

# **The Upper Triassic to Lower Jurassic Sedimentary Succession in Southern Portugal: A Stratigraphical Framework for Central Atlantic Magmatic Province (CAMP) Related Magmatism\***

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## **Abstract**

The onshore geological record of Late Triassic to Early Jurassic in the Western Iberian Margin may be studied in three different basins: the Lusitanian Basin (to the north), the Alentejo Basin (to the SW) and the Algarve Basin (to the south). The Central Atlantic Magmatic Province (CAMP) event, largely recorded in Morocco and Western Canada, is also present in these basins. In the Lusitanian Basin, this magmatic event is present only at its most southern part, the Arrabida Chain (30 km south of Lisbon). Around 20 meters of weathered basaltic layers occur over Hetangian red clays with gypsum (Dagorda Formation) and Platty Dolomites, being covered by Sinemurian massive dolomitic layers (Sesimbra Formation). Sixty kilometers to the south, the Alentejo Basin shows 50 meters thick volcanics in the same stratigraphical position, between the Platty Dolomites and the massive dolomitic layers (Fateota Formation). Another one hundred kilometers to the south, at the western part of the Algarve Basin, the magmatic event is part of the 50 meters thick Volcano-Sedimentary Complex, including mainly extrusive basaltic rocks intercalated with red clays. The stratigraphic position is very similar, following clays with gypsum (Silves Complex) and being covered by Sinemurian massive dolomites (Espiche Formation). From a stratigraphic point of view, this event is coeval with important paleoenvironmental changes in the basins. It occurs always between the sabkha-like continental to peritidal deposits, and the shallow marine massive dolomites with the first Sinemurian fossils. At the Algarve Basin, however, the intense magmatic intumescence seems to have prevented the regional development of peritidal Platty Dolomites.

After the magmatic extrusive event, subsidence in the Western Iberian Margin has been quite heterogeneous. In the south, shallow dolomitic facies were maintained all along the Lower Jurassic, whereas to the north (where there is no volcanic record), deeper marly facies were deposited in a highly subsident ramp, opened to the NW. This magmatic event is increasingly expressive southwards, towards Morocco, disappearing northwards. This fact can be attributed to the crucial role of the Central Atlantic opening (between Morocco and Nova Scotia) in the CAMP development. Considering the short temporal extension of the CAMP event (around 1 M.Y.?), it may be used as an isochronal time-line allowing correlation between different on-shore and offshore sub-basins, not only in Western Iberia, but also in Morocco and Western Canada.

### References Cited

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# **The Upper Triassic to Lower Jurassic sedimentary succession in southern Portugal -a stratigraphical framework for Central Atlantic Magmatic Province (CAMP)-related magmatism**

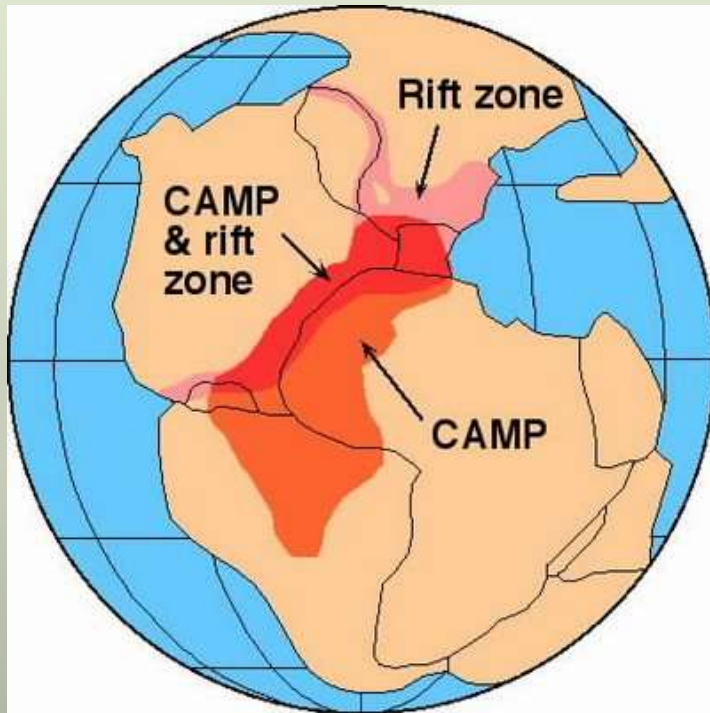
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3: Margins Exploration Group

