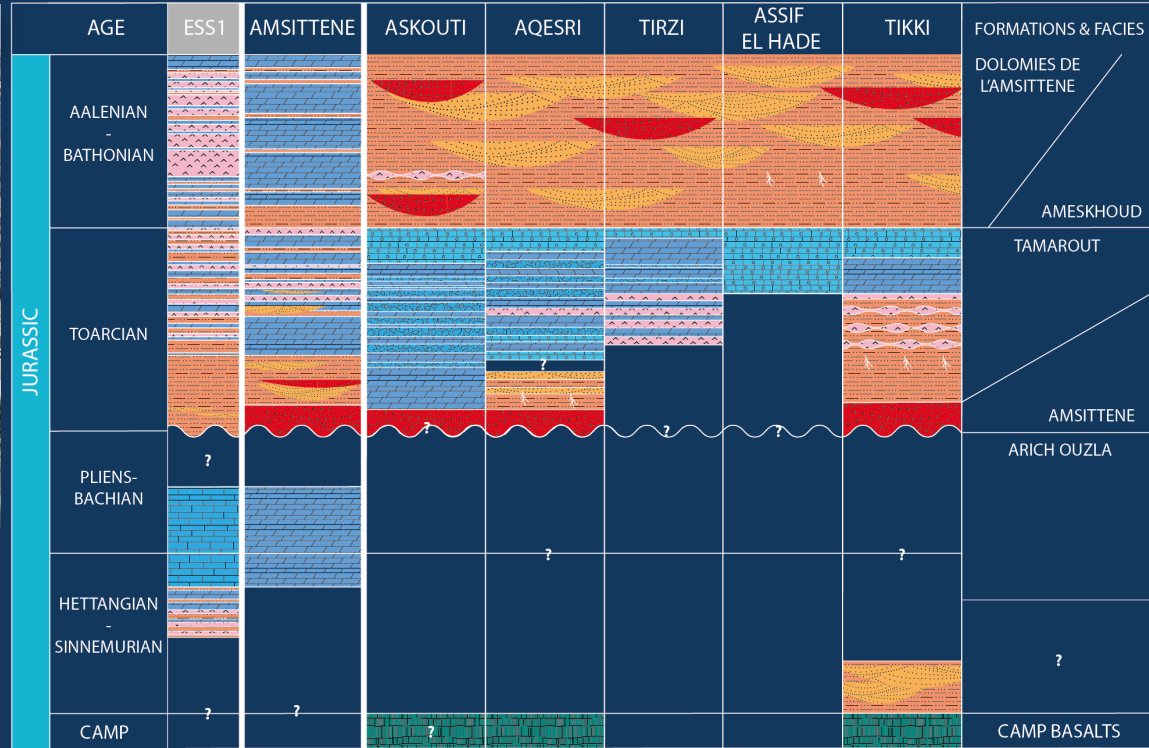
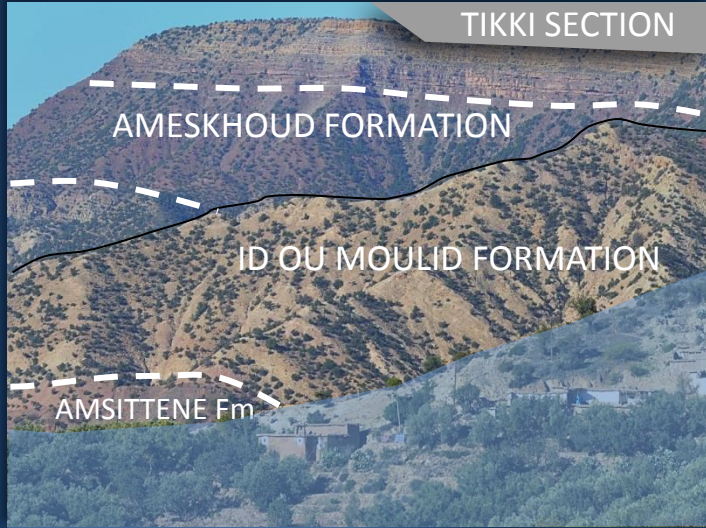


ESSAOUIRA – AGADIR BASIN





LIAS - DOGGER EAB



TOARCIAN: Establishment of a carbonate platform across the basin

MIDDLE JURASSIC: regression to fluvial deposits

TOARCIAN PLATFORM



Tizgui barrage outcrop



Toarcian Palaeomap
From Scotese, 2011

Sedimentary structures



PST/GST
Elements

Elements %
↑



Peritidal cycles :

- Oolitic GST
- Oolitic and peloidal W/PST
- Gypsum levels
- Dissolution breccias
- Stromatolites

TAMAROUT FORMATION

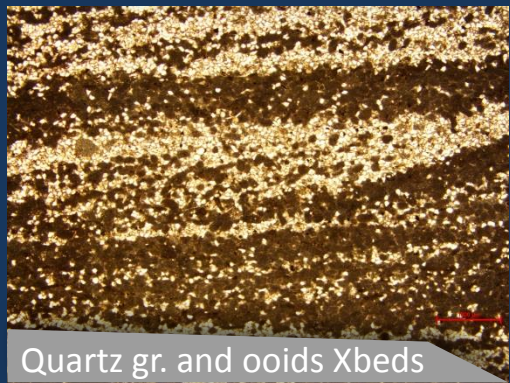


Oolitic PST/GST



Stromatolites

Dissolution breccias



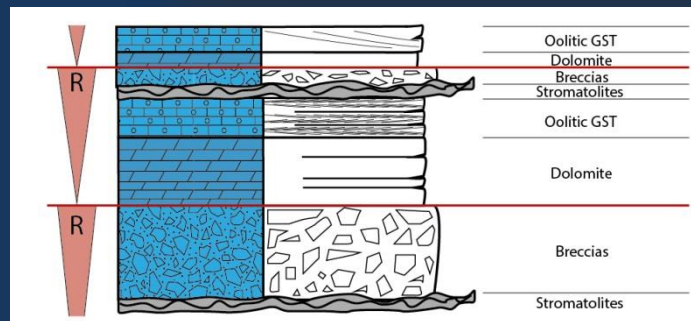
Quartz gr. and ooids Xbeds

SUPRATIDAL

INTERTIDAL

SUBTIDAL

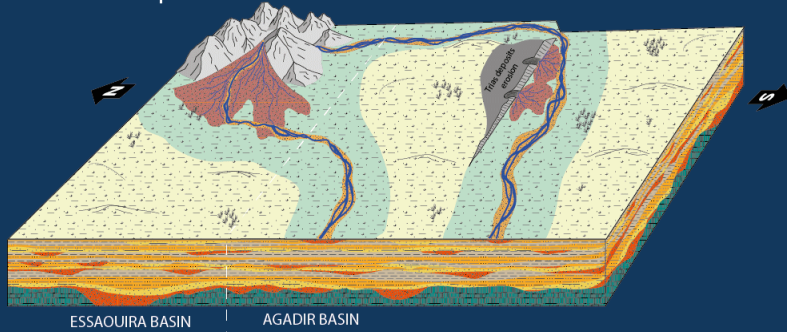
Peritidal cycles



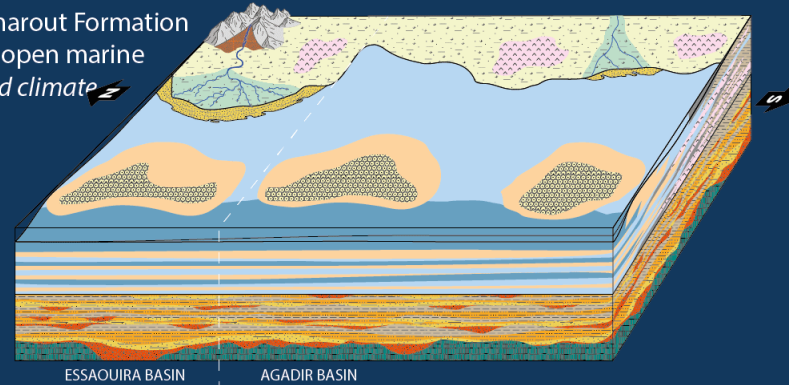
DEPOSITIONAL ENVIRONMENTS



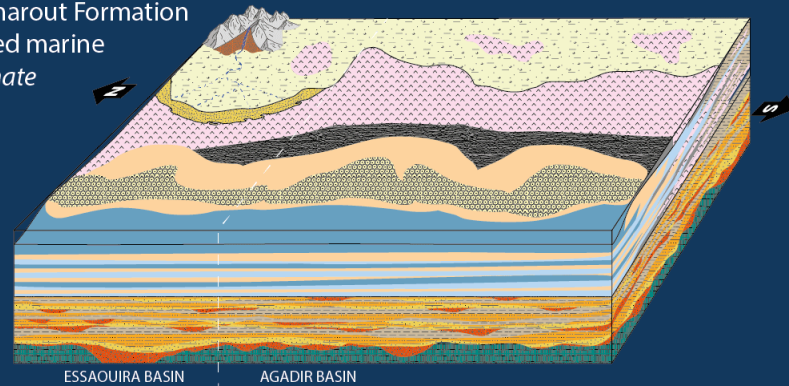
A - Amsittene Formation
Continental deposits



