

# Multi-stage diagenesis and dolomitization of Jurassic shelf-margin carbonates, Essaouira-Agadir Basin, Western Morocco



**Nawwar Al-Sinawi**

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## WHAT?

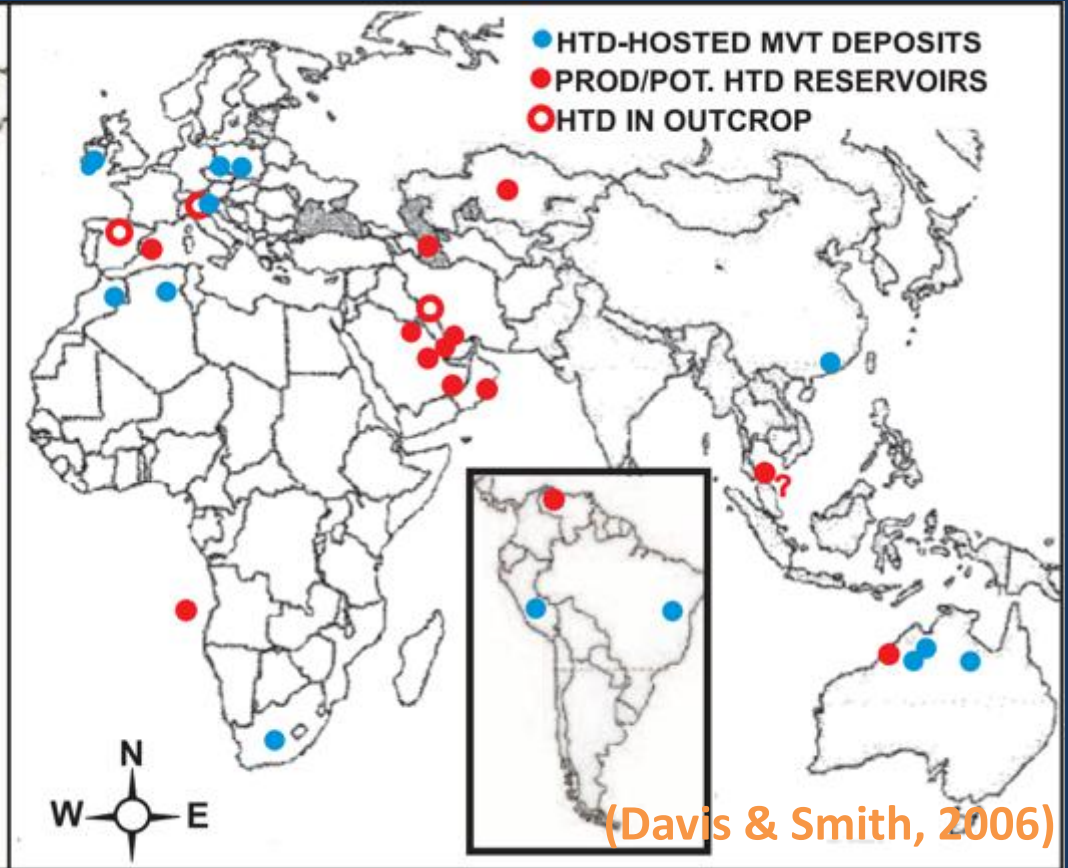
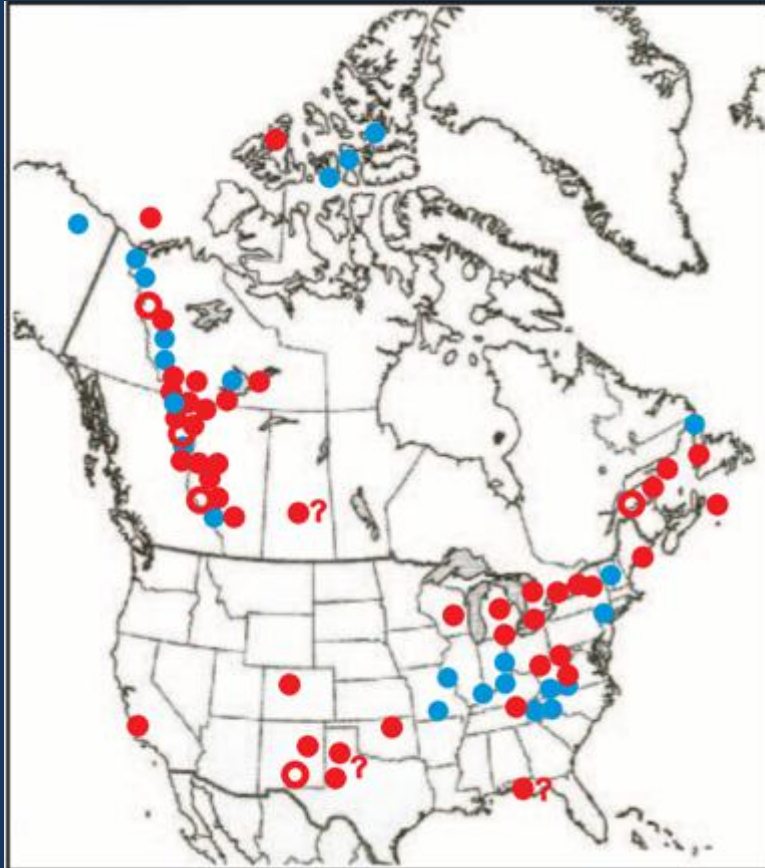
- Log & map the dolomite, asses its distribution
- Describe petrographically & geochemically

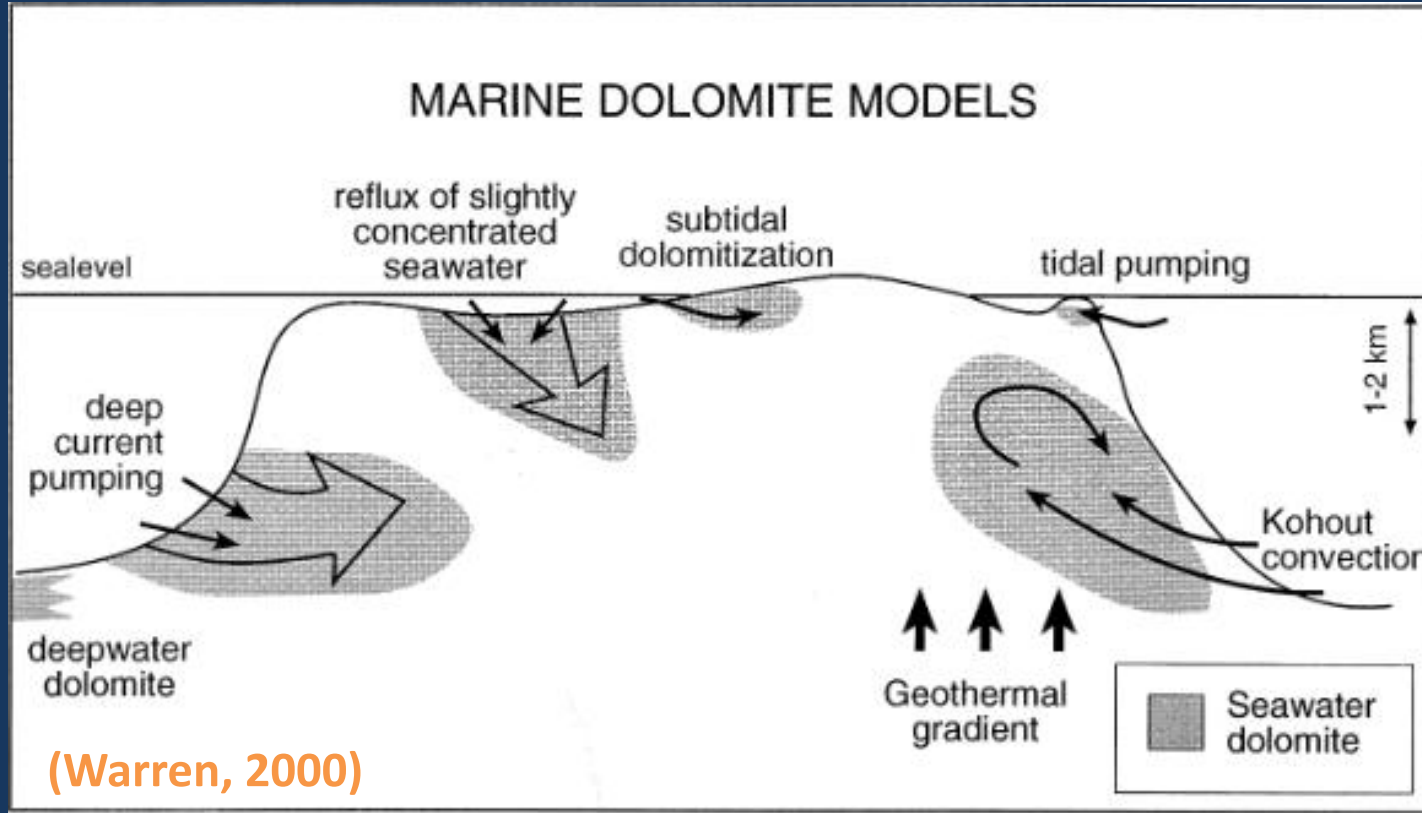
## SO WHAT?