# GEODYNAMIC FRAMEWORK



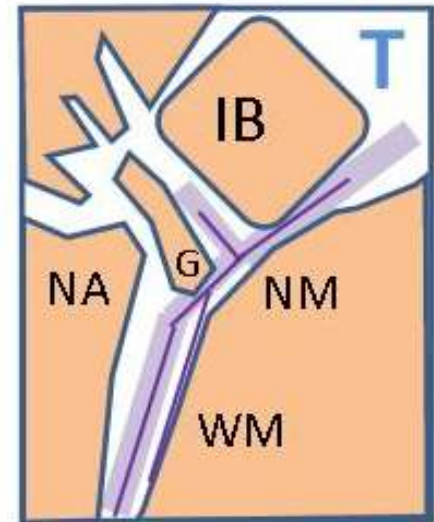
The CAMP event extends over four tectonic plates, related with the break-up of Pangea.

IB - Iberia  
G - Grand Banks  
NA - North America  
NM - North Morocco (Atlas)  
WM - West Morocco

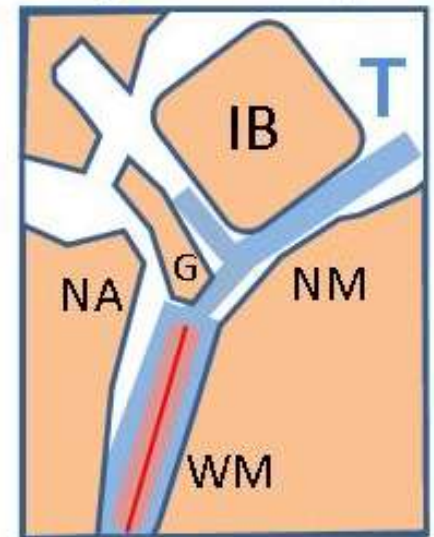


T - Tethys marine realm  
1 - Salt Basins and volcanics  
2 - Ocean spreading  
3 - Shallow marine carbonates  
4 - Deep marine carbonates  
5 - Alluvial to marine siliciclastics  
6 - Transitional siliciclastics and carbonates