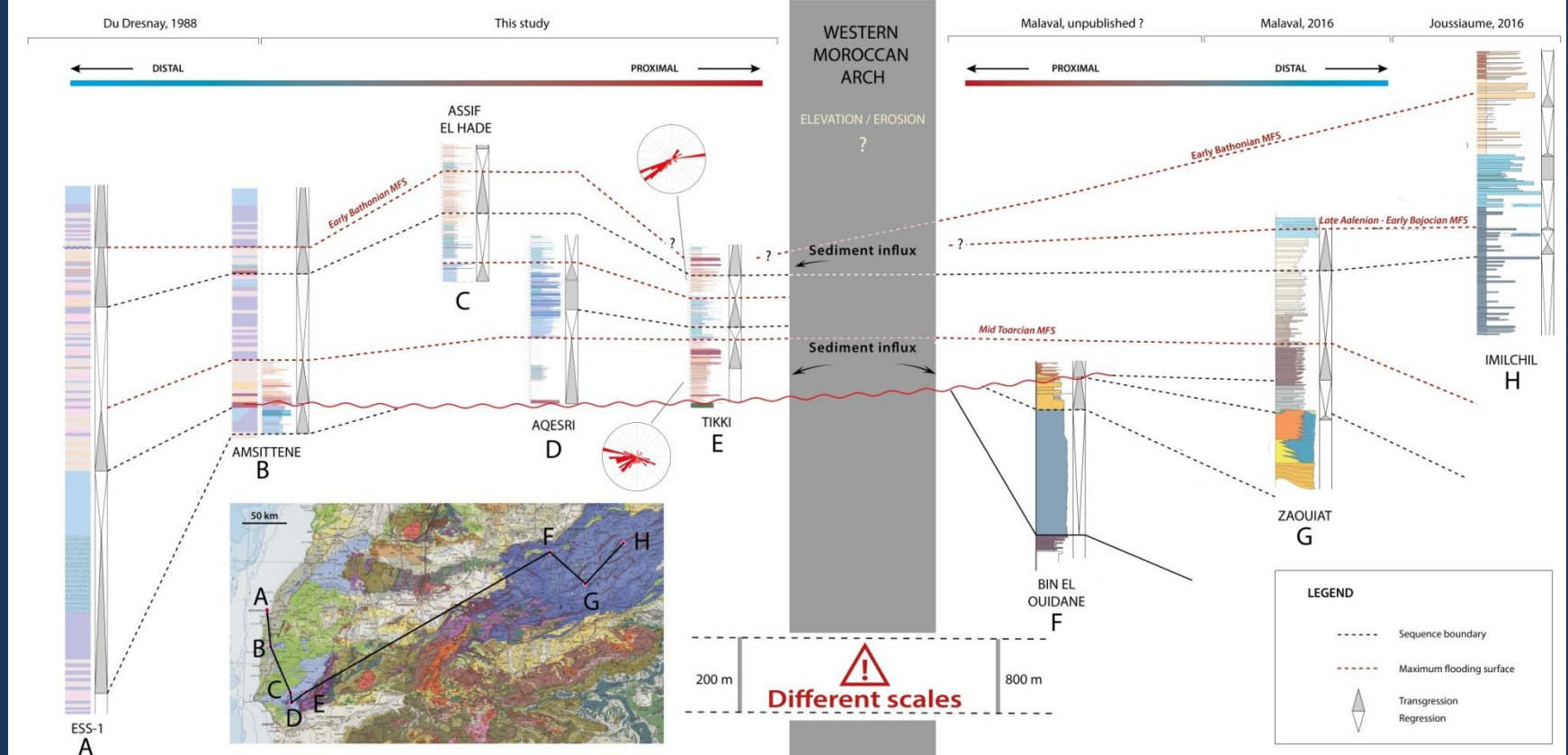
B1 - Tamarout Formation
Shallow open marine
Semi-arid climate