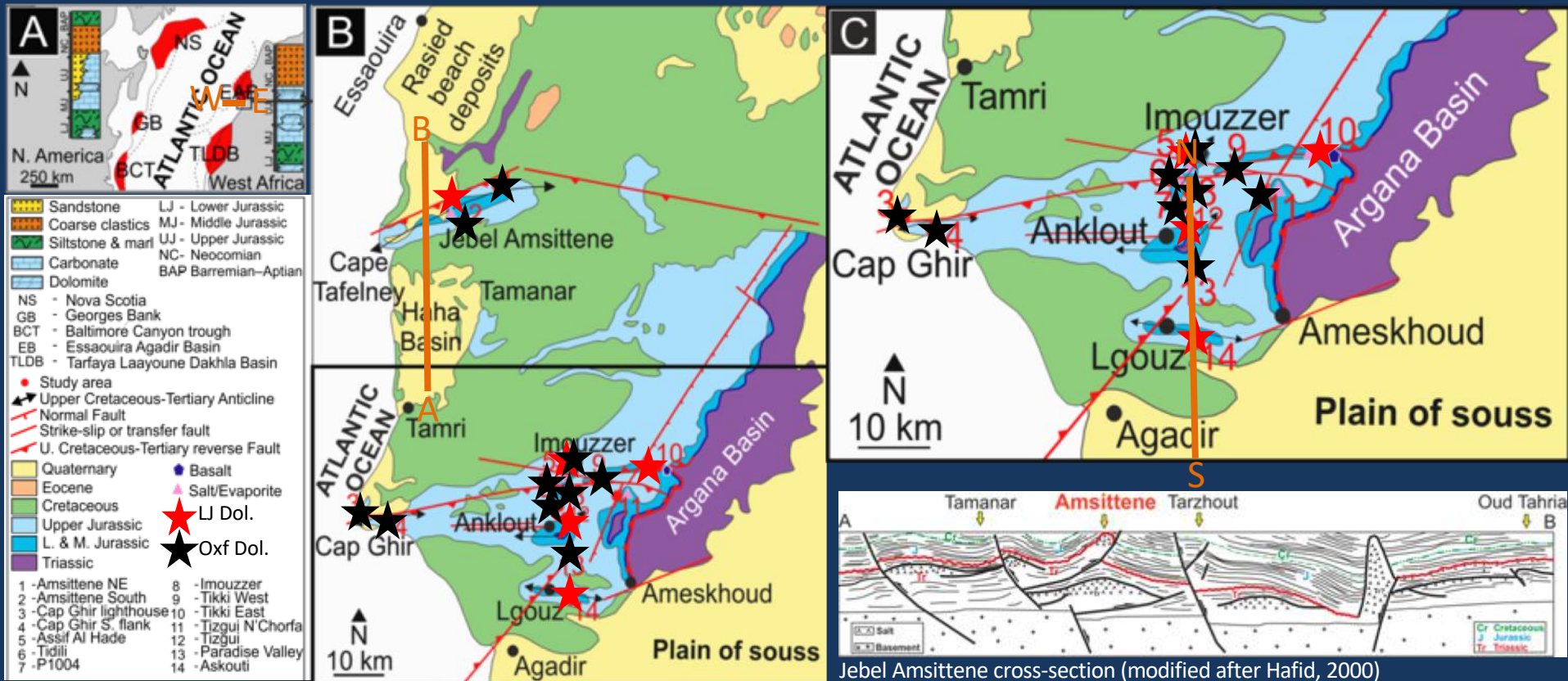
- Determine the dolomite controls, origin and time
- Assess dolomitization impact on reservoir quality



# DOLOMITIZATION

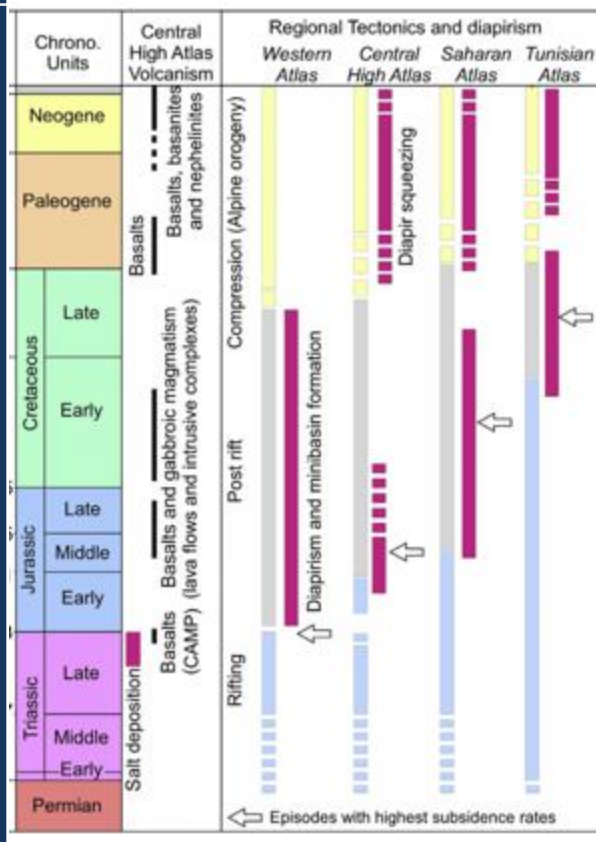




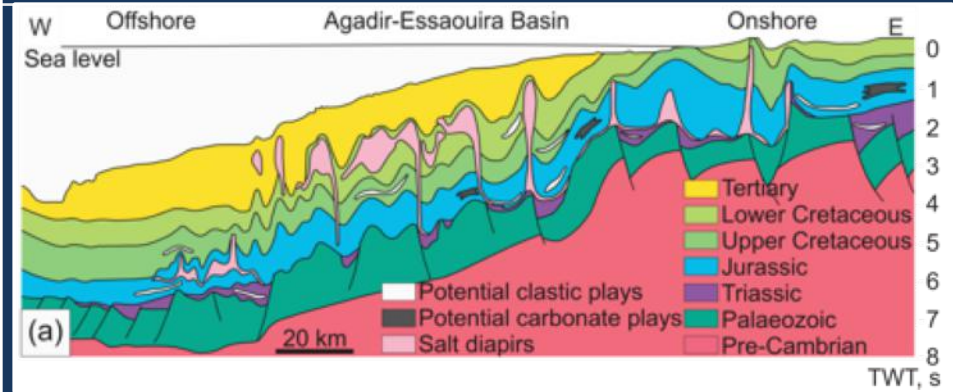


Jebel Amsittene cross-section (modified after Hafid, 2000)