Late Triassic – Step 1

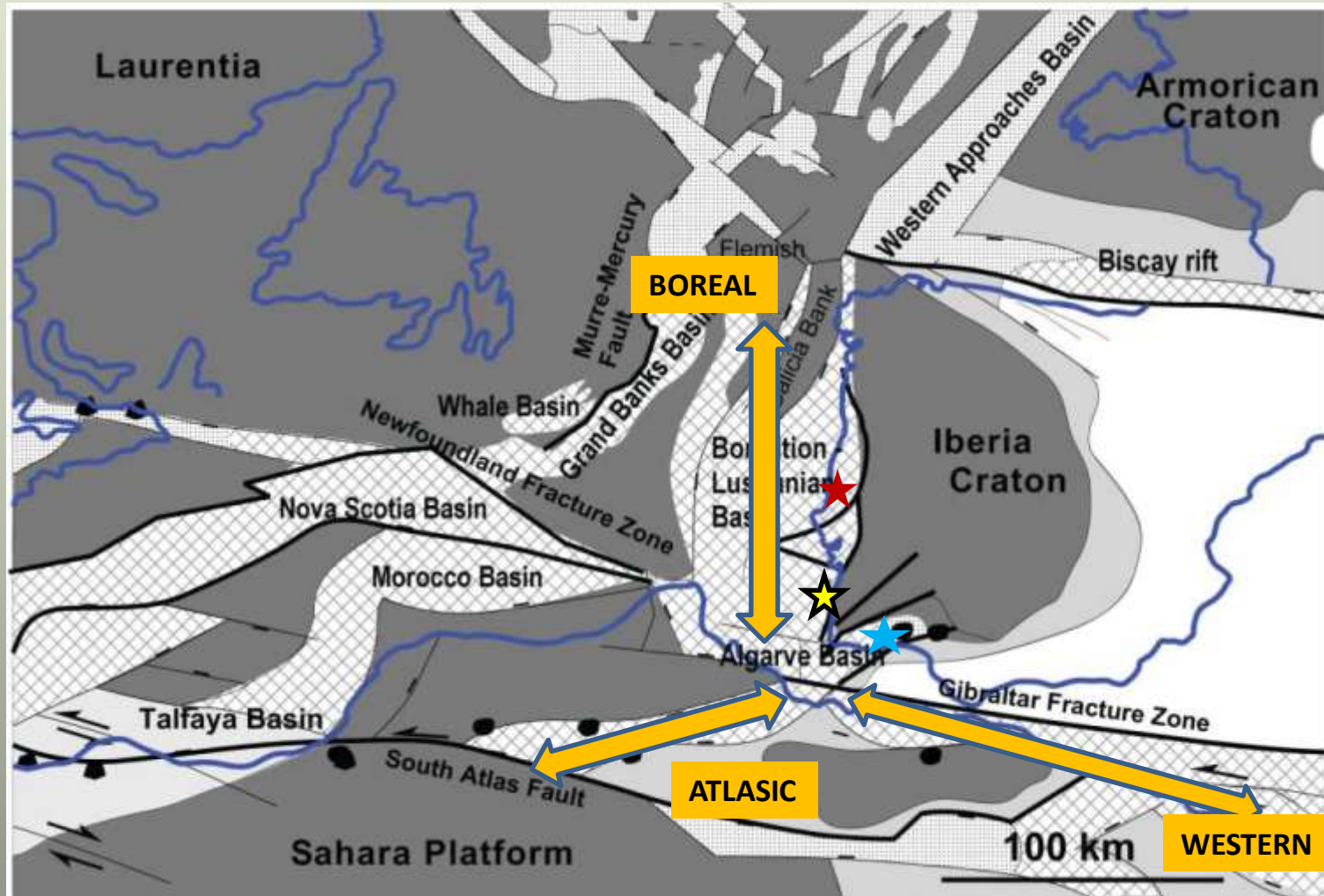


Early Liasic – Step 2



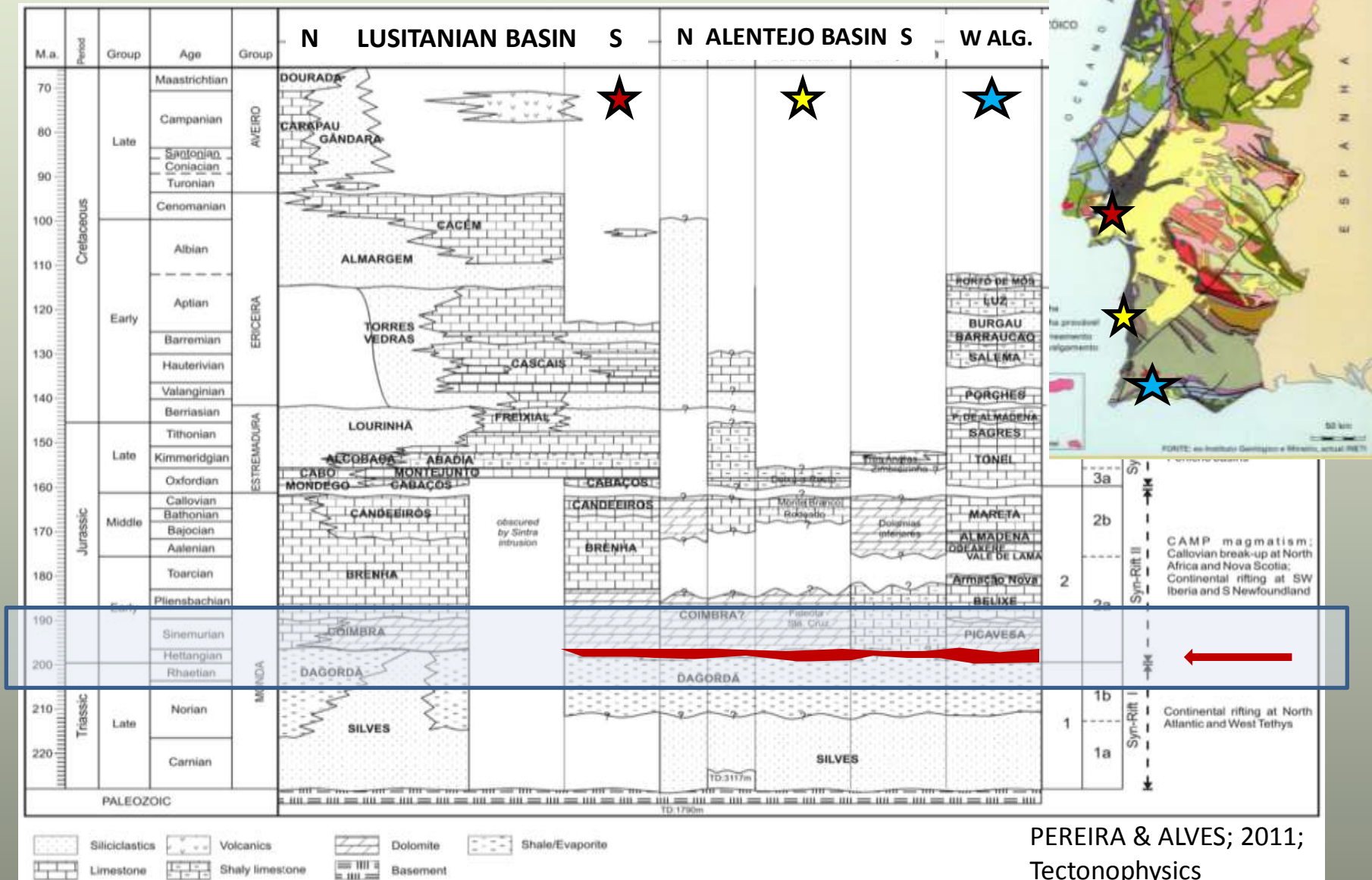
# WEST IBERIAN BASINS IN THE TETHYAN REALM