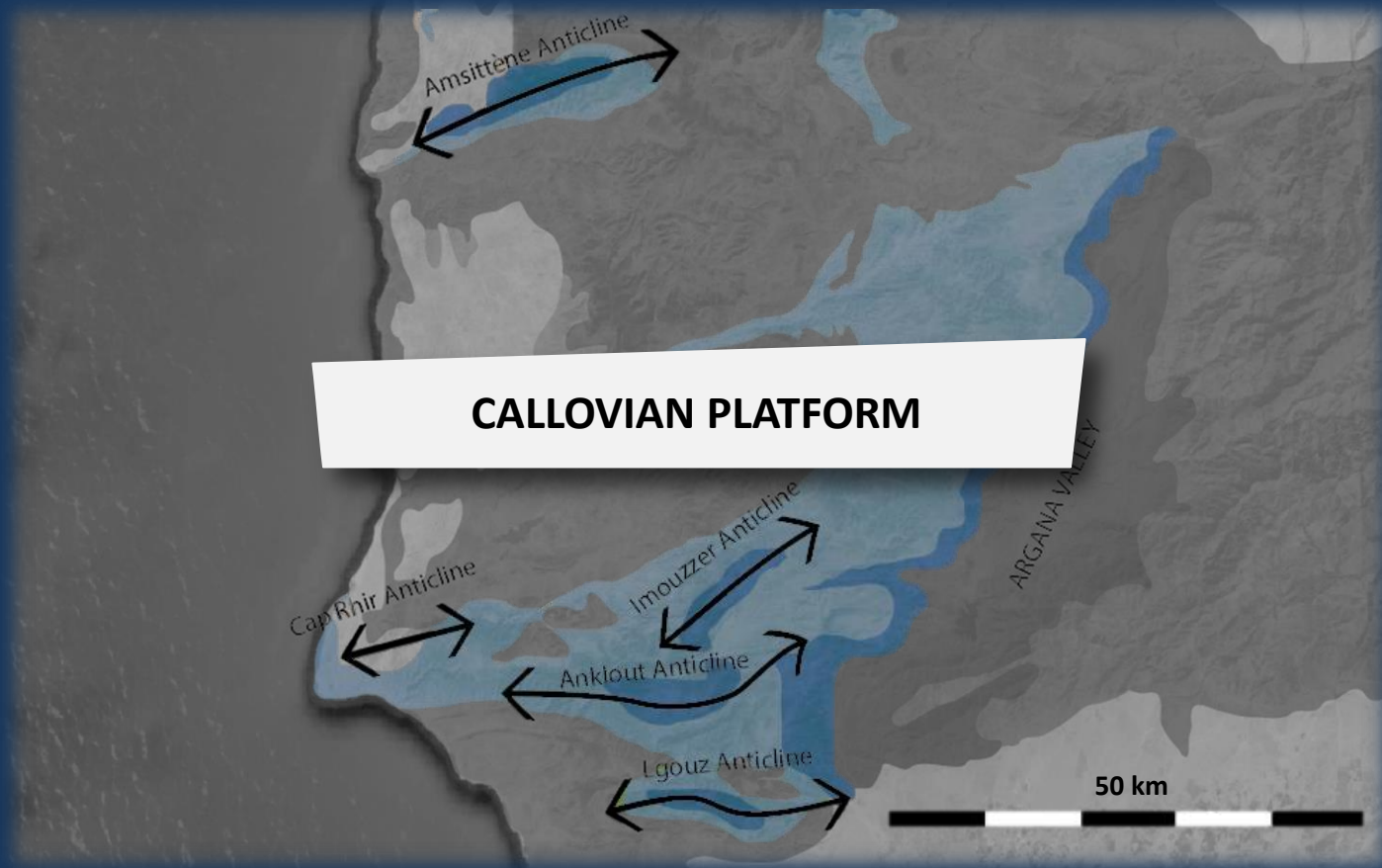


B2 - Tamarout Formation
Restricted marine
Arid climate



COMPARISON WHA/CHA

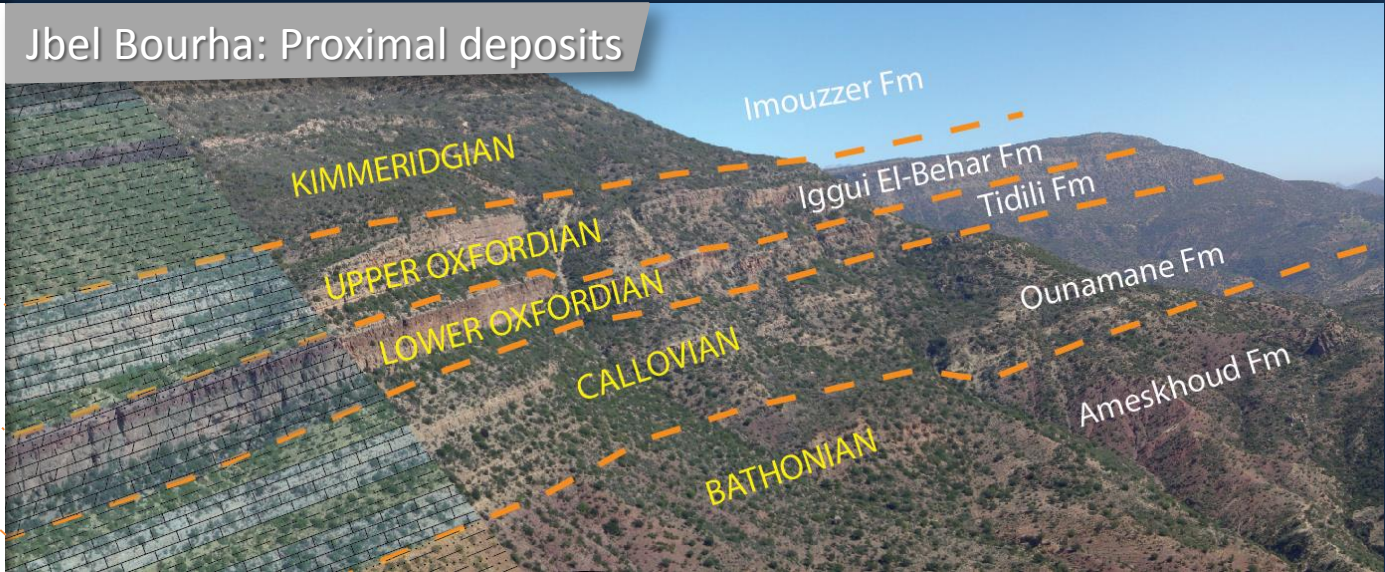
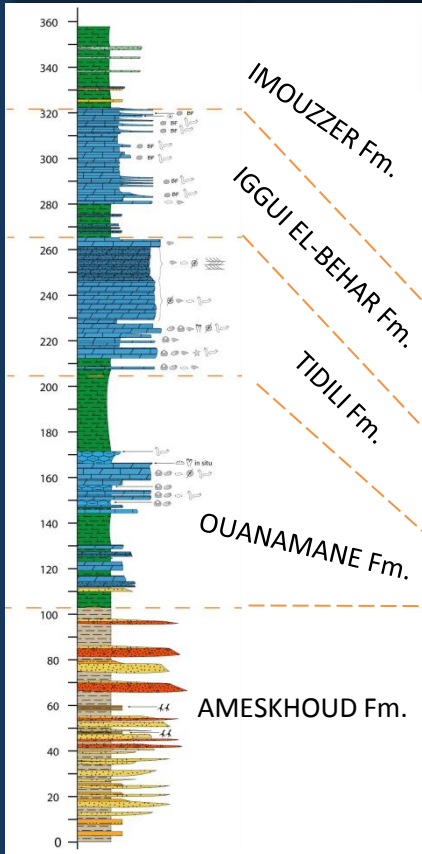




STRATIGRAPHIC OVERVIEW



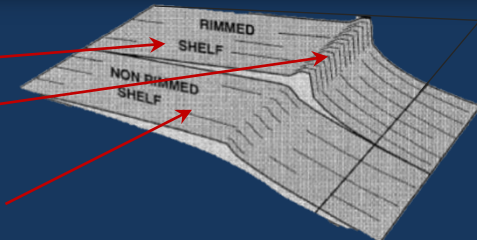
Jbel Bourha: Proximal deposits



Iggui-El Behar Fm: **LAGOON**

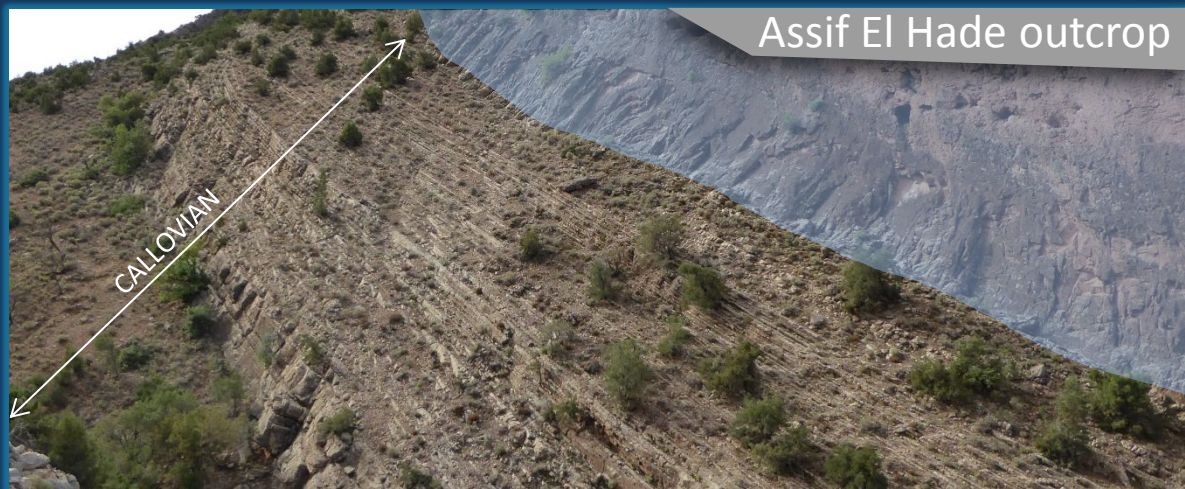
Tidili Fm: **CORAL REEFS**

Ouanamane Fm: **OPEN PLATFORM**



Modified after Pomar, 2001

CALLOVIAN PLATFORM



Aalenian-Callovian
Palaeomap
From Scotese, 2011

Open platform:

- Oolitic GST
- Brachiopod rich marls
- FST and RST
- Firm and Hard Ground
- General transgression

