

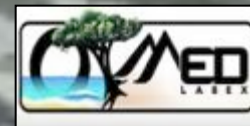
# Multiproxy assessment of Holocene relative sea-level changes in the Mediterranean:

improvements in the definition of the isostatic signal and new insights on the postindustrial acceleration of Mediterranean sea level rise



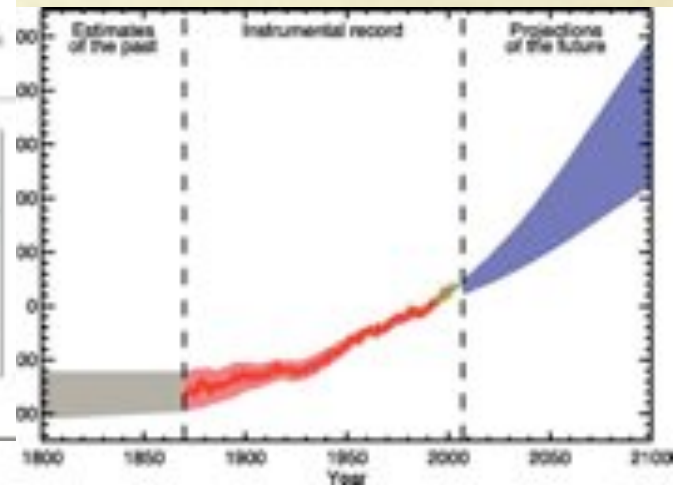
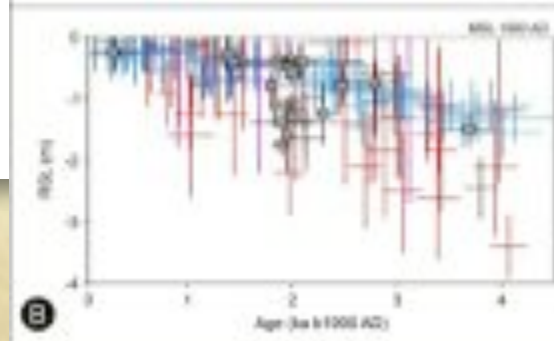
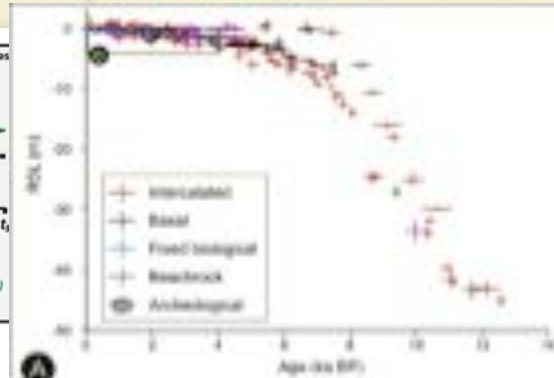
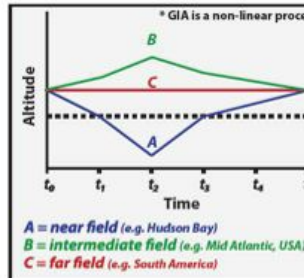
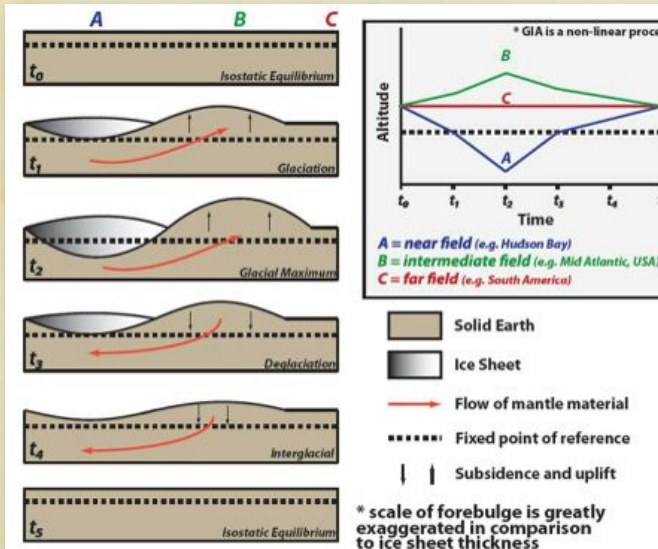
Matteo Vacchi

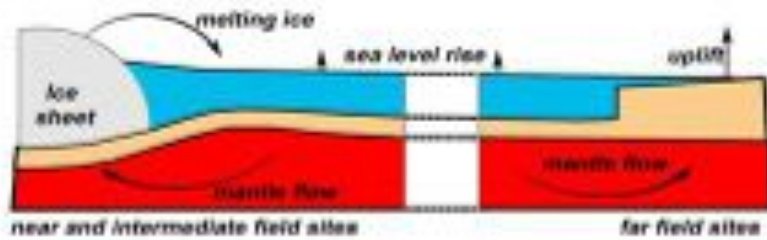
[vacchi@cerege.fr](mailto:vacchi@cerege.fr)



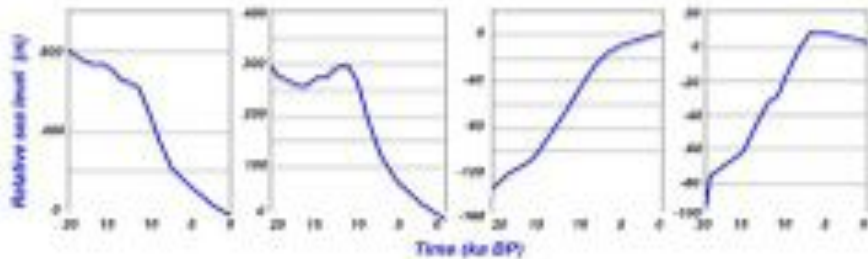
# Aims of the MedMax project

Role of Isostatic Adjustment along the Med basin  
 Better assessment late Holocene Relative Sea Level Rise  
 Tectonic influence on RSL changes  
 Future sea-level scenarios





**relative sea level (RSL) changes**



RSL Equation

$$\Delta \xi_{\text{RSL}}(\tau, \psi) = \Delta \xi_{\text{eus}}(\tau) + \Delta \xi_{\text{iso}}(\tau, \psi) + \Delta \xi_{\text{tect}}(\tau, \psi) + \Delta \xi_{\text{error}}(\tau, \psi)$$

where  $\tau$  and  $\psi$  represent time and space.

$\Delta \xi_{\text{eus}}(\tau)$  is the time-dependent eustatic function,

$\Delta \xi_{\text{iso}}(\tau, \psi)$  is the total isostatic effect of the glacial rebound process including both the ice (glacio-isostatic) and water (hydro-isostatic) load contributions,

$\Delta \xi_{\text{tect}}(\tau, \psi)$  is any tectonic effects,

$\Delta \xi_{\text{error}}(\tau, \psi)$  is unknown but we attempt to minimize this component by employing proven methodologies.