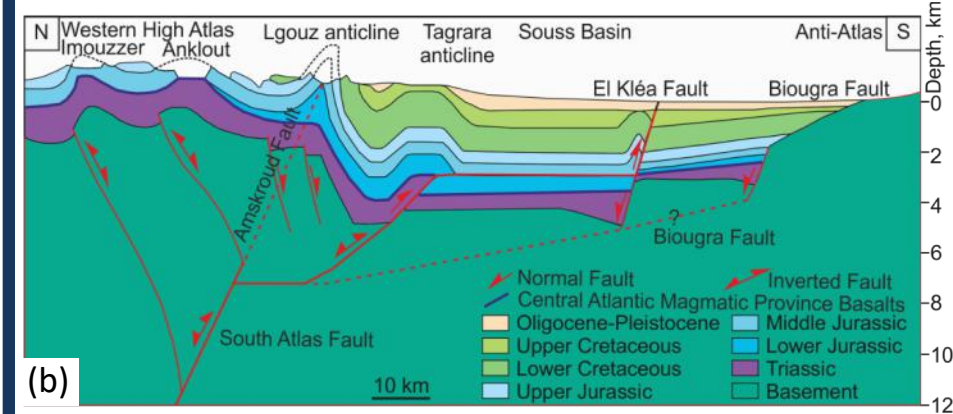
Geological map (modified after Ager (1974a), Mustaphi et al. (1997), Zuhlke et al. (2004), Hafid et al. (2006), Frizon de Lamotte et al. (2008), Bertotti & Gouiza, 2012)



(from Vergés, et al. 2017)