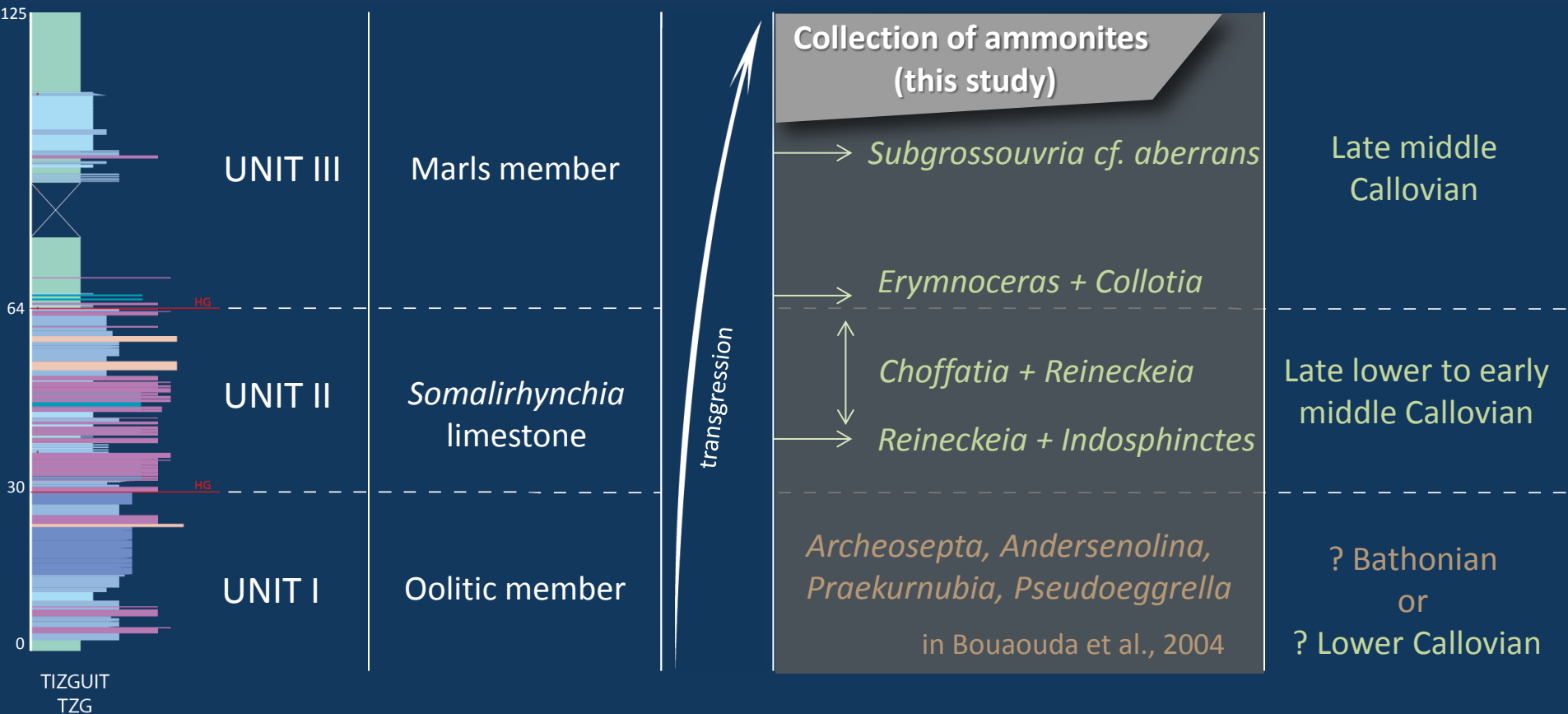
Alternation Marls /  rich FST

PST/FST
Elements

Elements %
↑



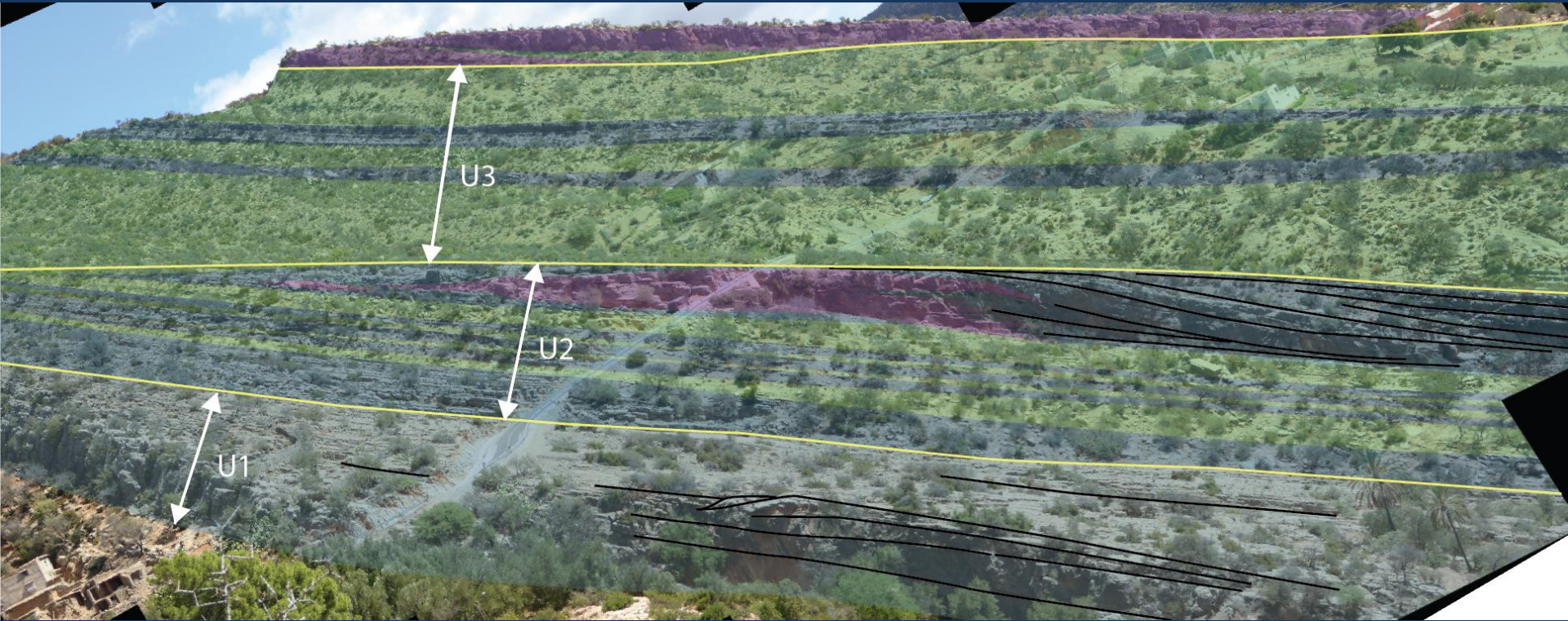
OUANAMANE FORMATION



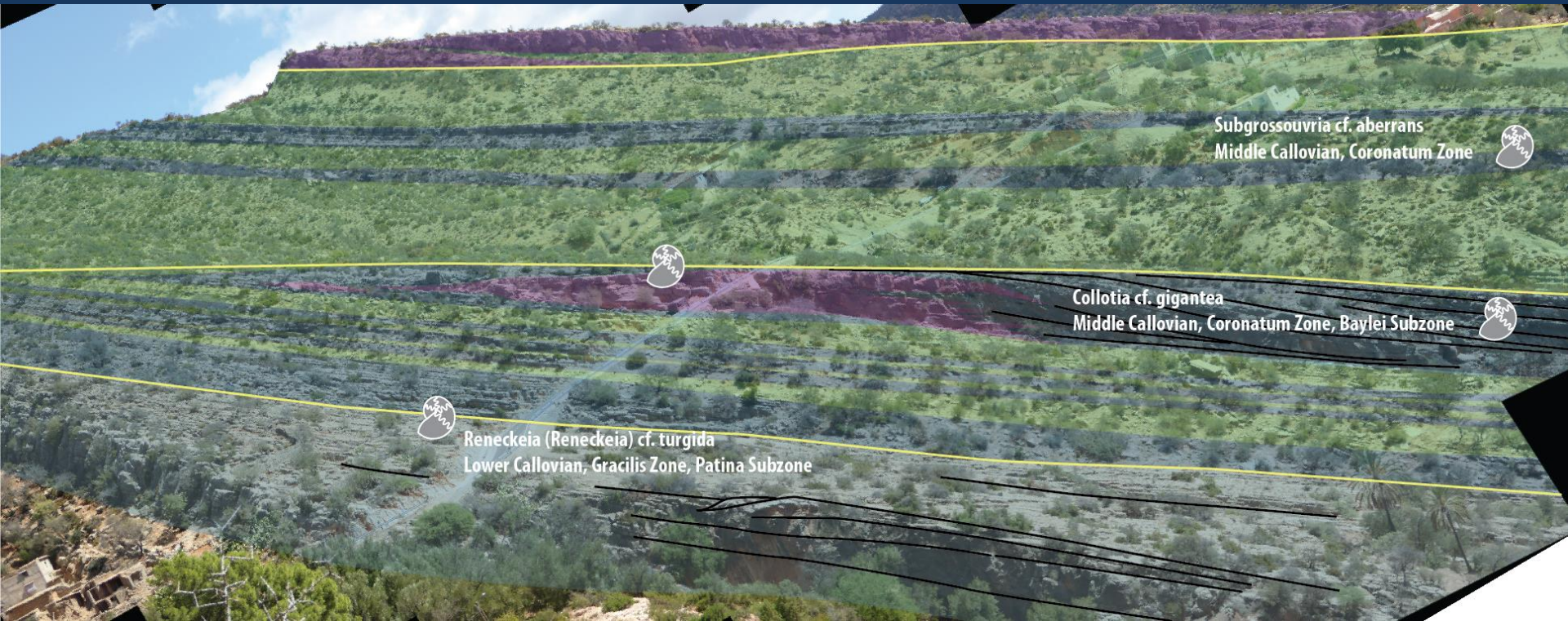
TIZGUIT EXAMPLE



TIZGUIT EXAMPLE



BIOSTRATIGRAPHY



Subgrossouvria cf. aberrans
Middle Callovian, Coronatum Zone



Collotia cf. gigantea
Middle Callovian, Coronatum Zone, Baylei Subzone



Reneckeia (Reneckeia) cf. turgida
Lower Callovian, Gracilis Zone, Patina Subzone



OUANAMANE FORMATION



Facies and environment of deposition

Outer ramp / slope

Open platform: outer ramp

Marls dominated



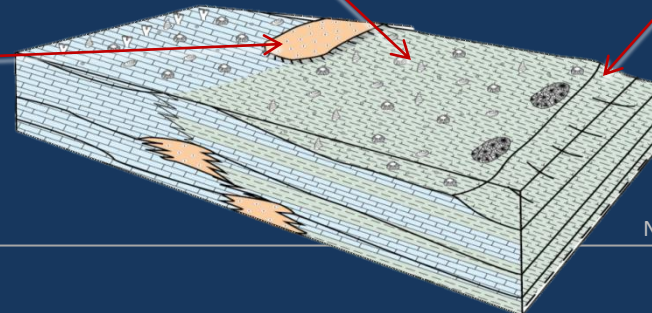