3



RSL database Western Mediterranean (Vacchi et al., under review)



RSL database Eastern Mediterranean (Vacchi et al., 2014; Kahn et al., 2015)



Contents lists available at ScienceDirect  
**Quaternary International**  
Journal homepage: [www.elsevier.com/locate/quaint](http://www.elsevier.com/locate/quaint)

An updated database of Holocene relative sea level changes in NE Aegean Sea  
Matteo Vacchi<sup>a,\*</sup>, Alessio Rovere<sup>b</sup>, Alexandros Chatzipetros<sup>c</sup>, Nikolas Zouros<sup>d</sup>, Marco Firpo<sup>e</sup>



Cur. Clim. Change Rep. (2015) 1, 247–302  
DOI: 10.1007/s10584-015-0820-x

SEA LEVEL PROJECTIONS (BP HORTON, SECTION EDITOR)

**Holocene Relative Sea-Level Changes from Near-, Intermediate-, and Far-Field Locations**

Nicole S. Khan<sup>1,2</sup>, Erik Ashe<sup>3,4</sup>, Timothy A. Shan<sup>5,6</sup>, Matteo Vacchi<sup>7,\*</sup>, Jennifer Walker<sup>1,2</sup>, W.K. Peckler<sup>8</sup>, Robert E. Kopp<sup>9,10</sup>, Benjamin P. Horton<sup>11,12</sup>



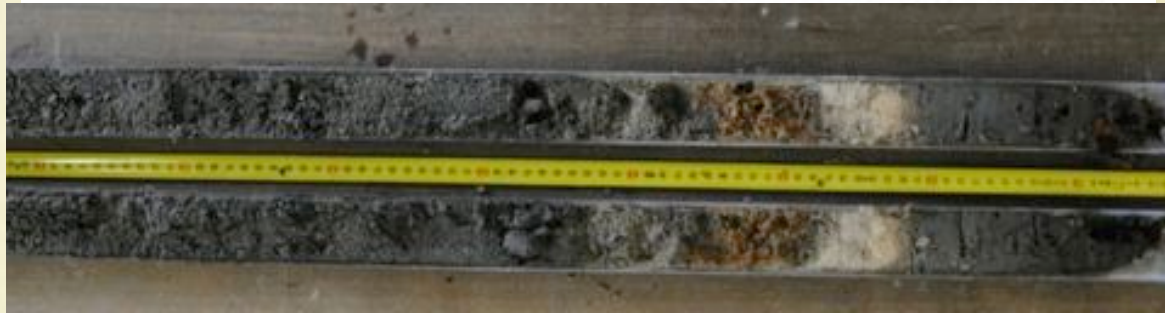
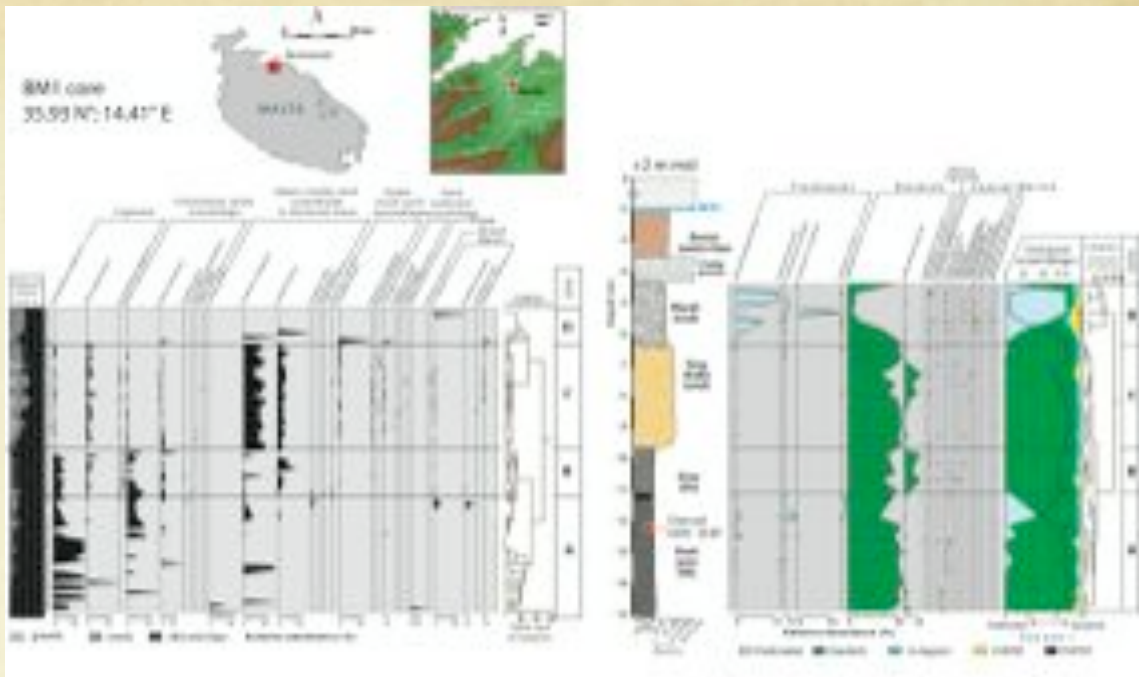
# New standardization of RSL index and limiting points

-Fixed biological indicators

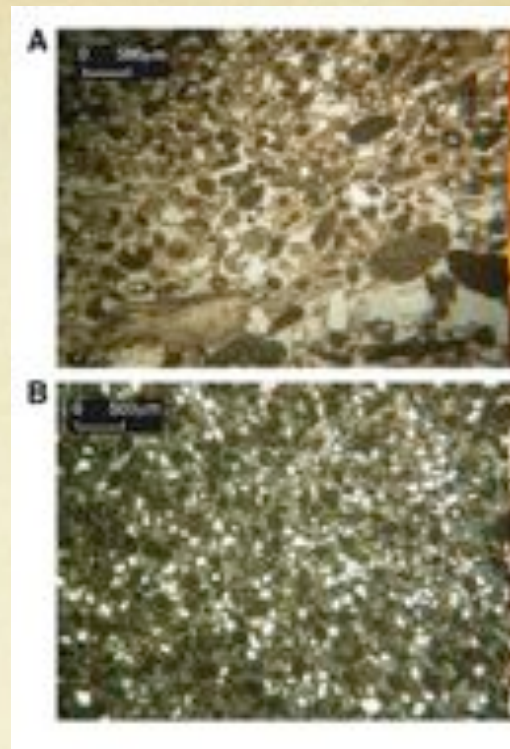
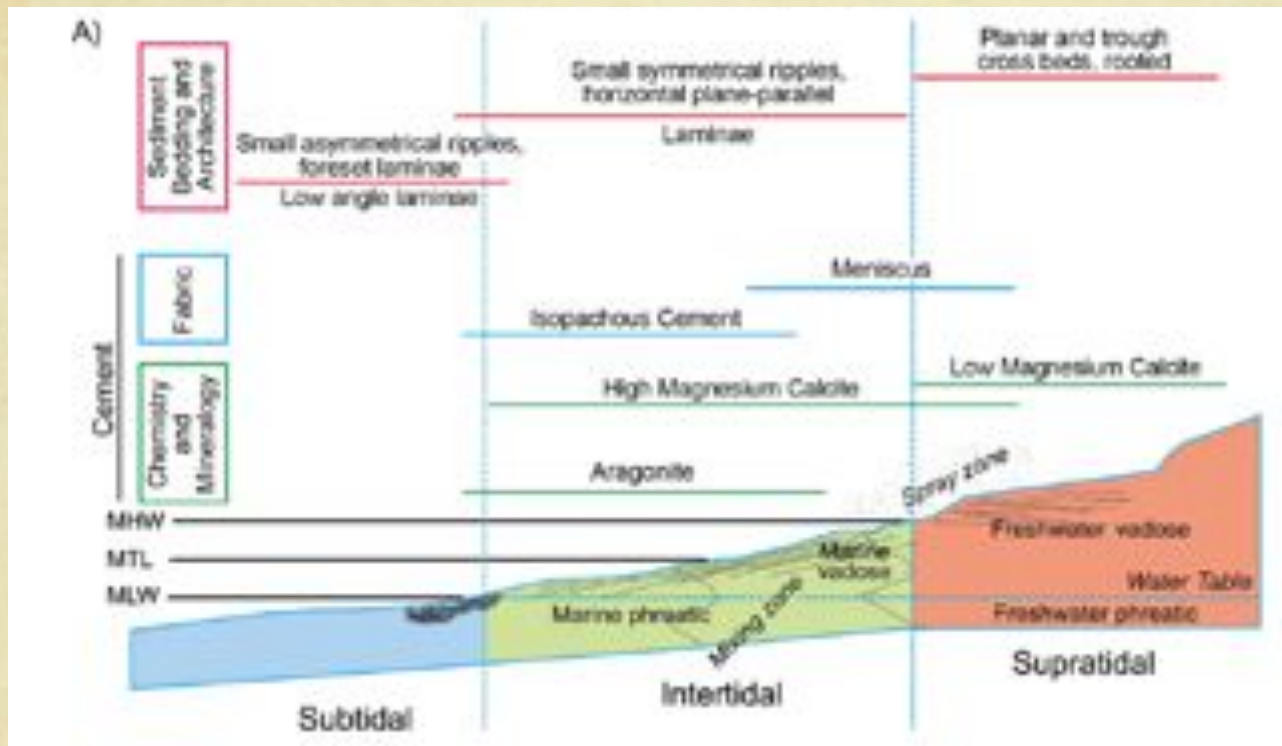
-Marsh and lagoonal indicators