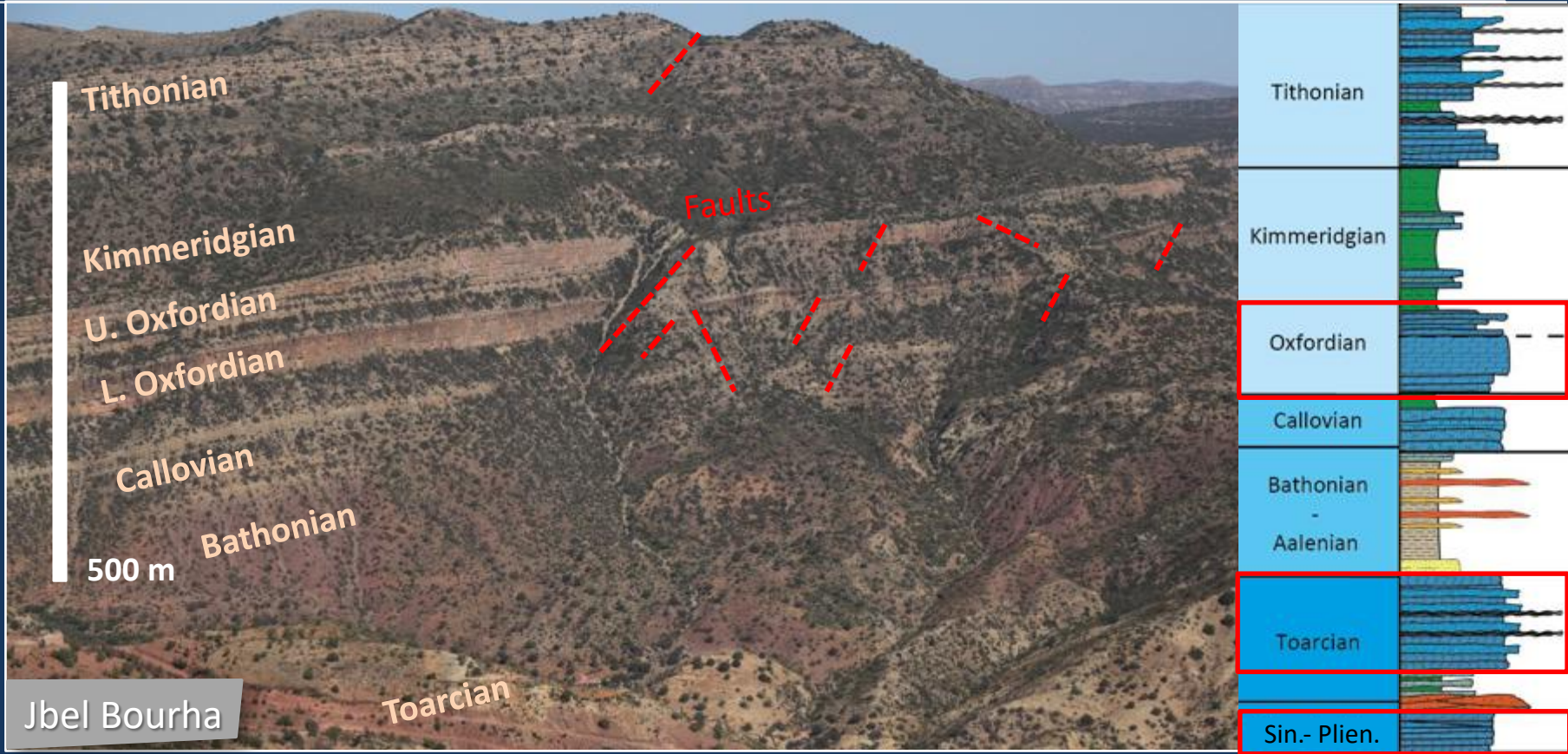


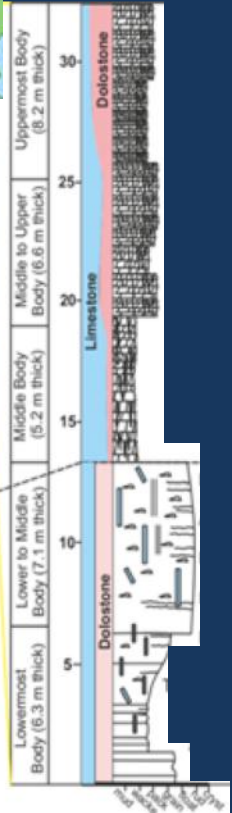
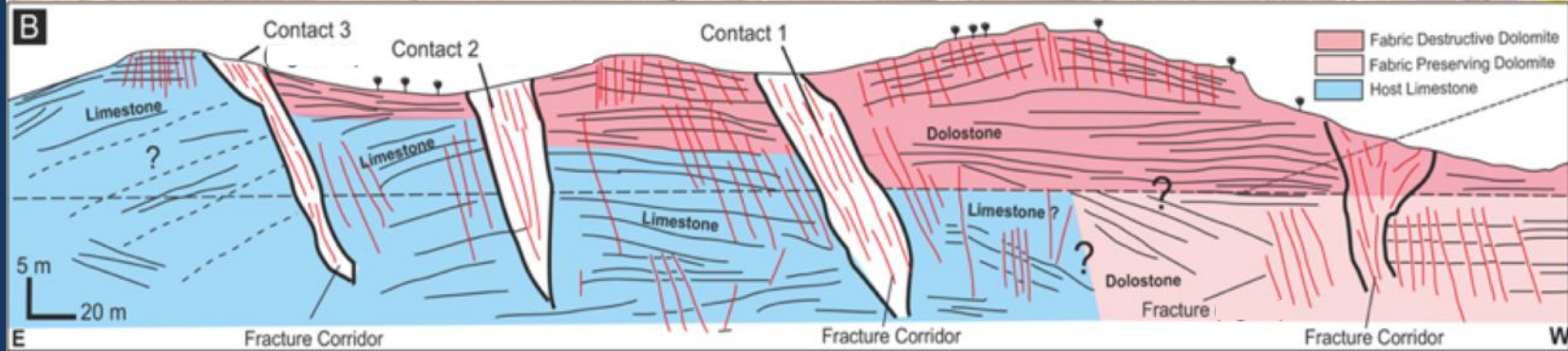
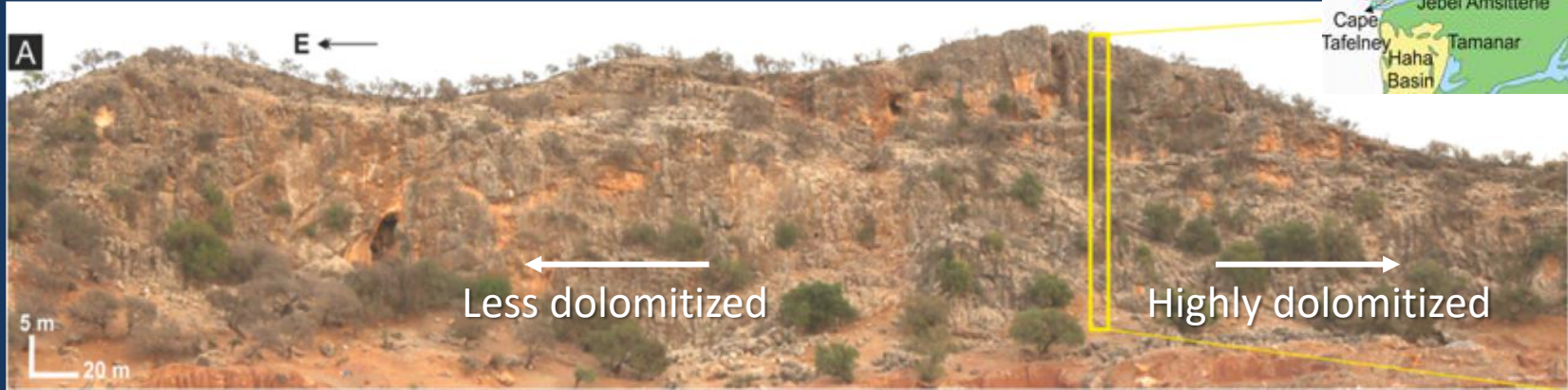
(modified from Tari et al. 2013)

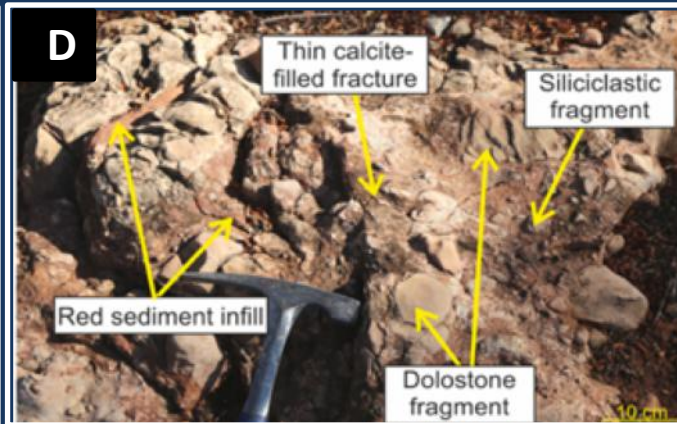
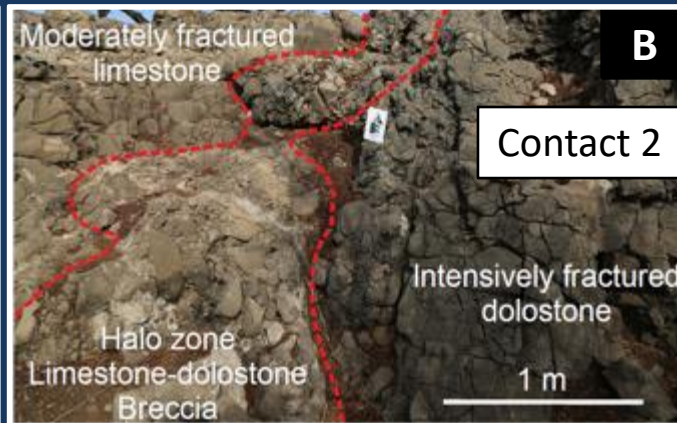
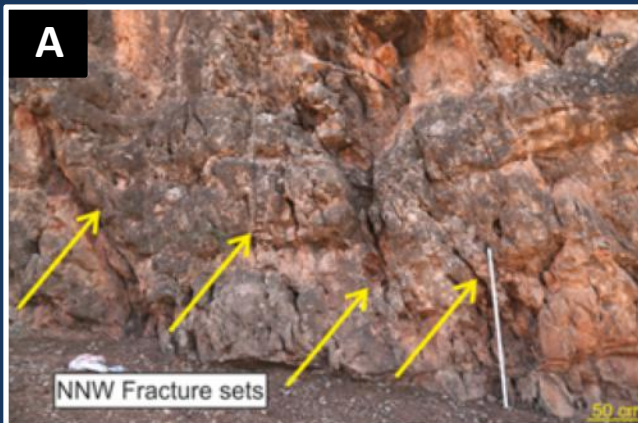


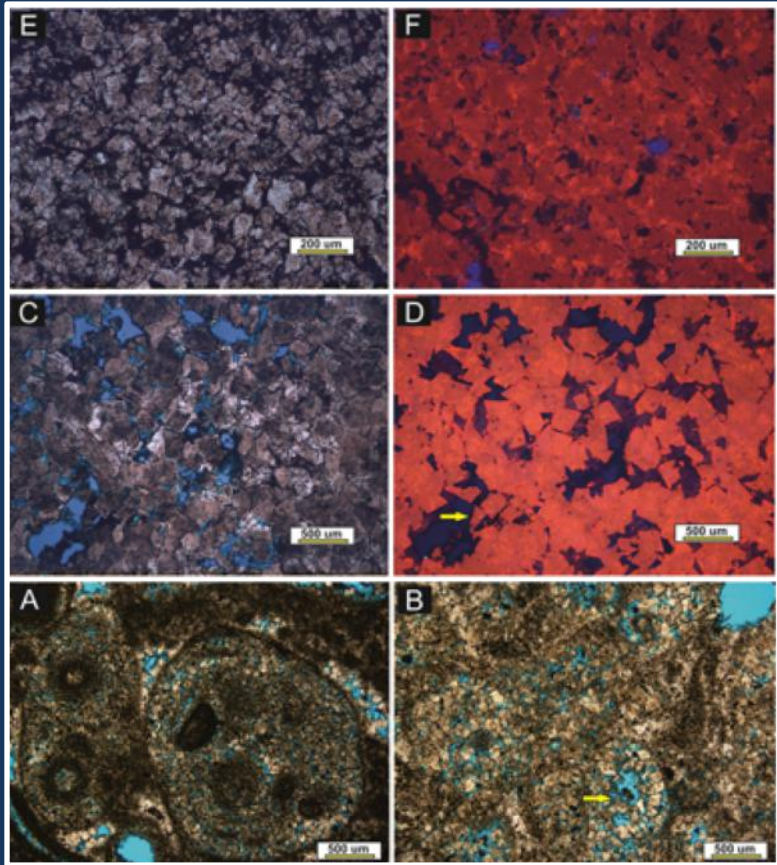
(modified from Frizon de Lamotte et al. 2008)