UNIT II



Collotia gigantea

Ammonite fauna relatively more abundant in the lower part of the unit III

Abundant fauna of brachiopods
Apparition of *Somalirhynchia africana*

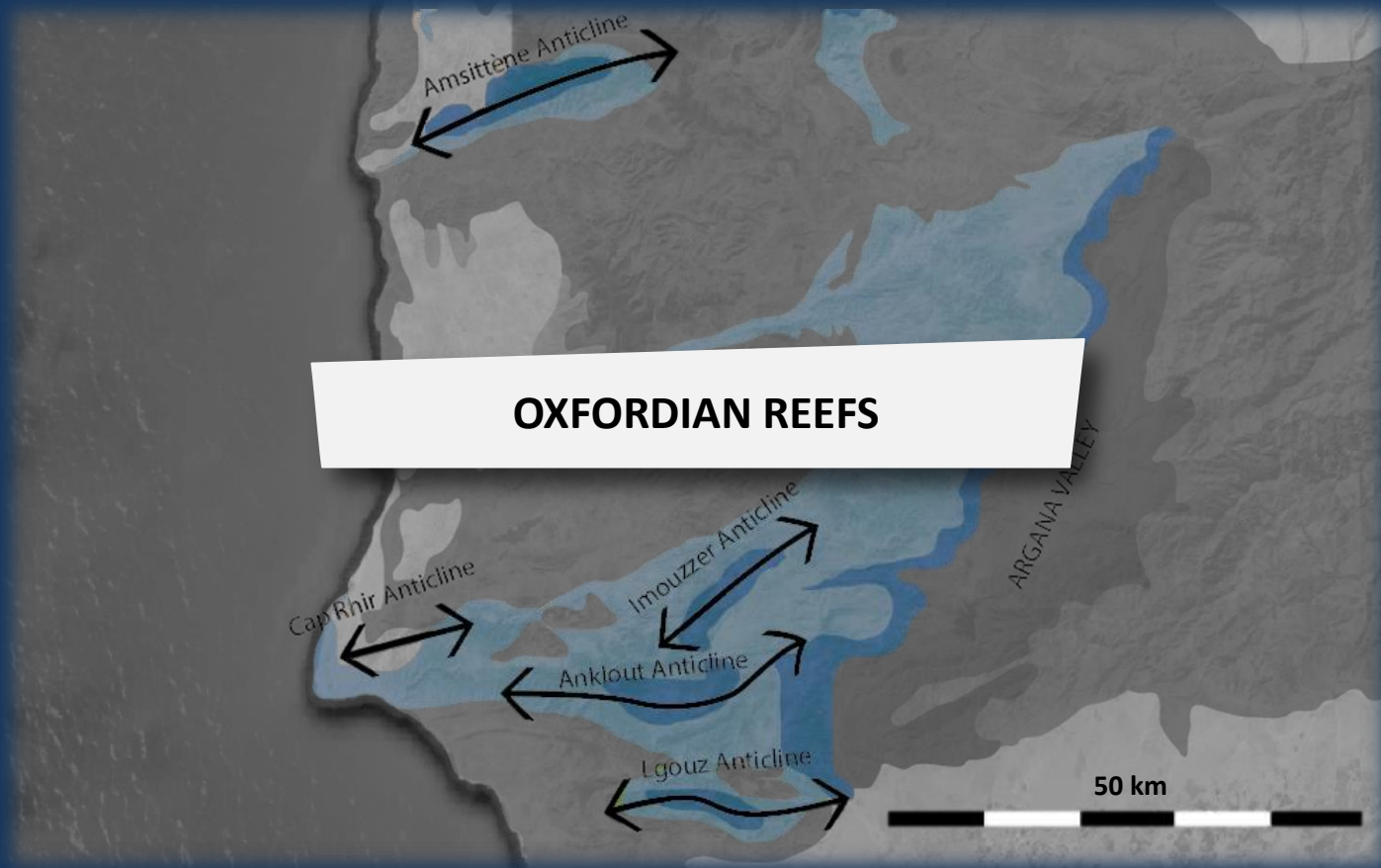


Not to scale

Oolitic shoals and bioclastic ramp

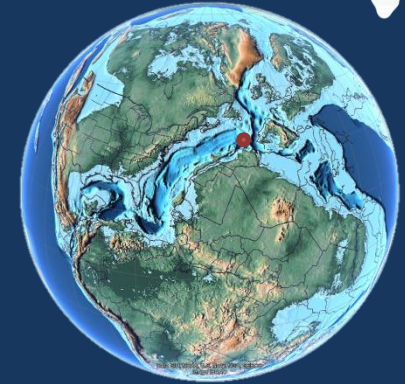


UNIT I



OXFORDIAN BIOSTROMS

Tidili outcrop



Oxfordian-Kimmeridgian
Palaeomap
From Scotese, 2011

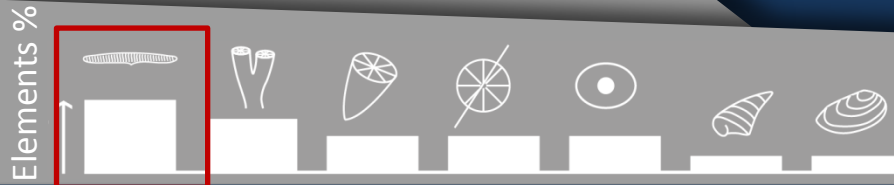
Evolution of coral
associations



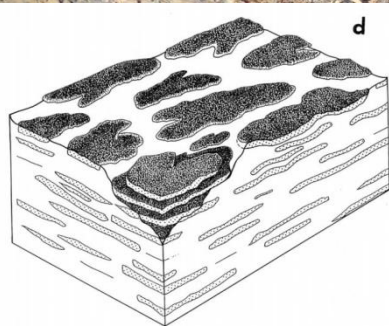
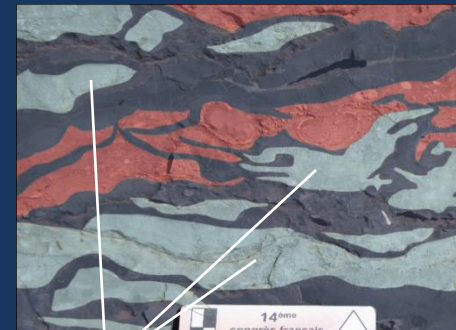
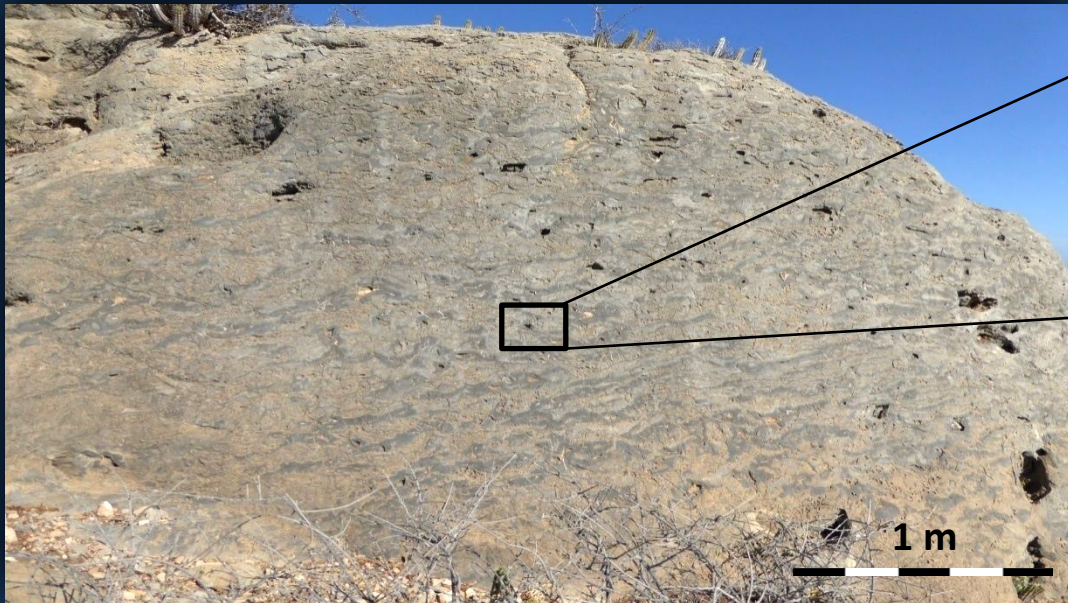
Coral biostroms:

- Mud/coral mounds
- MST / PST / BST
- Diachronism
- Shallowing upward

BST/FST
Elements



MICROSOLENOID DOMINATION



Associated with a marly matrix or a bioclastic WST/PST matrix, locally encrusted

Dimorpharaea = platy shape mirosolenoid coral

TIDILI FORMATION

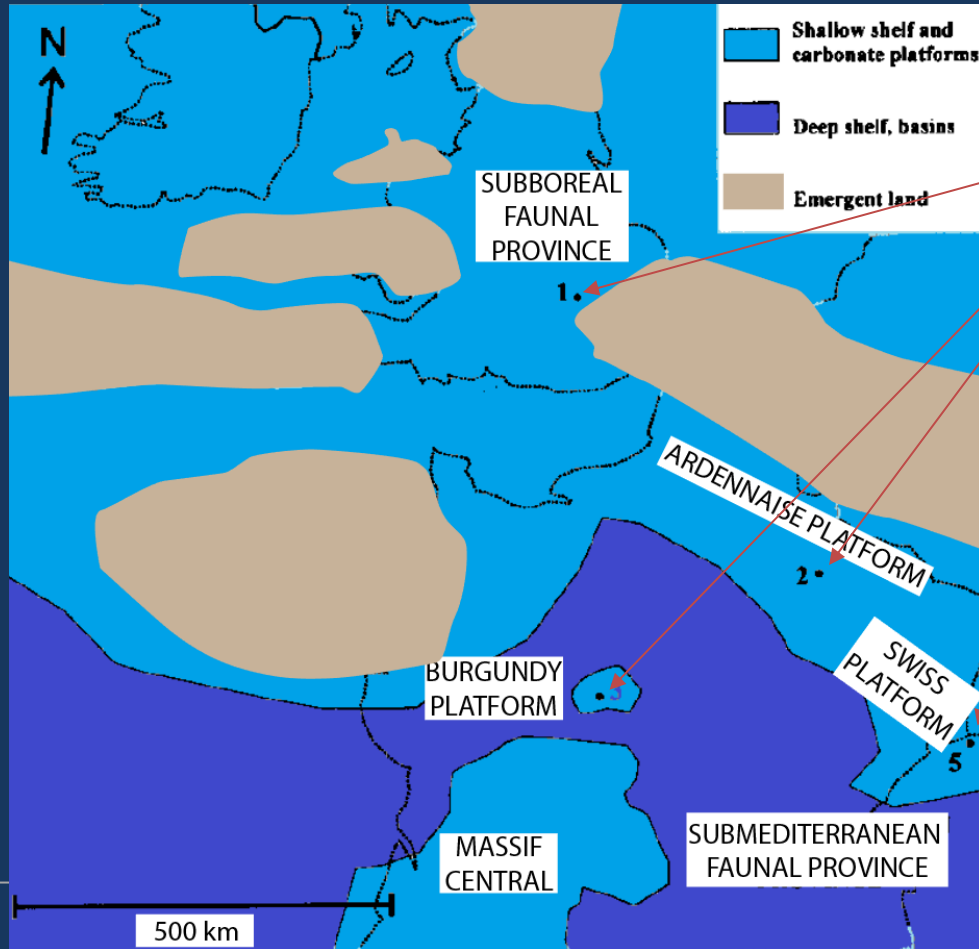


TIDILI FORMATION



	PLATY CORAL		BRANCHING CORAL		SOLITARY CORAL		CORAL FRAGMENTS
---	-------------	---	-----------------	---	----------------	---	-----------------

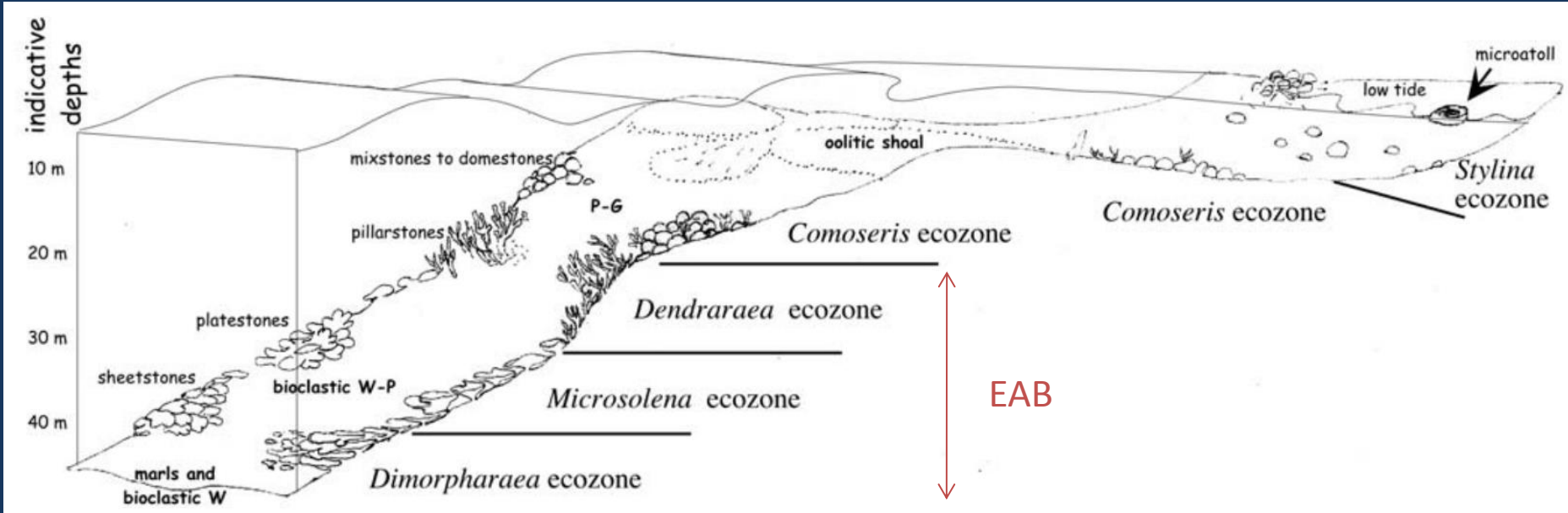
CENTRAL EUROPE



Upper Jurassic Microsolenoid Biostrom development

- **Microsolenoid Biostrom** very common during Upper Jurassic
- Low relief, laterally very extensive
- **Micritic matrix** with unsorted bioclasts
- **Low generic diversity**
- Low light, background sedimentation rate, **low energy**

CENTRAL EUROPE



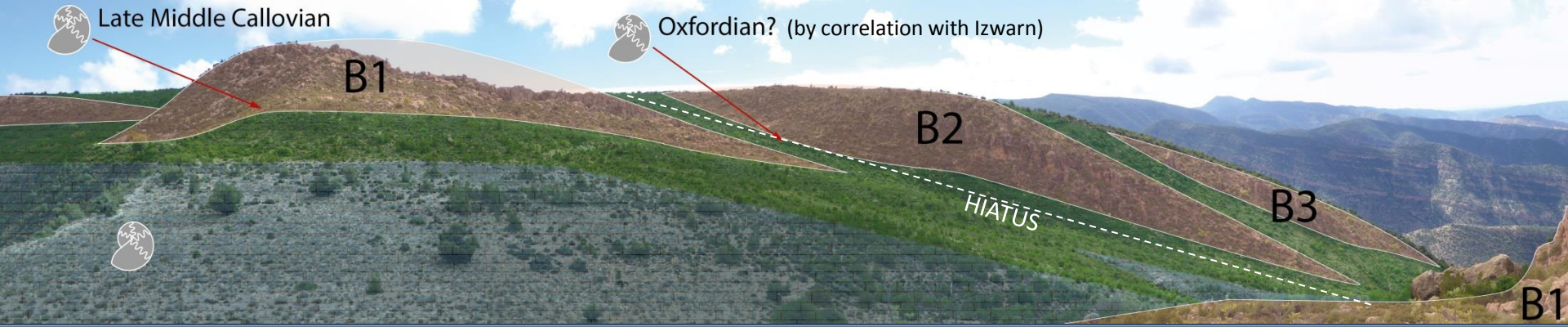
Bionomic zonation of the corallian platform of Bonnevaux-le-Prieur (Juras)

Lathuiliere et al., 2005

→ Patchy reefal frameworks

→ Relation with textures of juxtaposed sediments (WPG)