-Archeological indicators

-Beachrocks



# Beachrocks standardized indicative meaning



**Marine Geology**  
 Journal homepage: [www.elsevier.com/locate/margeo](http://www.elsevier.com/locate/margeo)

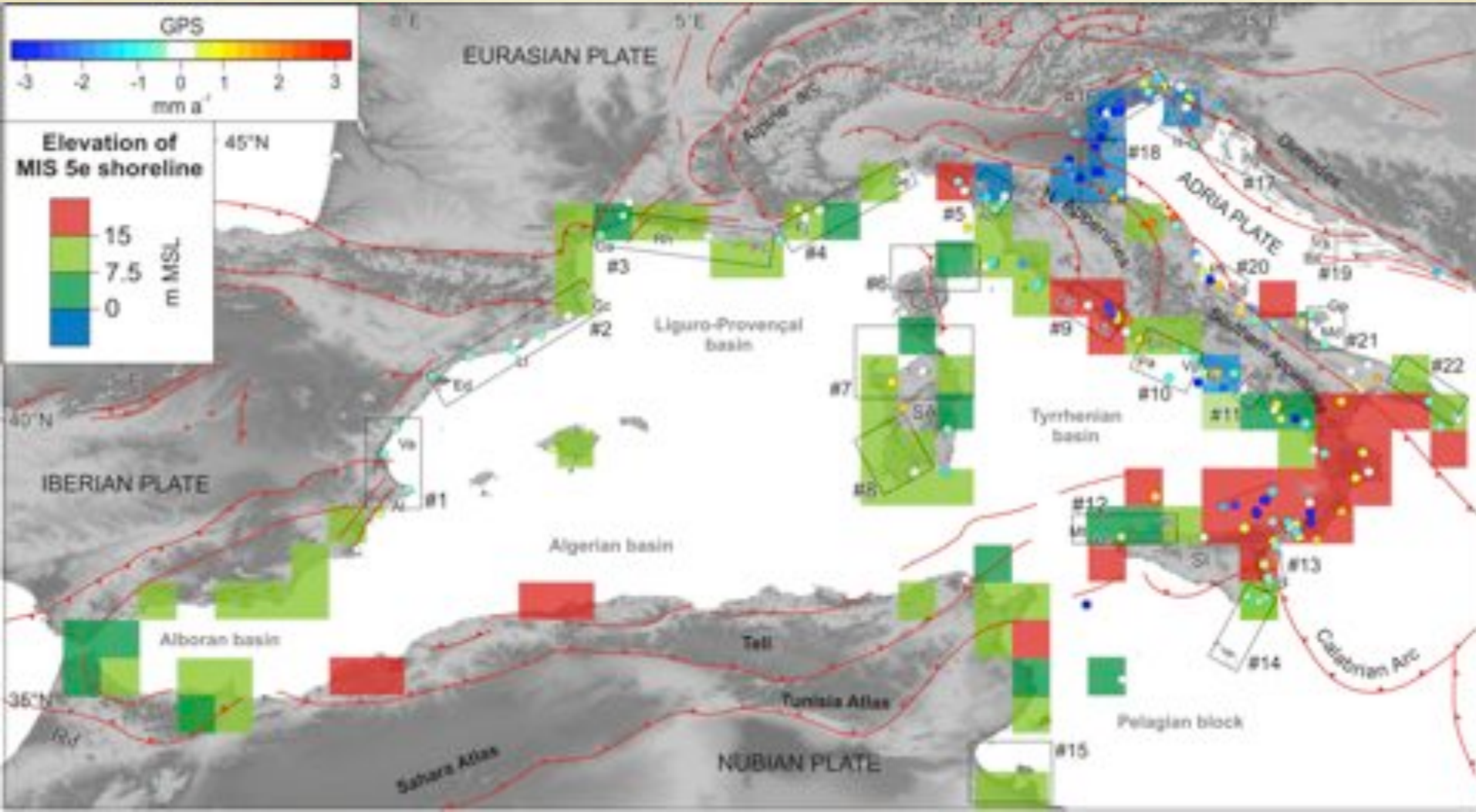
**Beachrock: A tool for reconstructing relative sea level in the far-field**  
 Barbara Mauz <sup>1,\*</sup>, Matteo Vacchi <sup>2</sup>, Andrew Green <sup>3</sup>, Goesta Hoffmann <sup>4</sup>, Andrew Cooper <sup>5,6</sup>

<sup>1</sup> School of Environmental Sciences, University of Liverpool, Liverpool L69 7ZJ, UK  
<sup>2</sup> Abu Dhabi University, UAD1001, PO Box 12, Abu Dhabi, UAE  
<sup>3</sup> School of Agriculture, Earth and Environmental Sciences, University of Exeter, Devon PL8 4AT, Exeter, UK  
<sup>4</sup> German University of Technology in Oman, P.O. Box 1815, Alkhailah 51301, Oman  
<sup>5</sup> School of Environmental Sciences, University of Ulster, Coleraine BT2 5BA, UK