# Study area







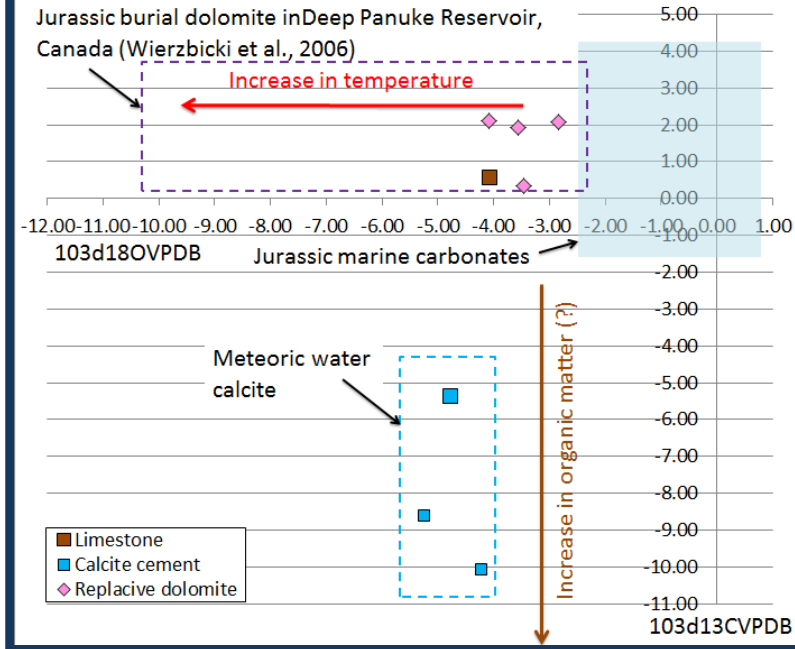


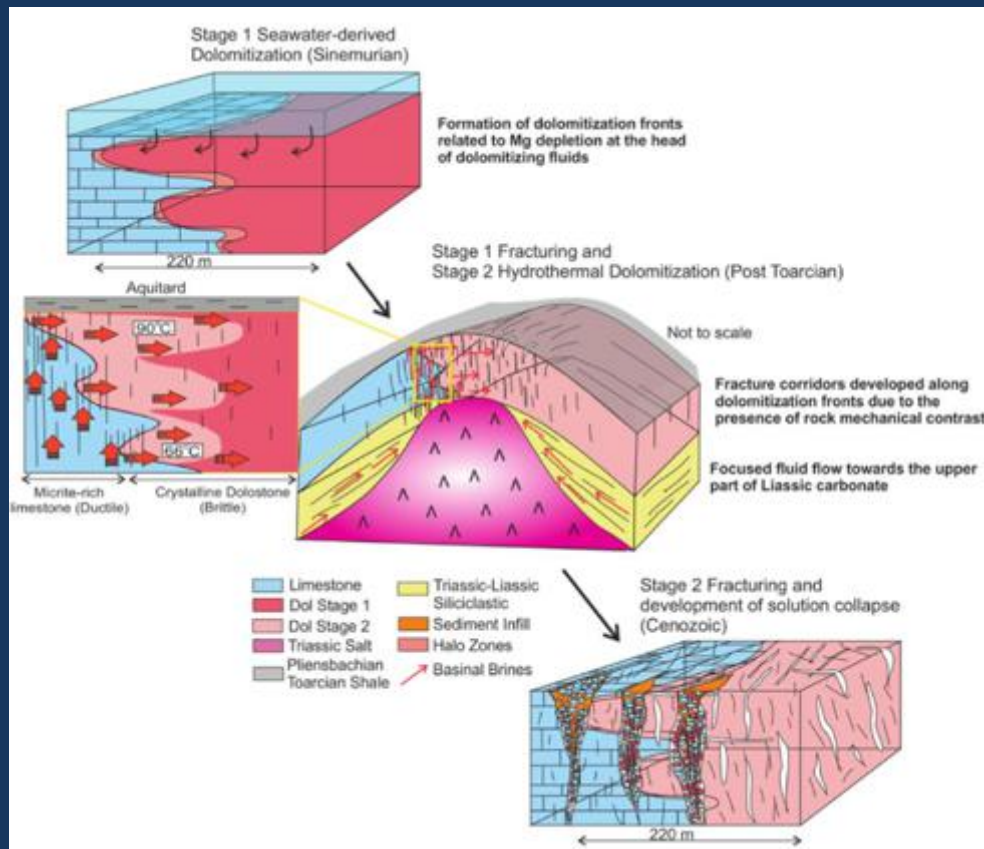
Micrite intensity increase ↑

Fabric preserved to fabric destructive ↑

Increase in recrystallization intensity ↑

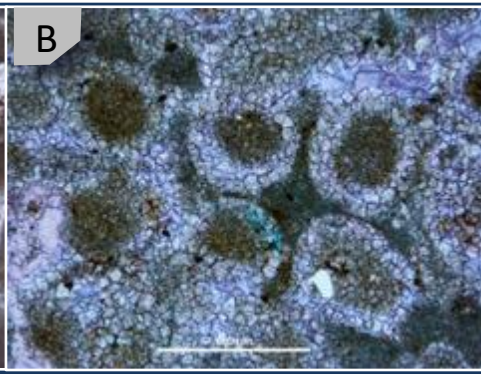
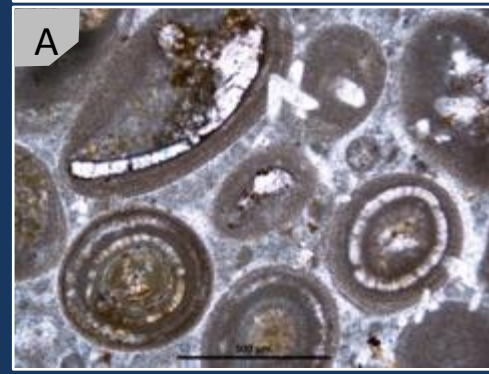
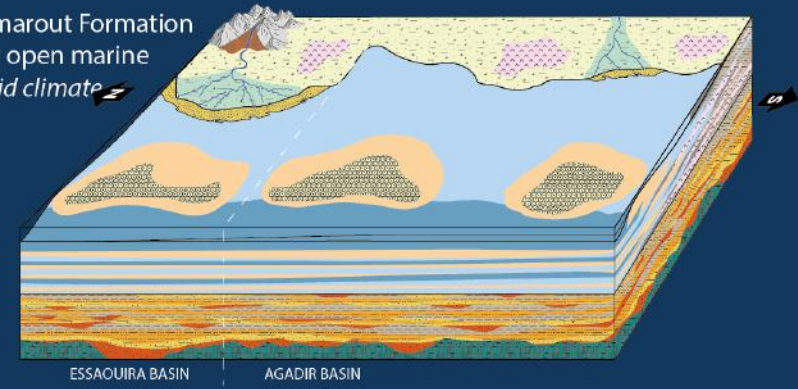
Increase in dolomite temperature 35-50°C → 90°C ↑