CALOVO-OXFORDIAN BIOSTROMS



TIDILI FORMATION



N

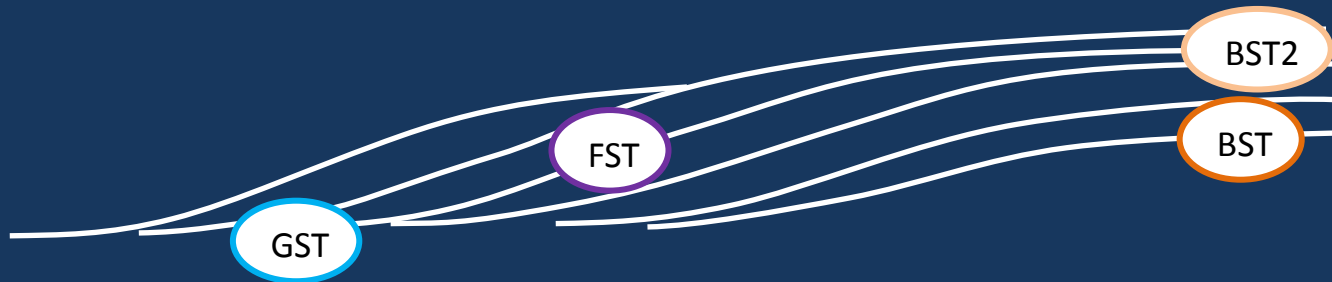
S



Large clinofolds offlapping the reef structure

REEF EDGE / CLINOFORMS

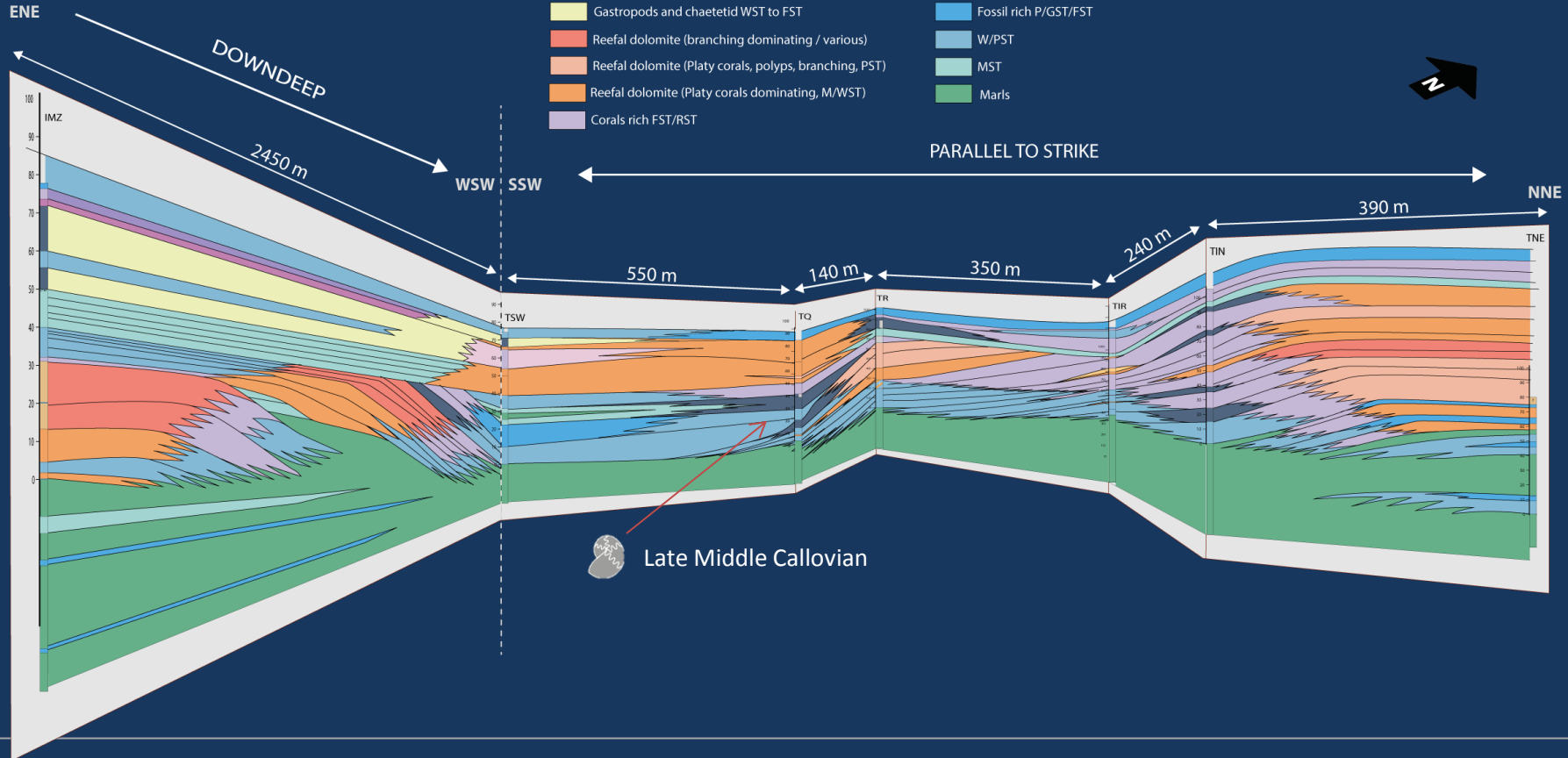
Flat corals
Dimorpharaea



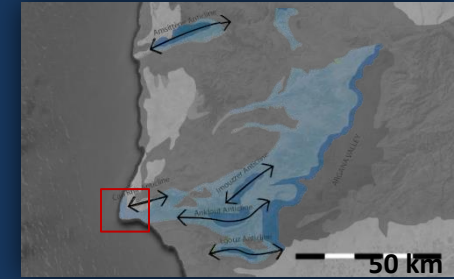
TIDILI FORMATION



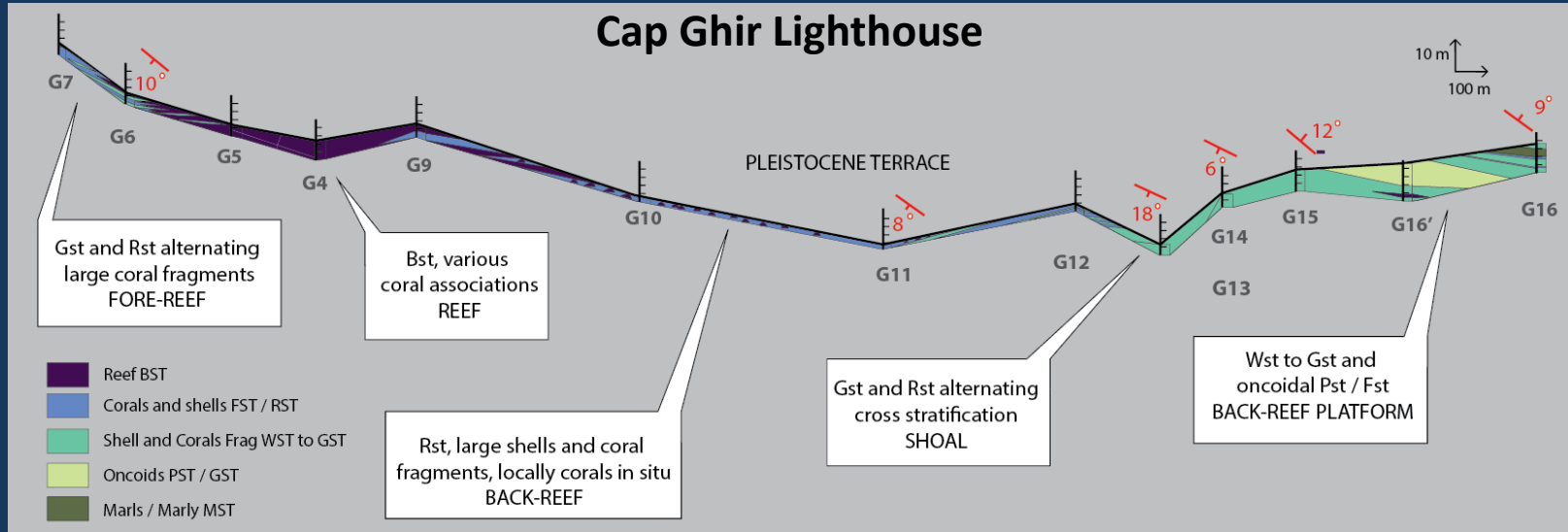
- Oncoids PST
- Corals rich WST to GST
- Gastropods and chaetetid WST to FST
- Fossil rich P/GST/FST
- Reefal dolomite (branching dominating / various)
- W/PST
- Reefal dolomite (Platy corals, polyps, branching, PST)
- MST
- Reefal dolomite (Platy corals dominating, M/WST)
- Marls
- Corals rich FST/RST