Western Mediterranean. 918 RSL datapoints

RSL reconstructions in 22 regions according to the tectonic setting

Comparison with the ICE 5G-VM2 isostatic model



## Results WestMed

918 RSL datapoints,

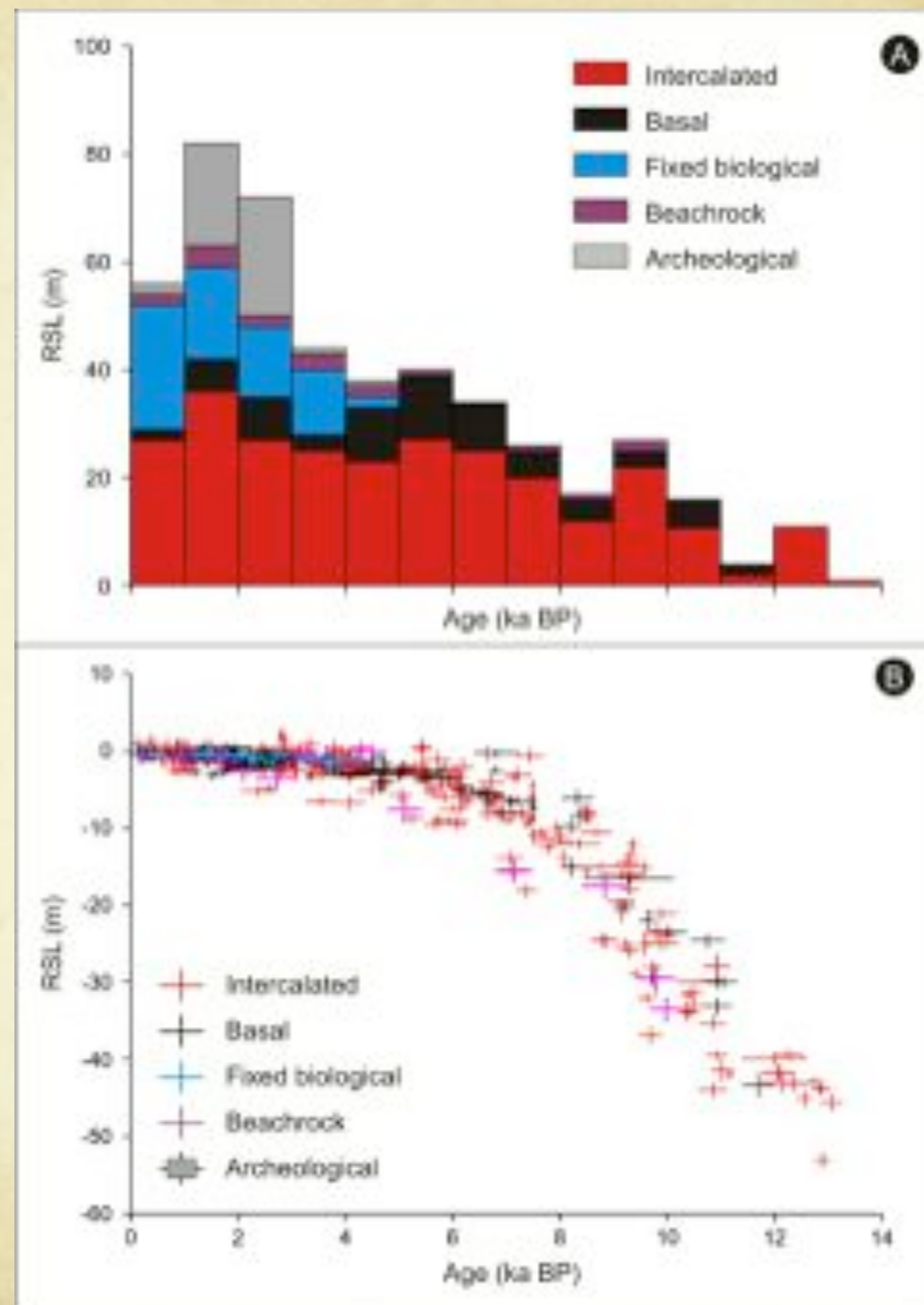
Excellent temporal span

Good applicability of the  
multiproxy standardization

A continuous rise in RSL along the  
Holocene in tectonically stable  
areas



*Punta sottile, Trieste, Italy*



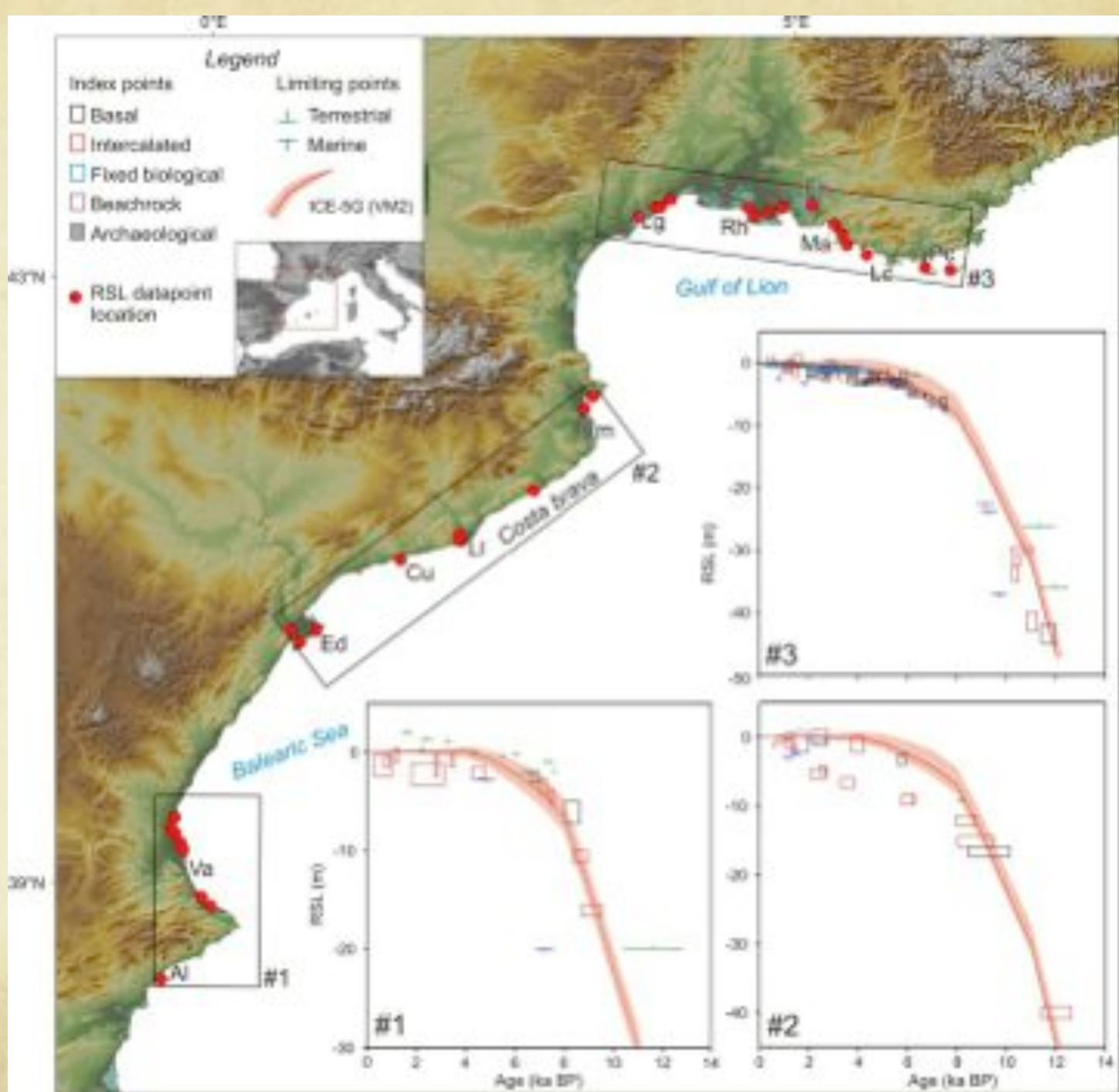


# Some results

-Assessment of Ebro Delta Holocene subsidence rates

~1 mm a<sup>-1</sup> between 6.0 and 3.5 ka BP,