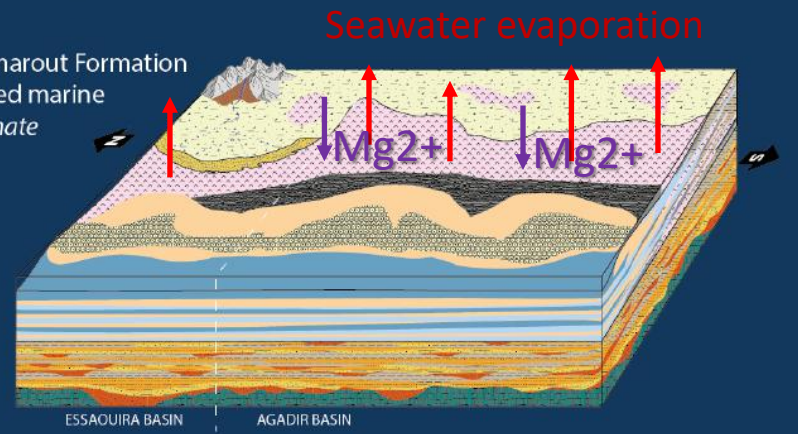




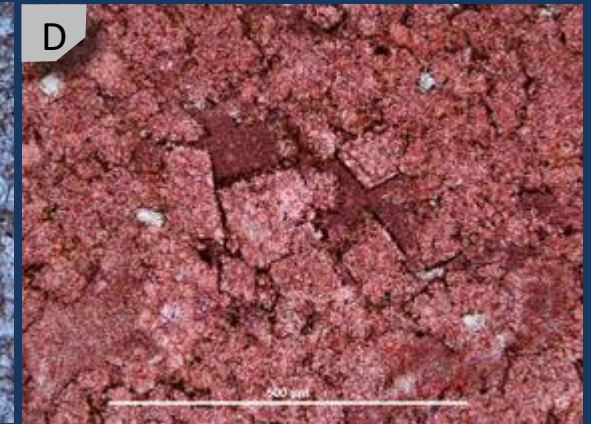
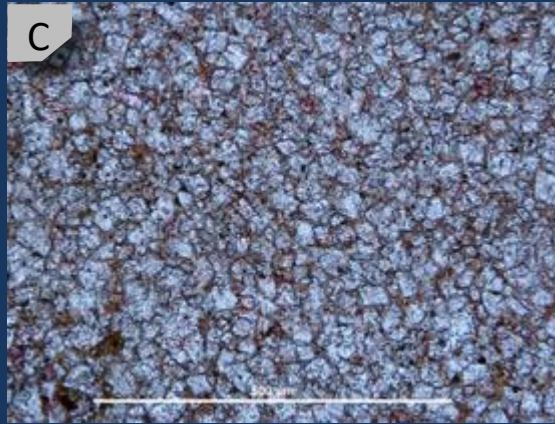
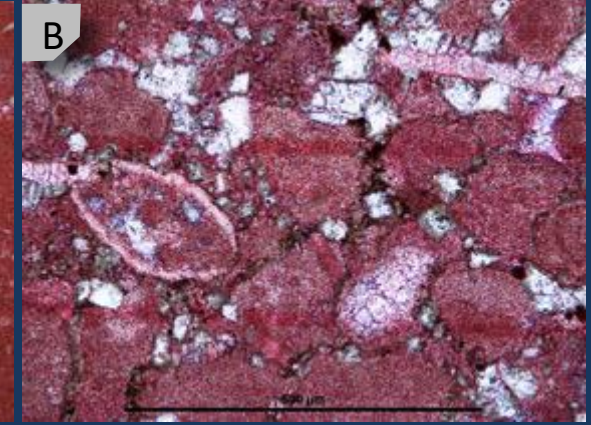
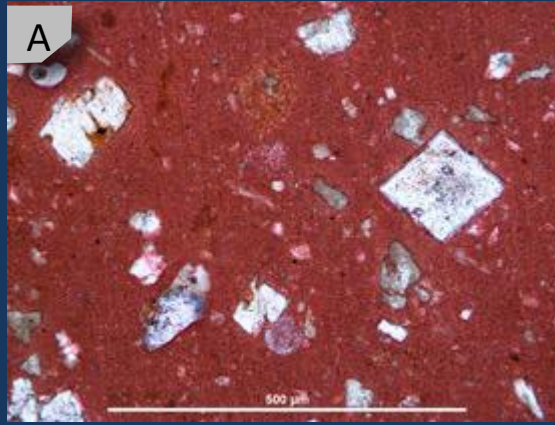
B1 - Tamarout Formation  
Shallow open marine  
Semi-arid climate

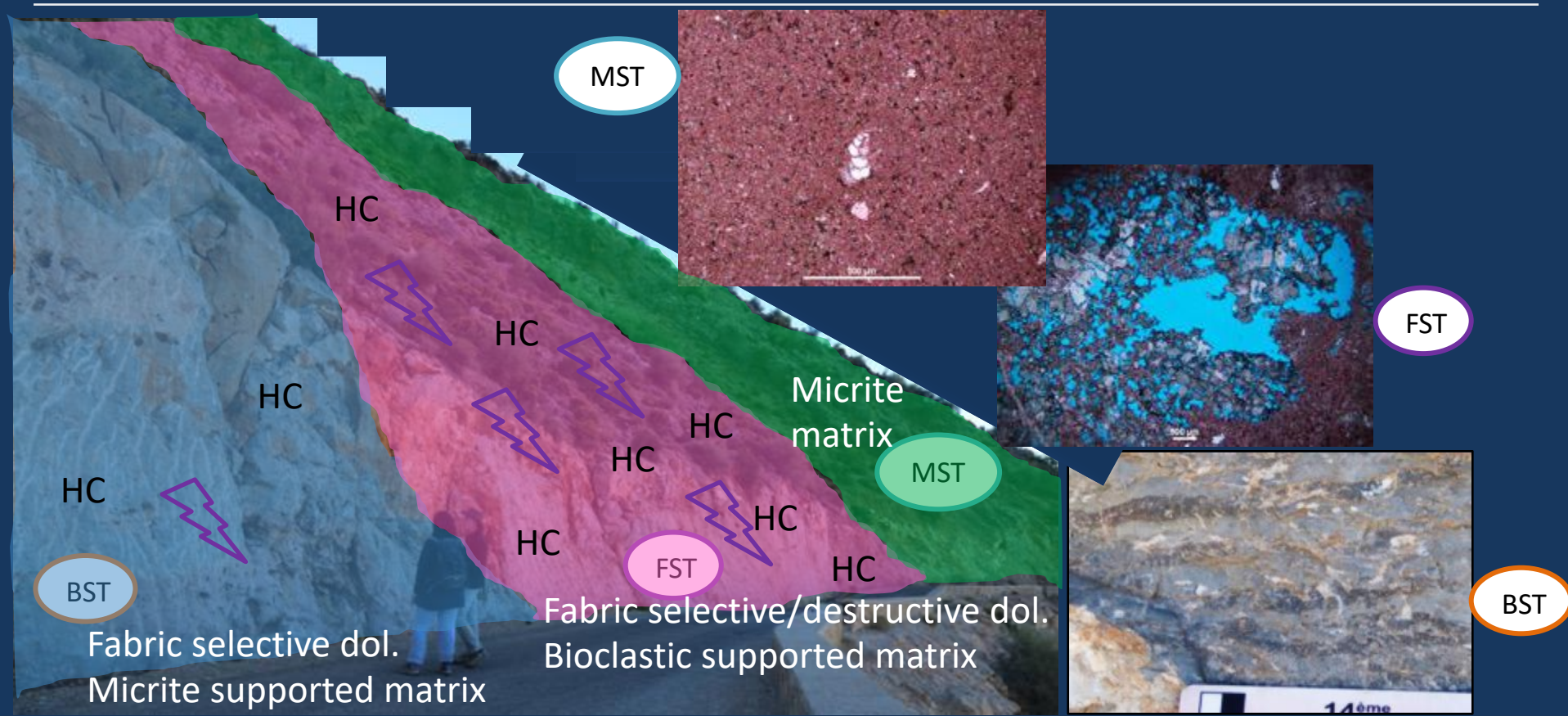


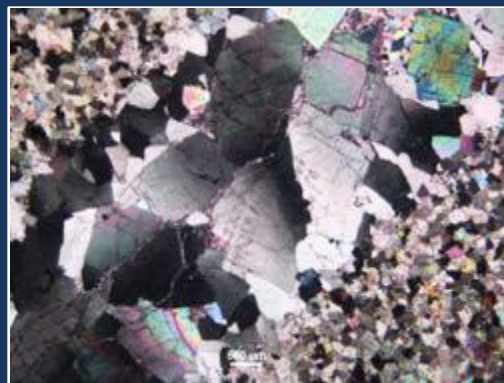
B2 - Tamarout Formation  
Restricted marine  
Arid climate