- ★ LUSITANIAN
- ★ ALENTEJO
- ★ ALGARVE



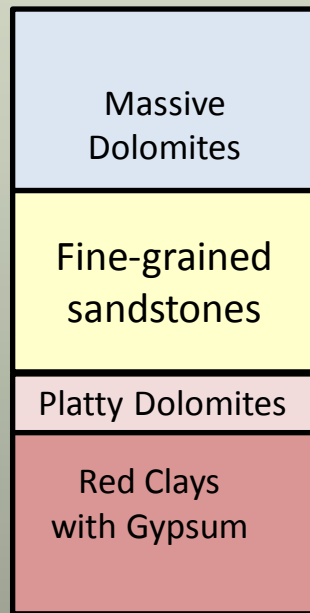
(adapt. MATIAS et al., 2011)

# STRATIGRAPHIC SIGNATURE OF CAMP-related MAGMATISM in WESTERN IBERIAN BASIN



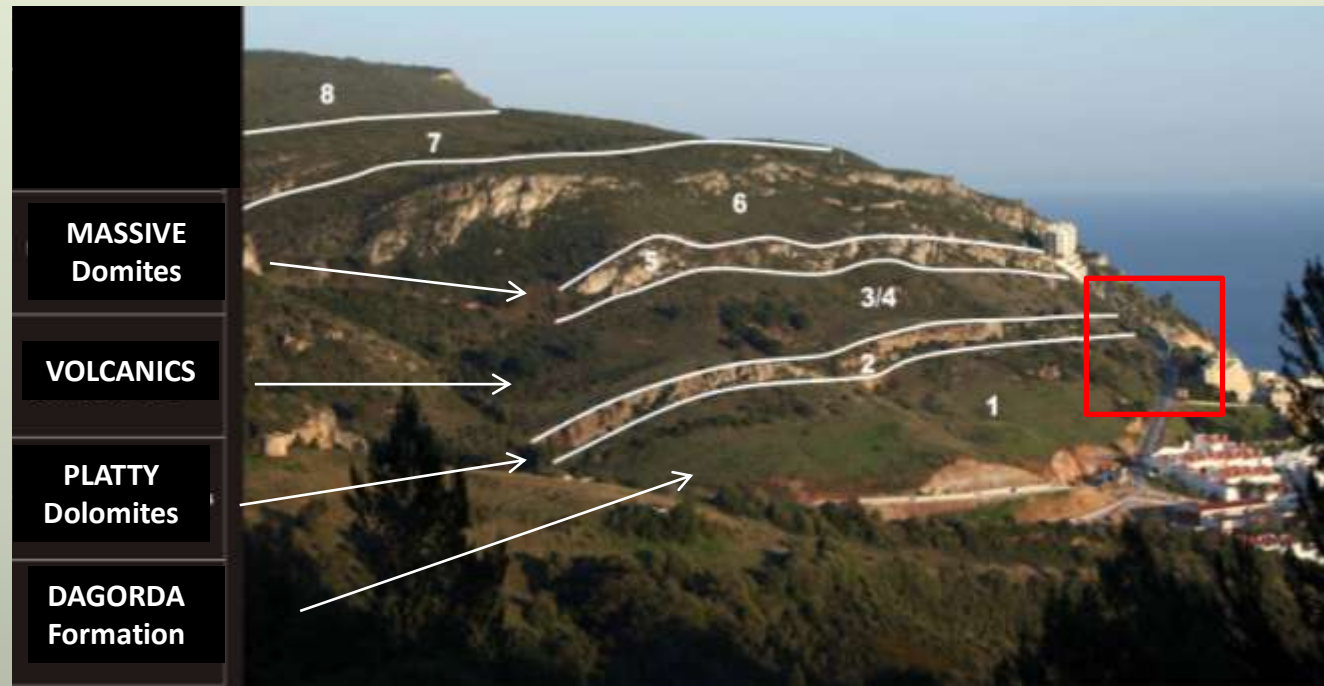
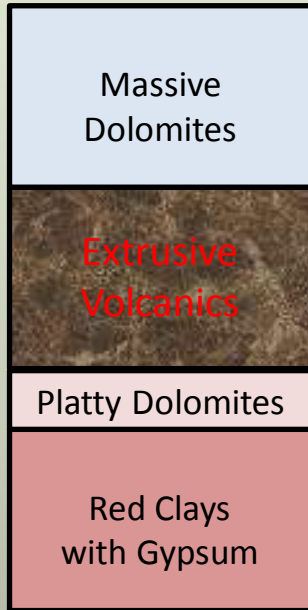
## LUSITANIAN BASIN