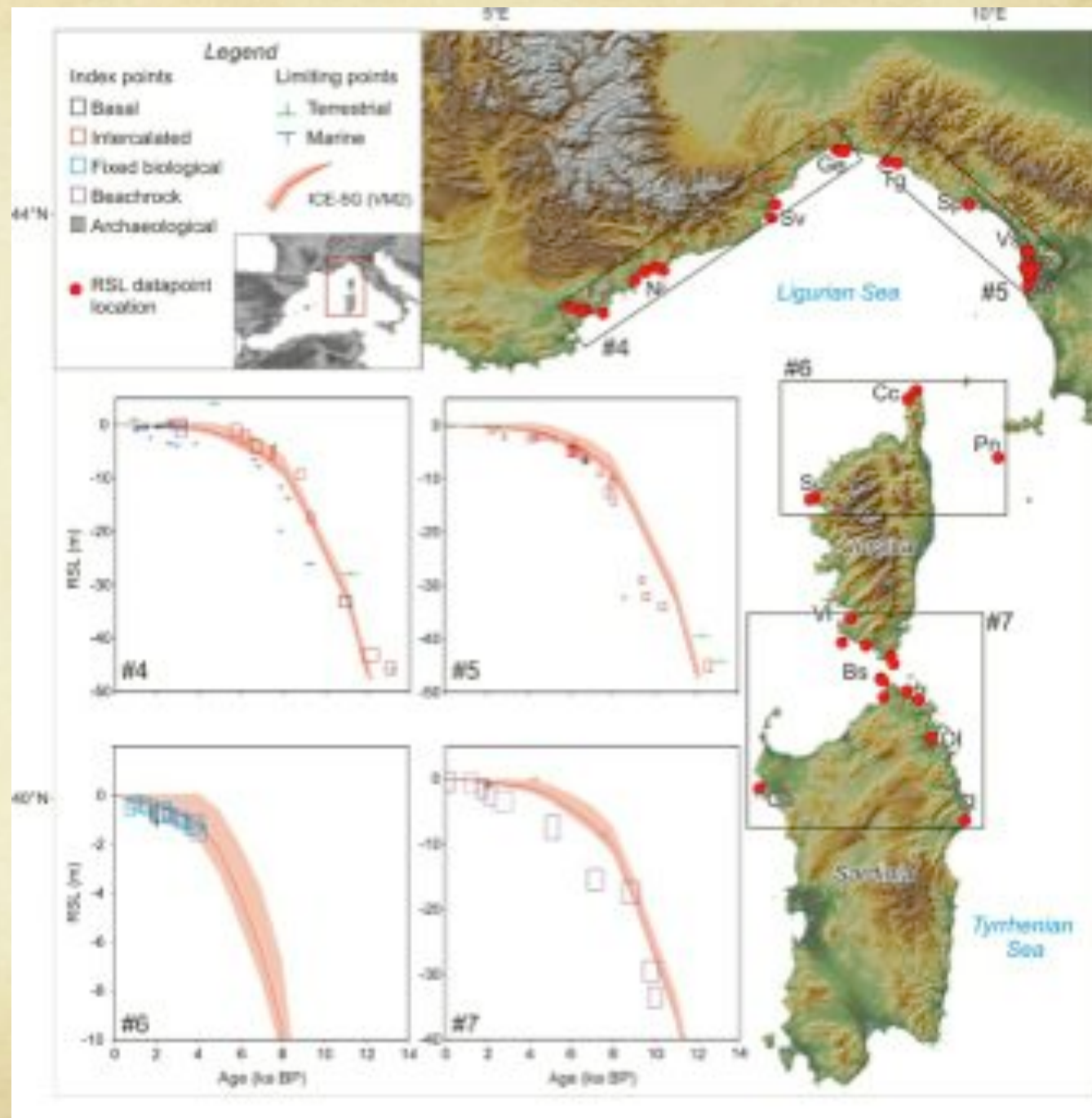
≥ 2 mm a<sup>-1</sup> in the last 2.5 ka BP



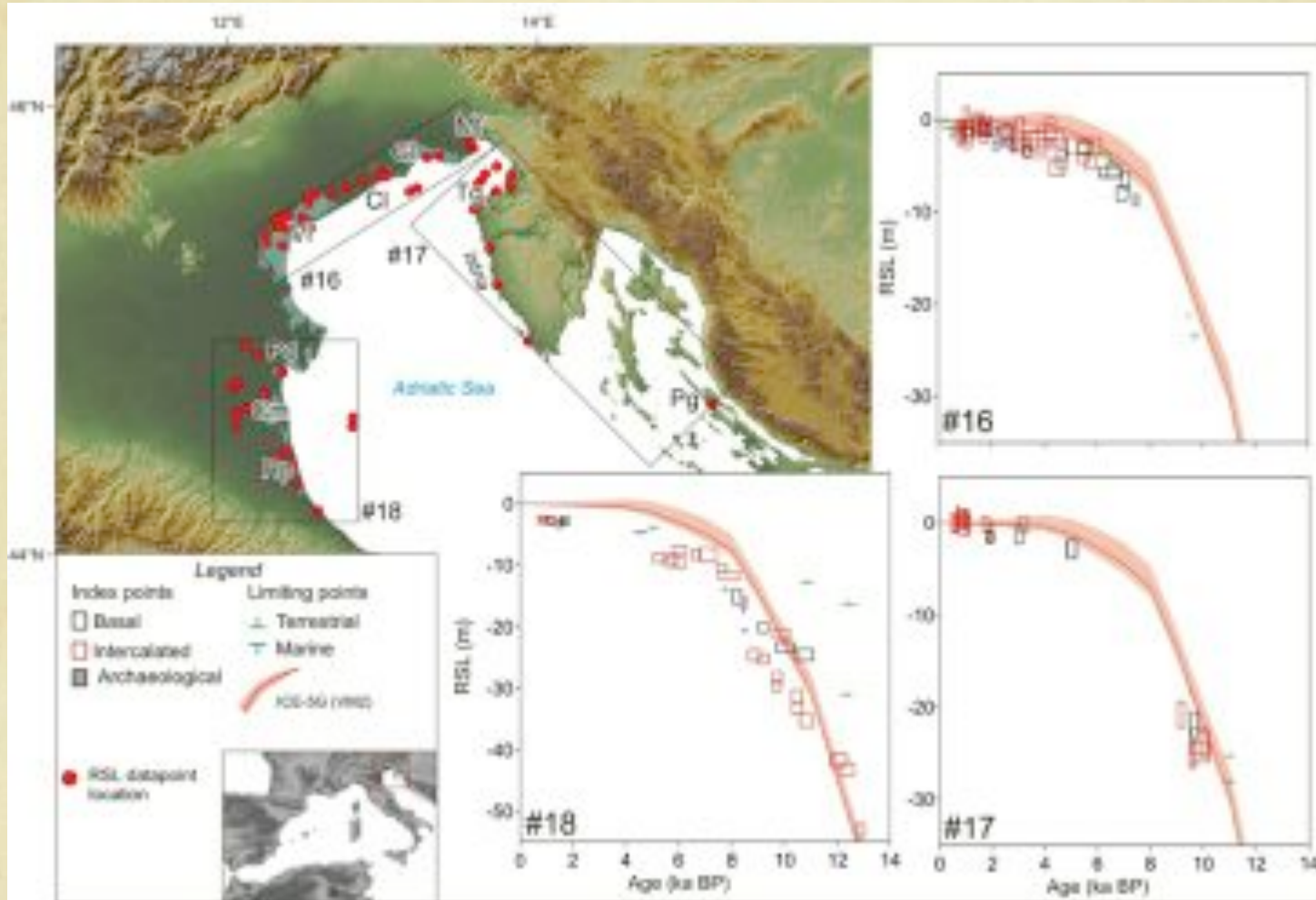
Contrasting RSL histories between Northern and Southern Corsica

Coastline occupation problems!

Collection of new field data



Southern Po delta subsidence rates up to  $5.5 \text{ mm a}^{-1}$  for the last 9.5 ka BP  
 Highest values in the West Med: Tectonics+compaction



New insights about the post-roman sea level evolution in NE Adriatic Sea



Geomorphology

journal homepage: [www.elsevier.com/locate/geomorph](http://www.elsevier.com/locate/geomorph)