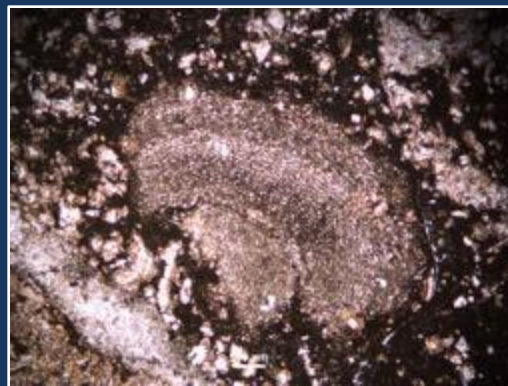
- Isolated coral build-ups:  
BST,FLST,RST textures
- Euhedral replacive dolomites
- Dolomitizing fluid (ideally) <50oC
- Mostly overprinted by HT dol.
- Dedolomitized by meteoric fluids



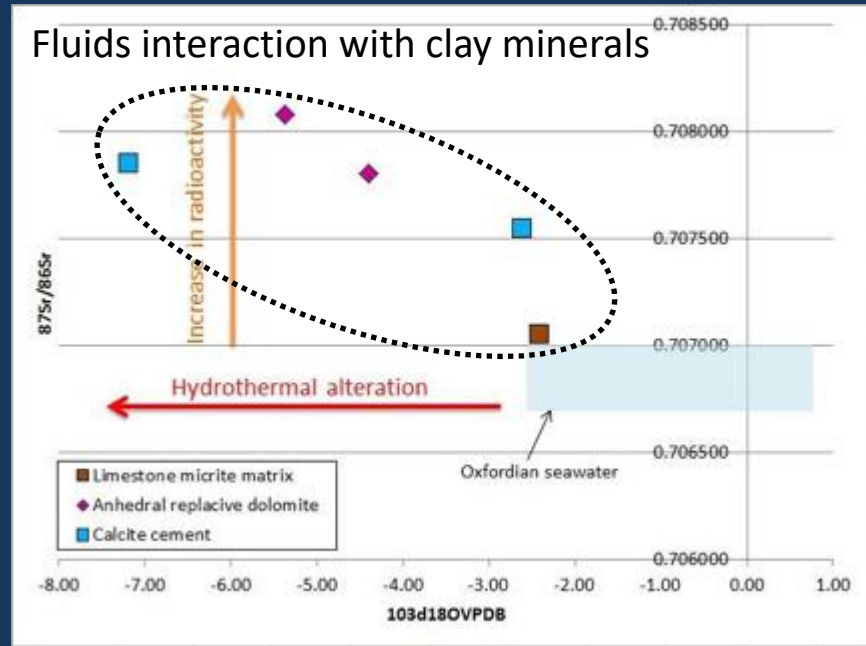
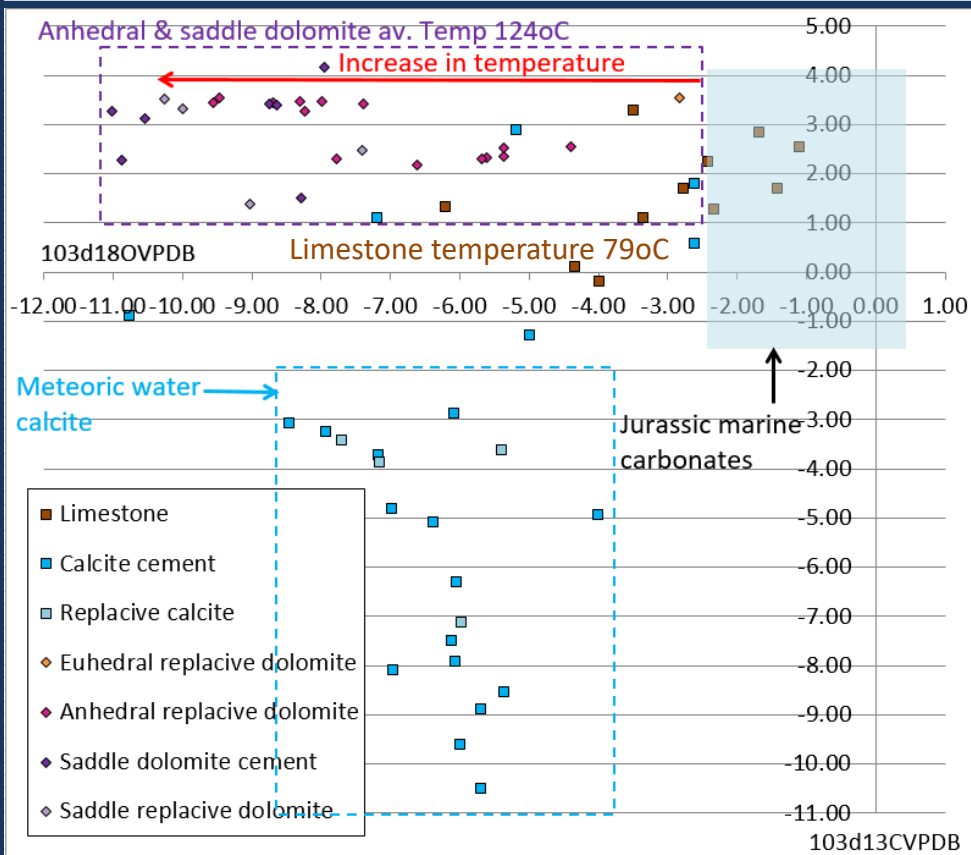