NO STRATIGRAPHIC RECORD of the CAMP-related magmatic event.  
Its position is occupied by thin coastal siliciclastics.

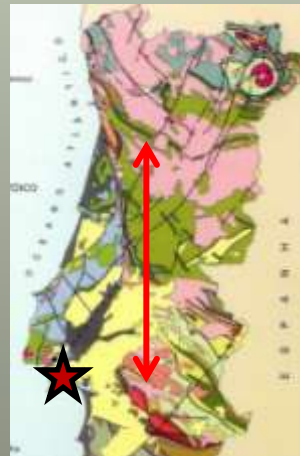


# LUSITANIAN BASIN

## Southern most sector

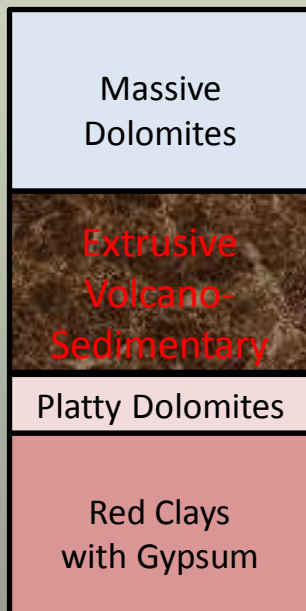


The Arrabida chain is the only place where the CAMP-related magmatism is recorded in the Lusitanian Basin, around 300 km long N-S



## ALENTEJO BASIN

CAMP-related volcanics include rare thin sedimentary clay intercalations



FATEOTA Fm

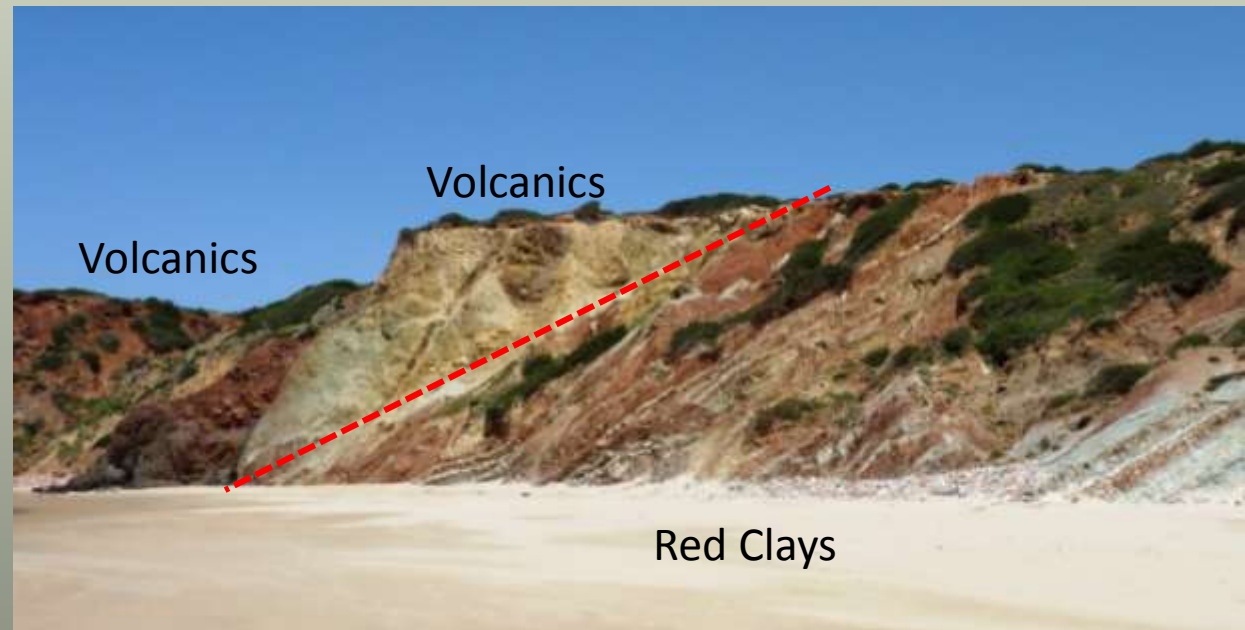
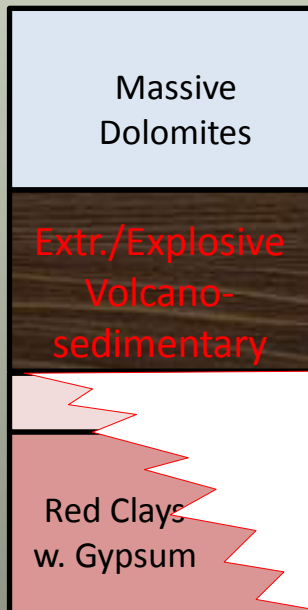
VOLC.SED.  
Complex  
(50 meters)