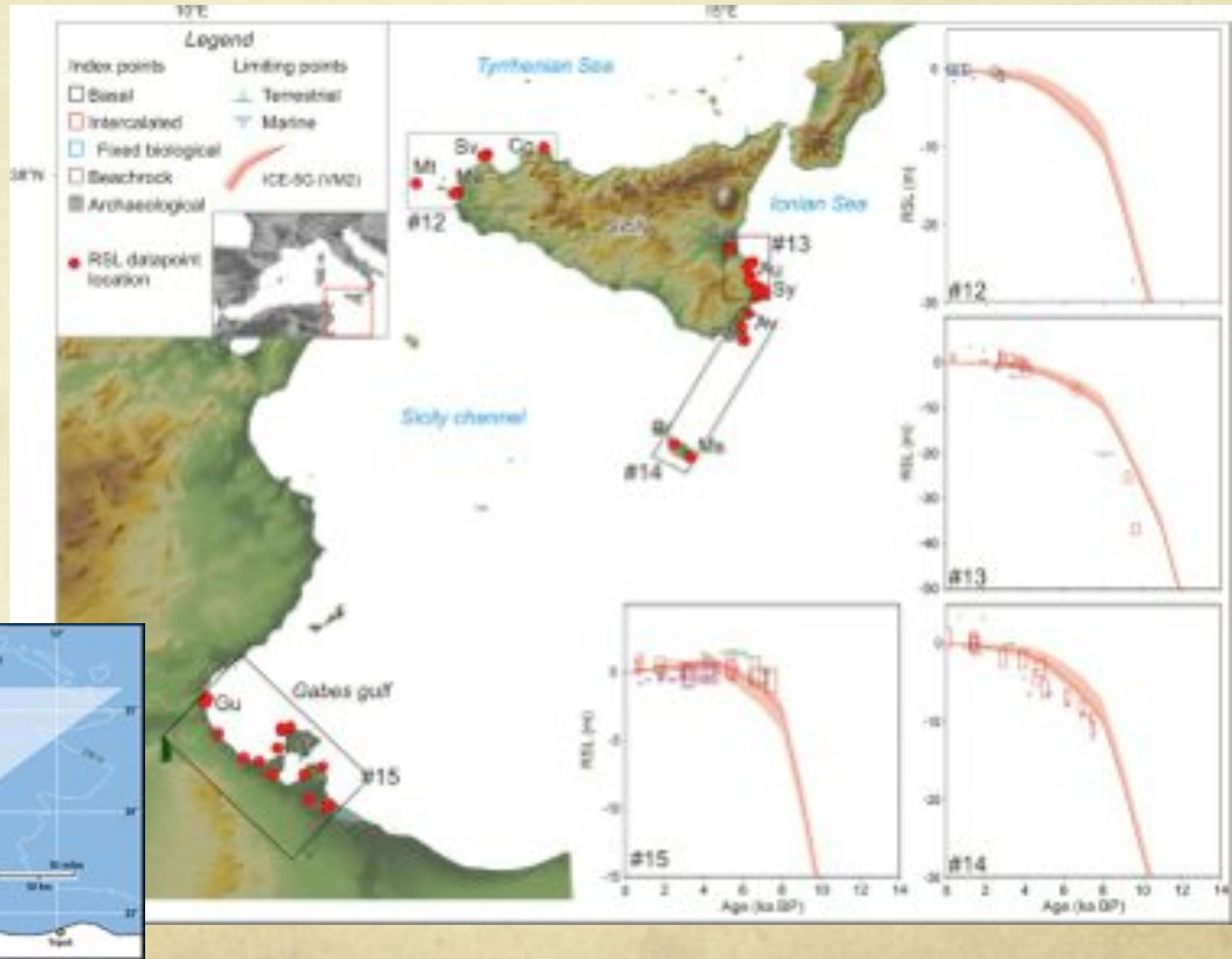


Post-Roman sea-level changes on Pag Island (Adriatic Sea): Dating Croatia's "enigmatic" coastal notch?

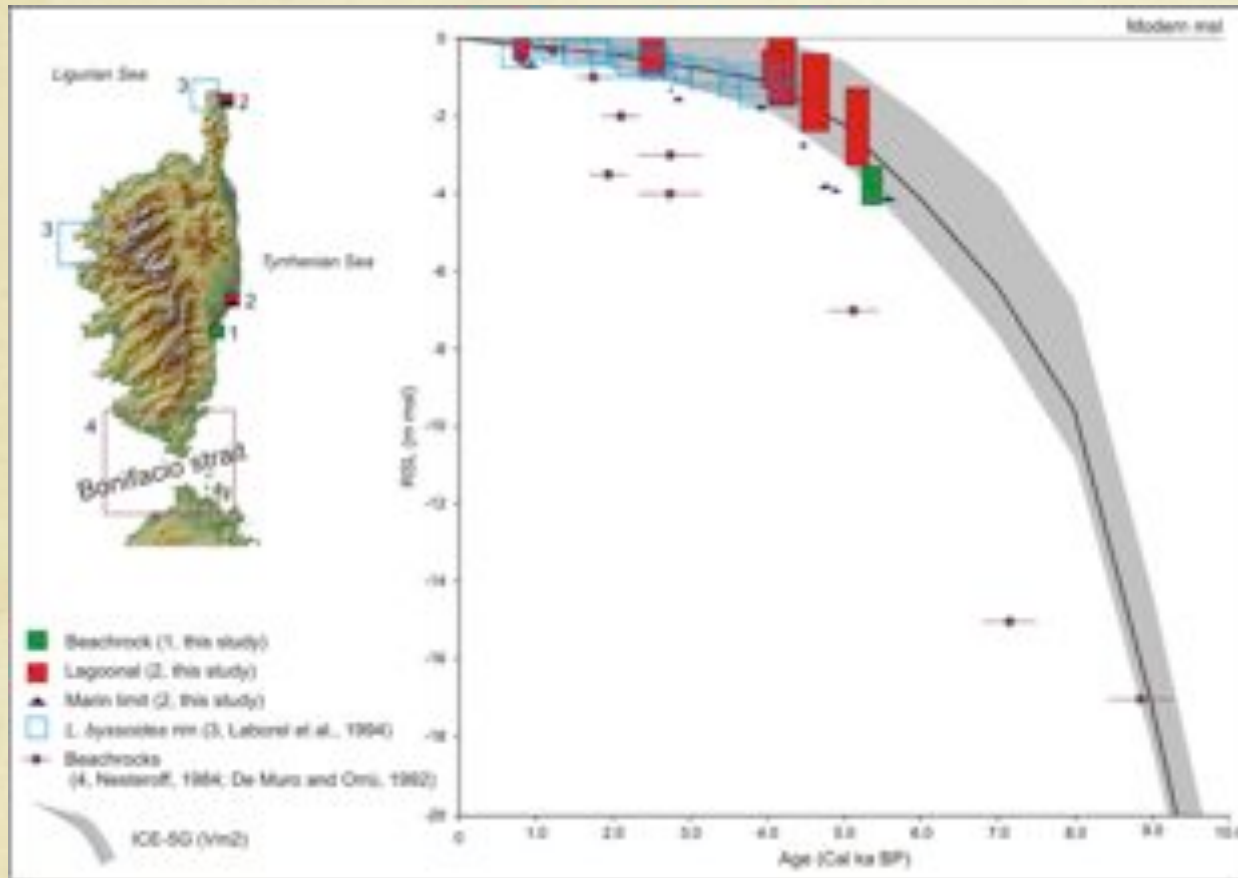
Nick Marriner<sup>a,\*</sup>, Christophe Morhange<sup>b</sup>, Sanja Faivre<sup>c</sup>, Clément Flaux<sup>b</sup>, Matteo Vacchi<sup>d</sup>, Slobodan Miko<sup>e</sup>, Vincent Dumas<sup>f</sup>, Giulia Boetto<sup>f</sup>, Irena Radic Rossi<sup>g</sup>