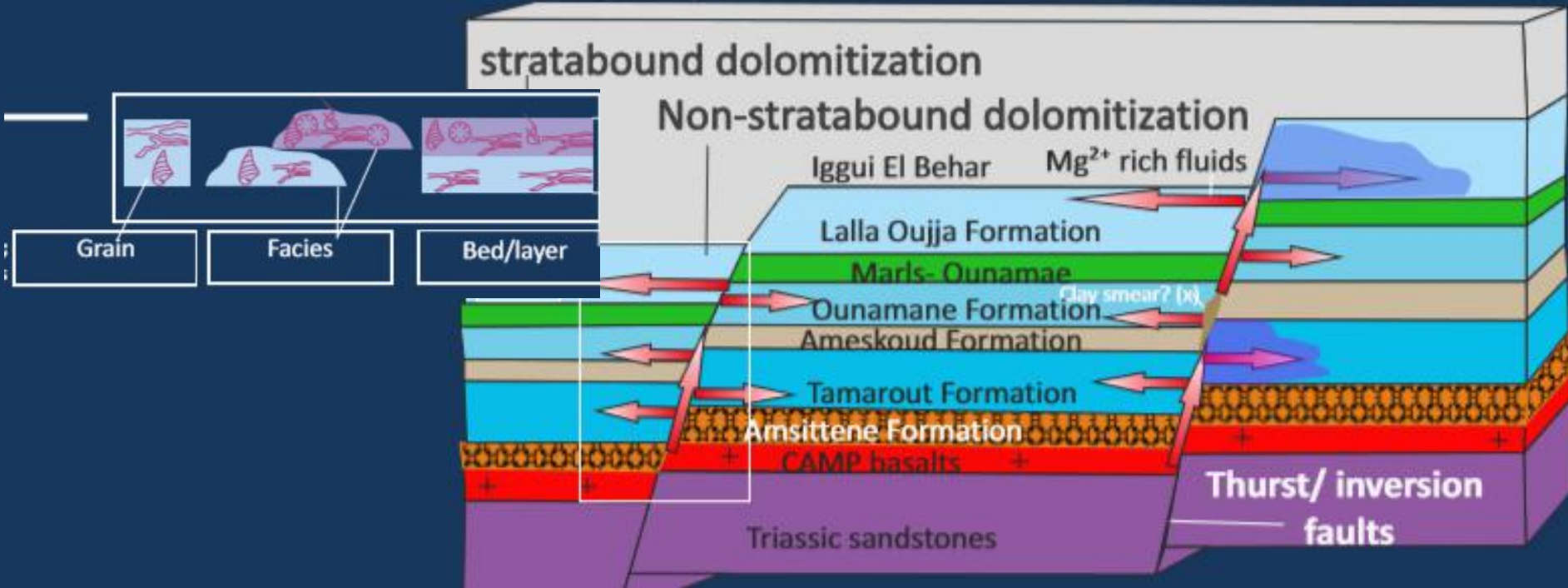


FD anhedral and saddle dolomite  
Bioclastic RST  
Heavily fractured and brecciated  
Bioclastic supported matrix  
Overdolomitized



FP anhedral dolomite selective rep.  
Isolated branching corals,  
*Thalassinoides*  
Colour contrast between LST & DOL  
Micrite supported matrix





## Where is good reservoir quality?

Sinemurian: HL: 0.4%, 0.2mDarcy, RD: 11%, 0.9mDarcy

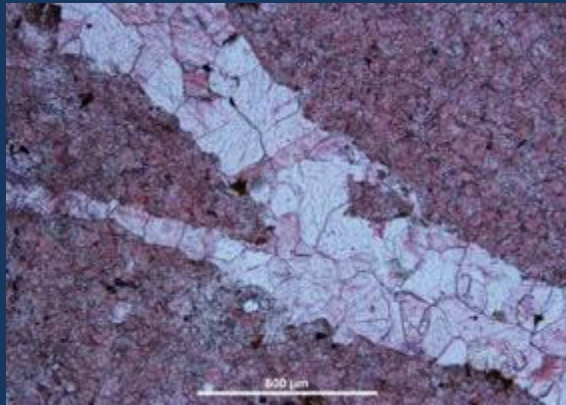
Toarcian: HL: 6.9%, 0.1mDarcy, RD: 9%, 0.1mDarcy

Oxfordian: HL: 2-5%, 0.1-0.4mDarcy, D: 2-8%, 0.01-3.2mDarcy

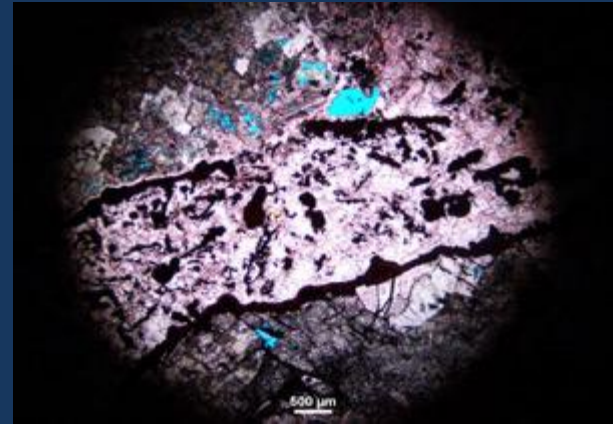
## What is degrading reservoir quality?

Over dolomitization of HT dolomites

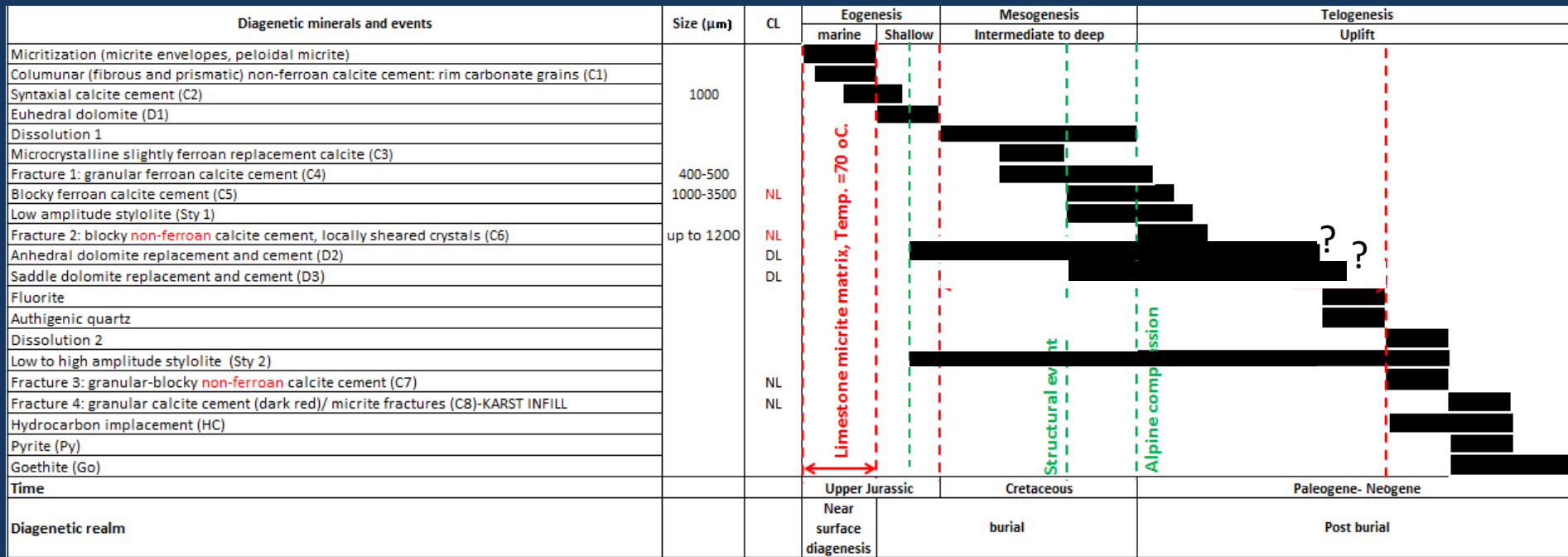
Late stage calcite cements



Calcite cements



## Burial history and paragenesis





- Lower Jurassic dolostones are stratabound and laterally extensive
- Oxfordian dolostones show complex facies distribution and poro-perm patterns
- Sinemurian dolomites sourced from seawater reflux overprinted by HT fluids
- *Toarcian* dolomites sourced from seawater reflux in a sabkha setting
- Anhedral- saddle *Oxfordian* dolomites: seawater reflux followed **HT fluids** through **faults**
- Generally, dolomitization **enhanced porosity** of parent limestone
- Calcitization **occluded** original porosity created during dolomitization

THANK YOU FOR THE SUPPORT:



Special thanks :