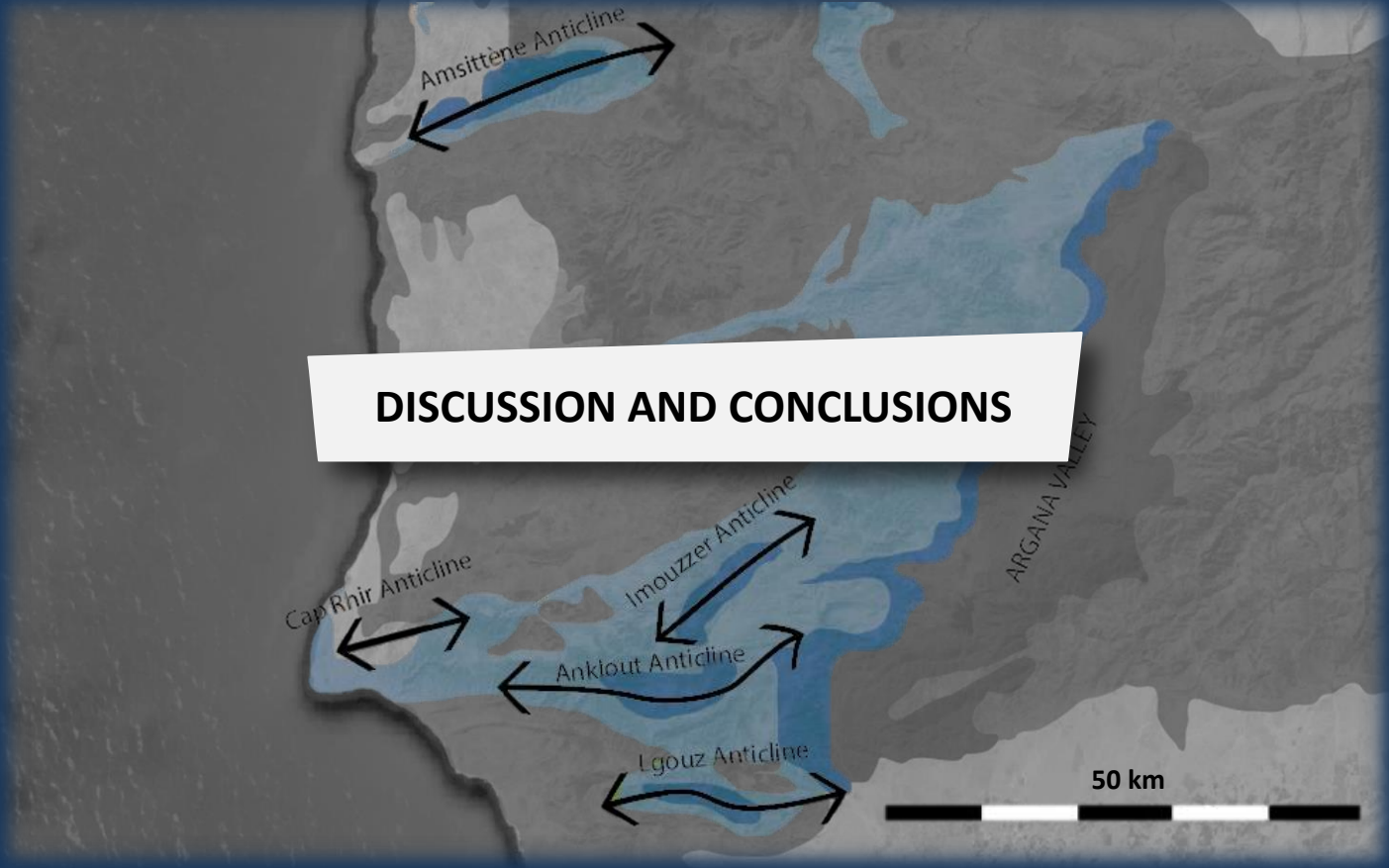


LATERAL FACIES VARIATIONS



Cap Ghir Lighthouse





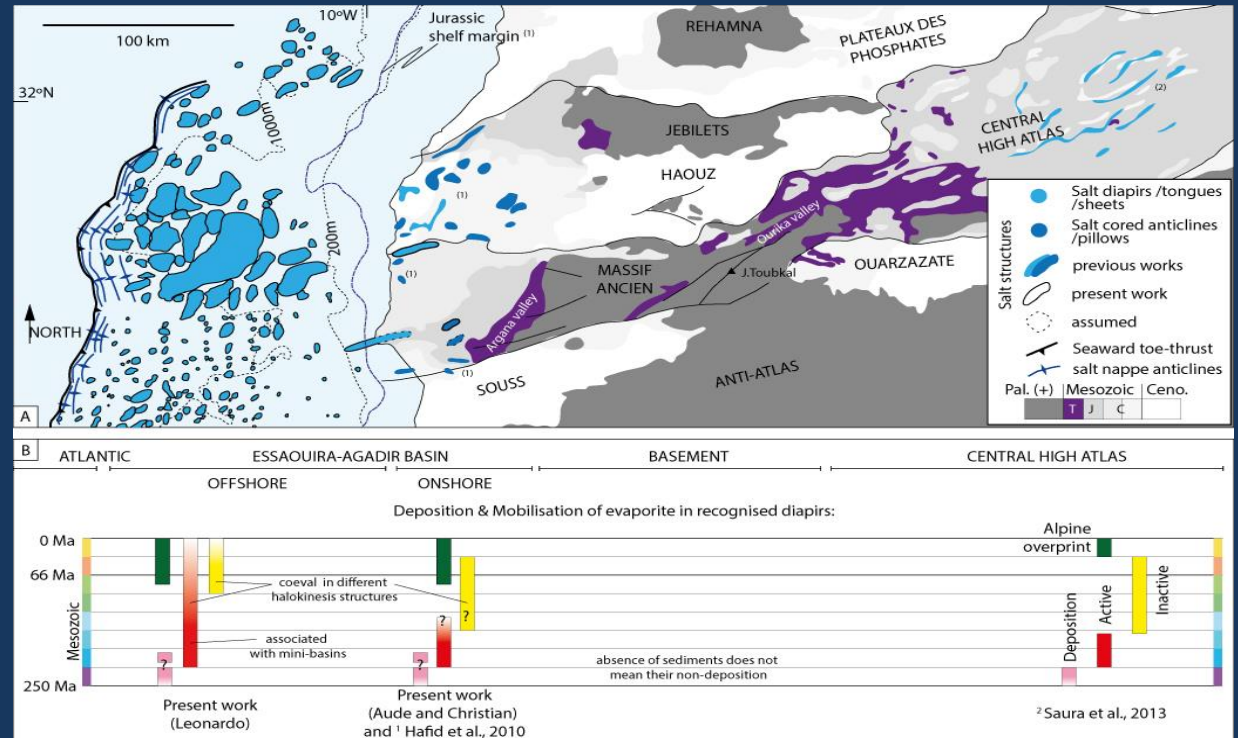
Geometries linked to structural evolution

Onshore salt anticlines:

- Clastics distribution
- Reefs geometries (CHA)

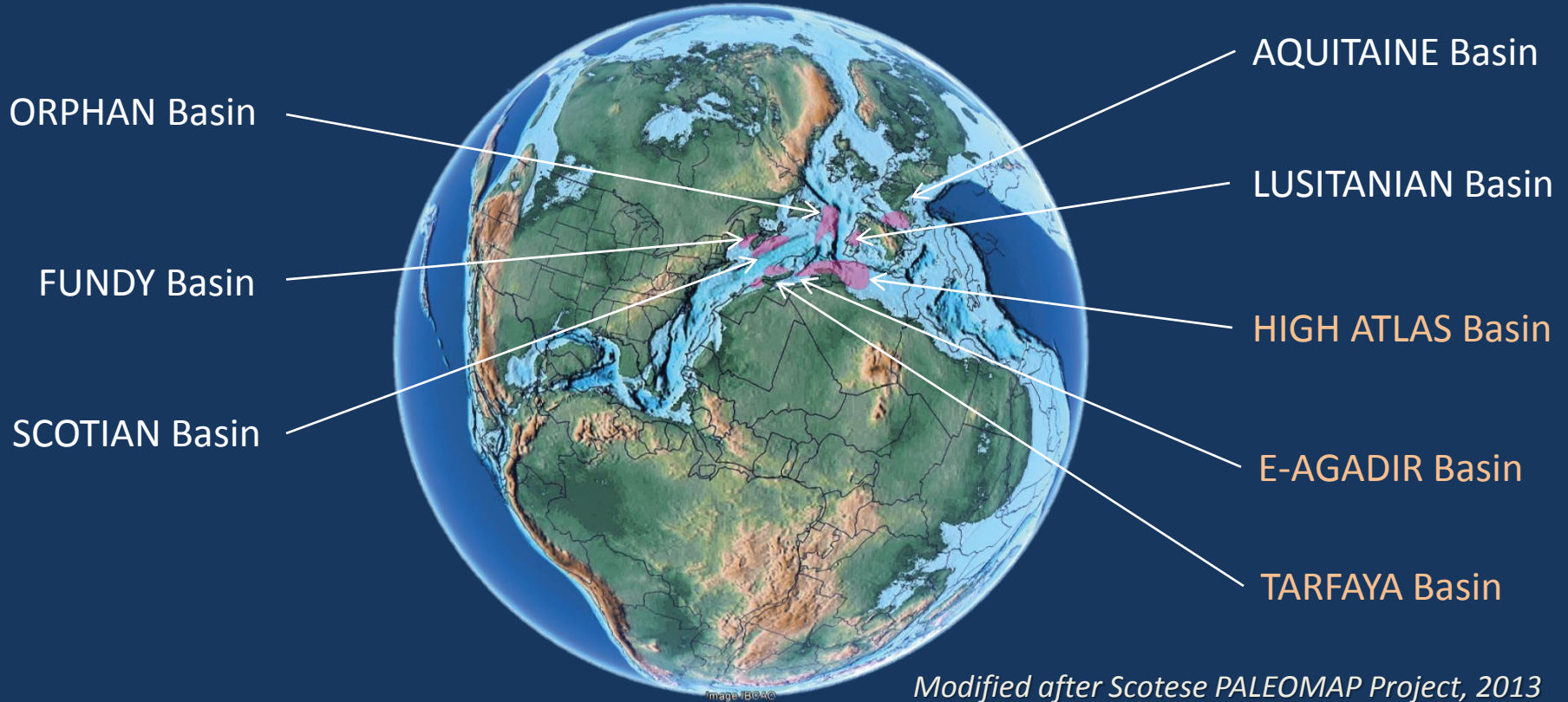
Offshore salt diapirs:

- Mini basins
- Small scale platforms
- Strong facies control



Work from R. Charton, unpublished

MIDDLE JURASSIC BASINS



- **Carbonates stratigraphic evolution**
 - Evolution of the **open platform** during the Callovian and Oxfordian
 - Domination of **Microsolenoid** biostroms with rapid lateral facies variations
 - Geometries and facies linked to **structural evolution** (WMA-clastics, CHA-diapirism)
 - **Biostroms size** (40 m – 2km) and lateral variations

- **Central Atlantic Margin**
 - Better understanding of the **Jurassic platforms along the margin**
 - Good **analogue** for Nova Scotia (Core observations in August)

THANK TO OUR SPONSORS :



TOTAL



Shell



woodside



bp



REPSOL



Special thanks :

ONHYM

المكتب الوطني للهيدروكاربونات و الماسات
OFFICE NATIONAL DES HYDROCARBURES ET DES MINES