# Southern Tunisian highstand: the sole in West Med and compatible with the remote Antarctic Ice sheet melting history



# Corsica and Sardinia, collaboration with the OT-Med project of Andrés Curras and Matthieu Ghilardi

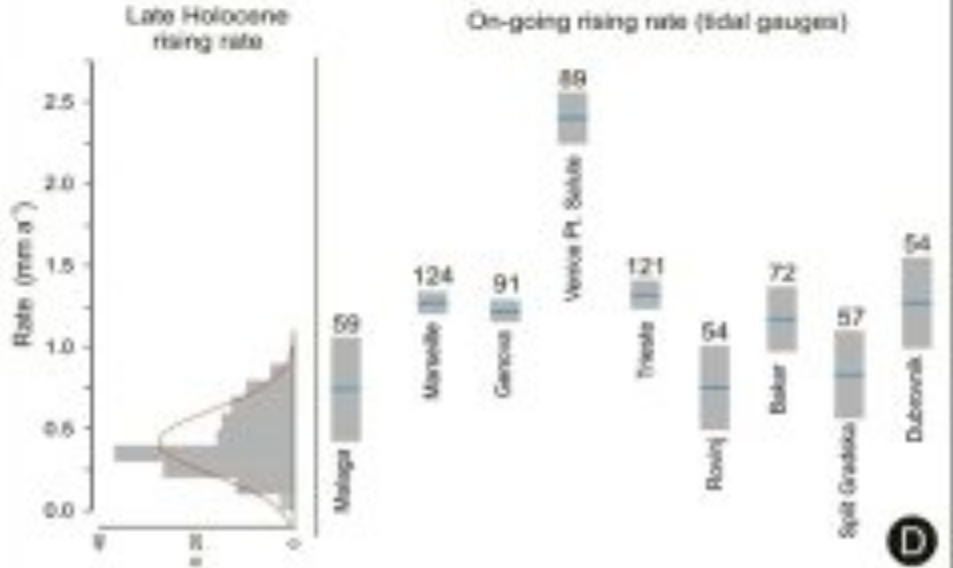
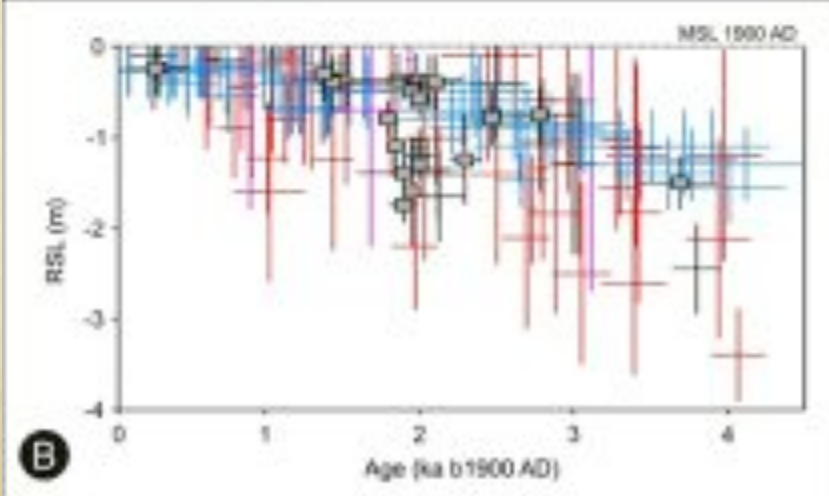
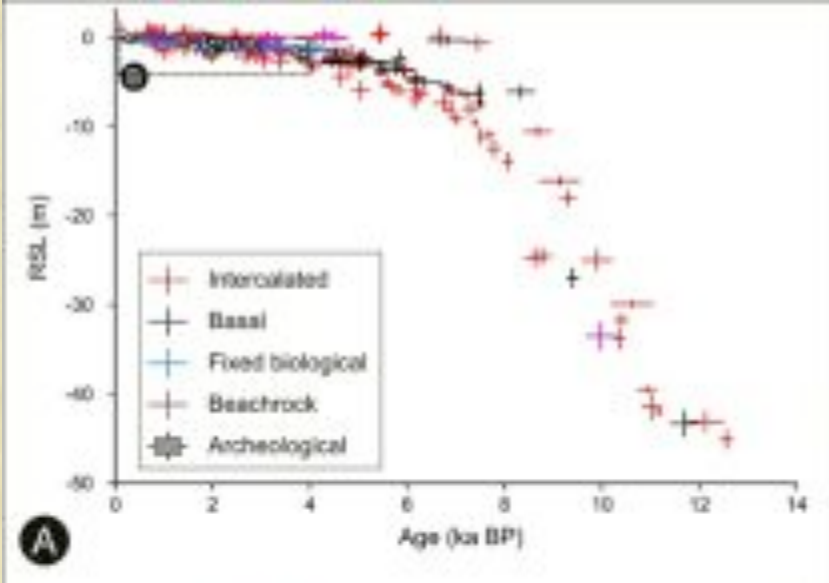


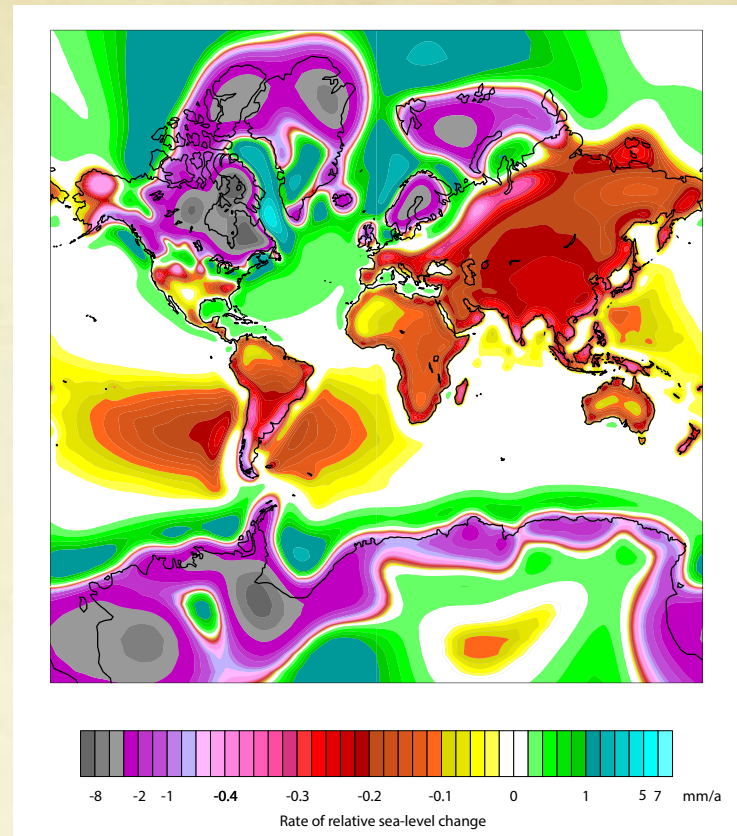
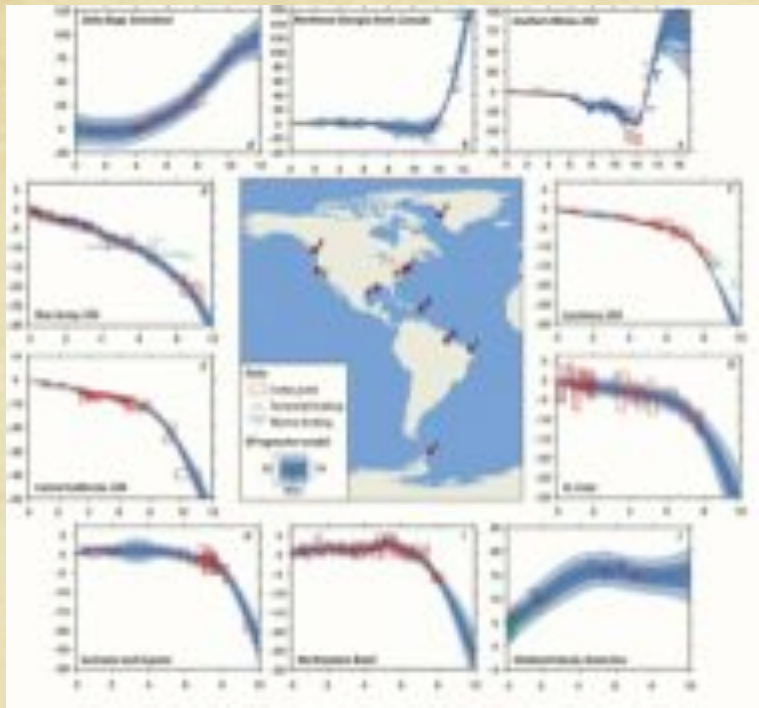
*Vacchi et al.*, New insights on the mid to late-Holocene Relative Sea-Level changes in Corsica (NW Mediterranean) *under review*

*Curras et al.*, Reconstructing past landscapes in the Aleria Plain (Corsica) for the last 6000 years based on sedimentological and palynological analyses, *under review*.

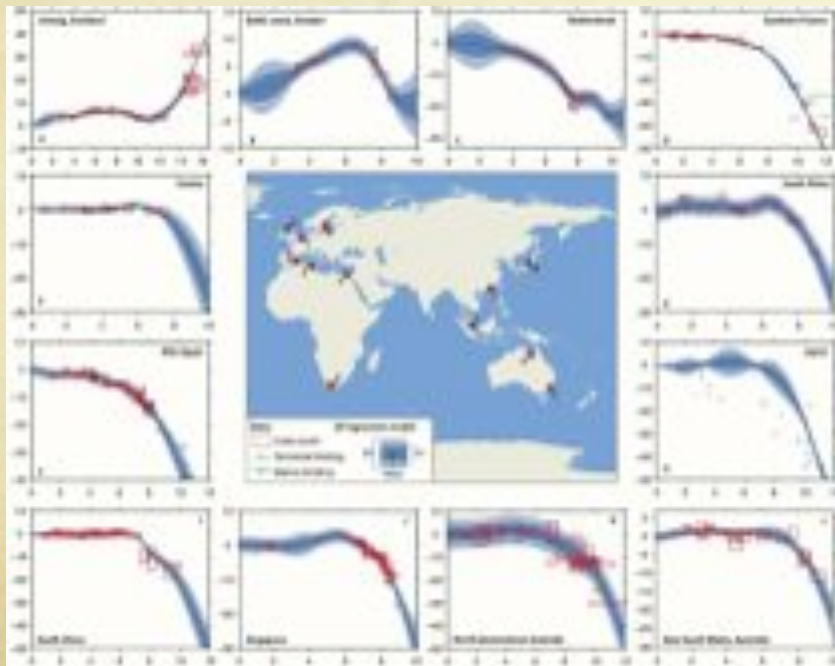
# Redefinition of the isostatic signal across the western Mediterranean (Vacchi et al., submitted)

-Last 4.0 ka negligible meltwater input, minimized tectonics and sediment compaction  
 -GIA-related land movements in the western Mediterranean vary between ~3.4 m the southeastern part of the basin up to ~1.6 m in the northwestern.





Gaussian model on geological records  
 VS  
 ICE-6G (VM6) isostatic model



Cur Clim Change Rep (2015) 1:247-262  
 DOI 10.1007/s00641-015-0029-z



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**SEA LEVEL PROJECTIONS (BP HORTON, SECTION EDITOR)**

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**Holocene Relative Sea-Level Changes from Near-, Intermediate-, and Far-Field Locations**

Nicole S. Khan<sup>1,2</sup> · Erica Ashe<sup>2,3</sup> · Timothy A. Shaw<sup>1,2</sup> · Matteo Vacchi<sup>4</sup> · Jennifer Walker<sup>1,2</sup> · W.R. Peltier<sup>5</sup> · Robert E. Kopp<sup>2,6</sup> · Benjamin P. Horton<sup>1,2,7</sup>

ON LINE WEBGIS <http://medmax.otmed.fr/>

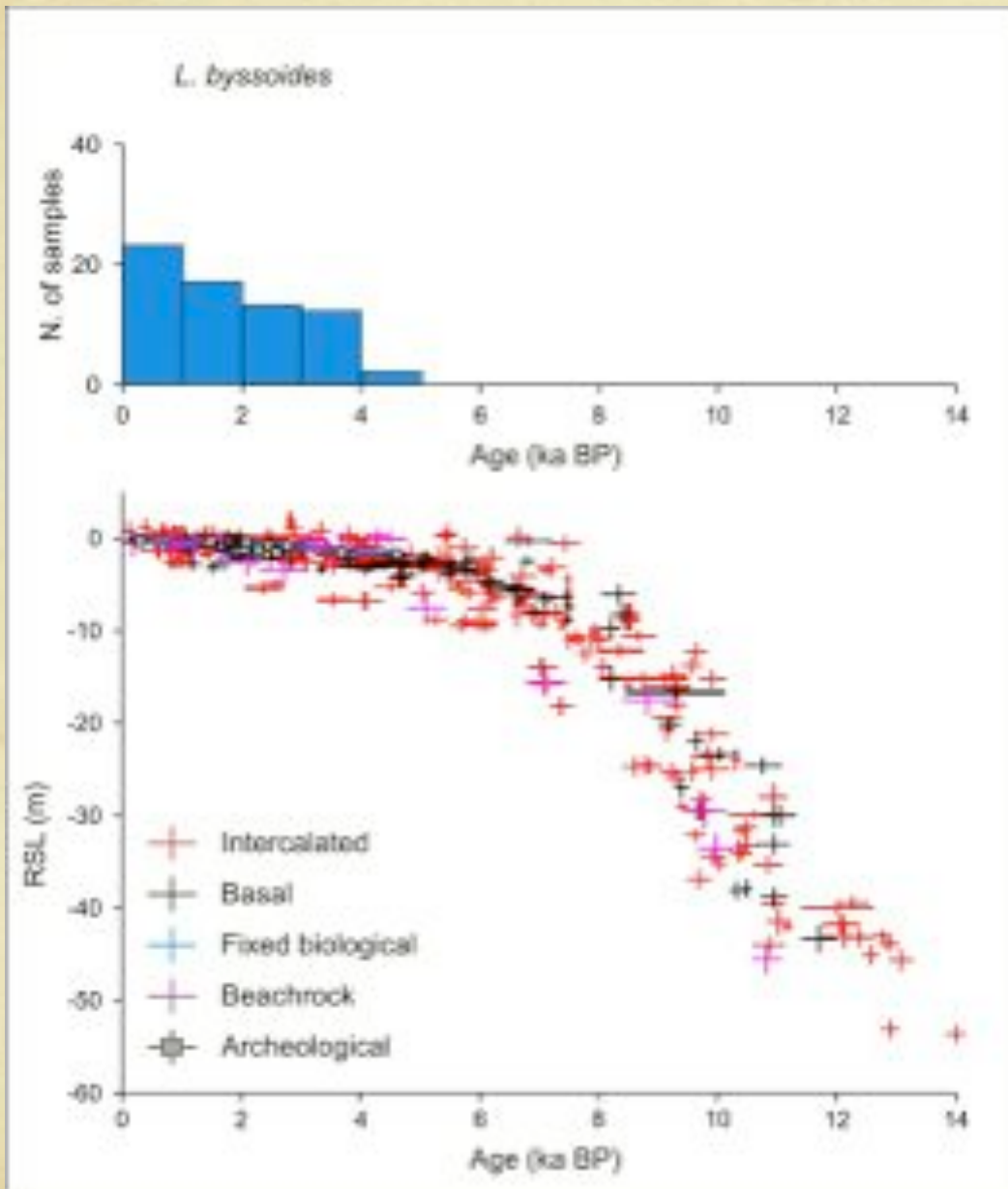
The screenshot displays a web browser window with the URL [medmax.otmed.fr](http://medmax.otmed.fr/). The page features a header with logos for OYMED, COTIS, INRA, and Aix-Marseille universit . Below the header is a banner image of a coastal landscape. The main content area is divided into a left sidebar and a central map. The sidebar contains a legend with the following items:

- Red legend
- Sampling sites
- Sea Level Data Points
- Bathymetry 300 meters
- Topography / Bathymetry
- Central Spain
- Northern Spain
- Central France
- Western Ligurian Sea
- Eastern Ligurian Sea
- Northern Corsica
- Southern Corsica - Northern Sardinia
- South Western Sardinia
- North Central Latium
- Genoa Gulf
- Salerno Bay
- North Western Sicily
- Mid Eastern Sicily

The central map, titled "MEDMAX", shows a topographic and bathymetric map of the Mediterranean region, including the Bay of Biscay, the Gulf of Lion, and the Tyrrhenian Sea. Numerous red circular markers are overlaid on the map, indicating sampling sites. A blue circle highlights a specific site in the Gulf of Lion. The map includes navigation controls and a scale bar.



## OPEN QUESTIONS



Are the current sea level rising rates (1,3 mm year) leading to the disappearance of *L. byssoides* rims in NW Med?

New sampling and dating are requested