SILVES  
Carb.-Evap.  
Complex

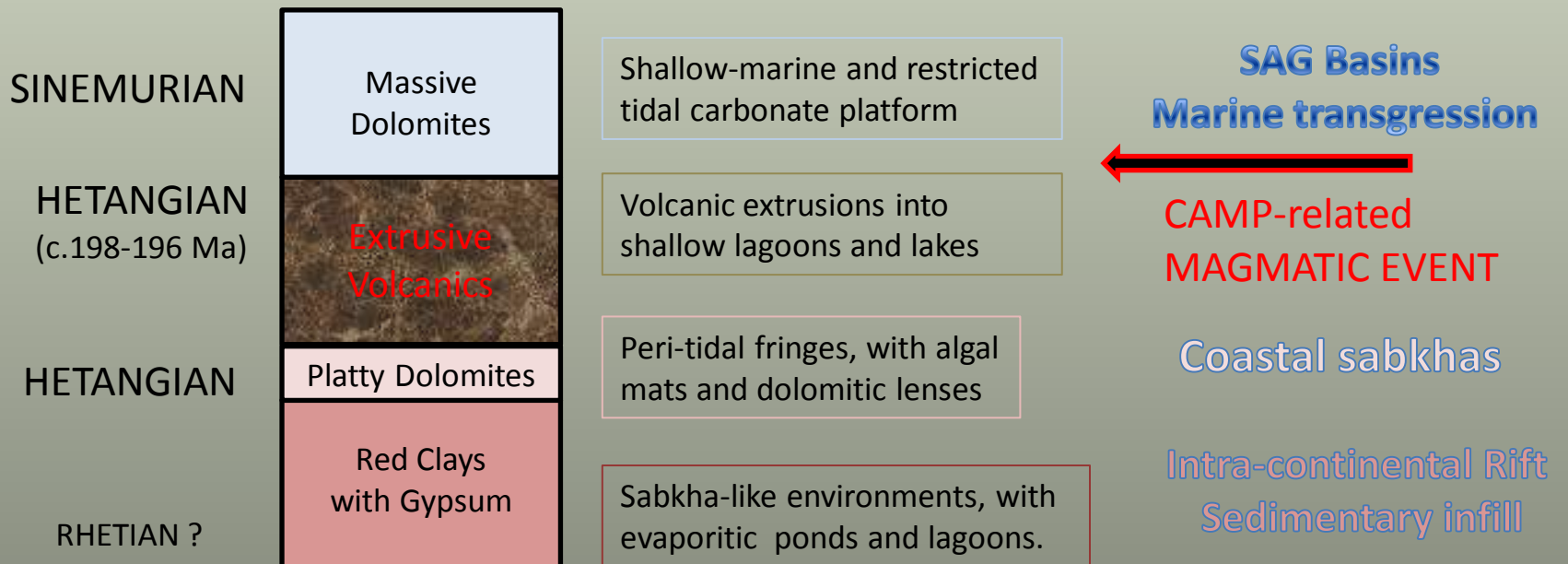
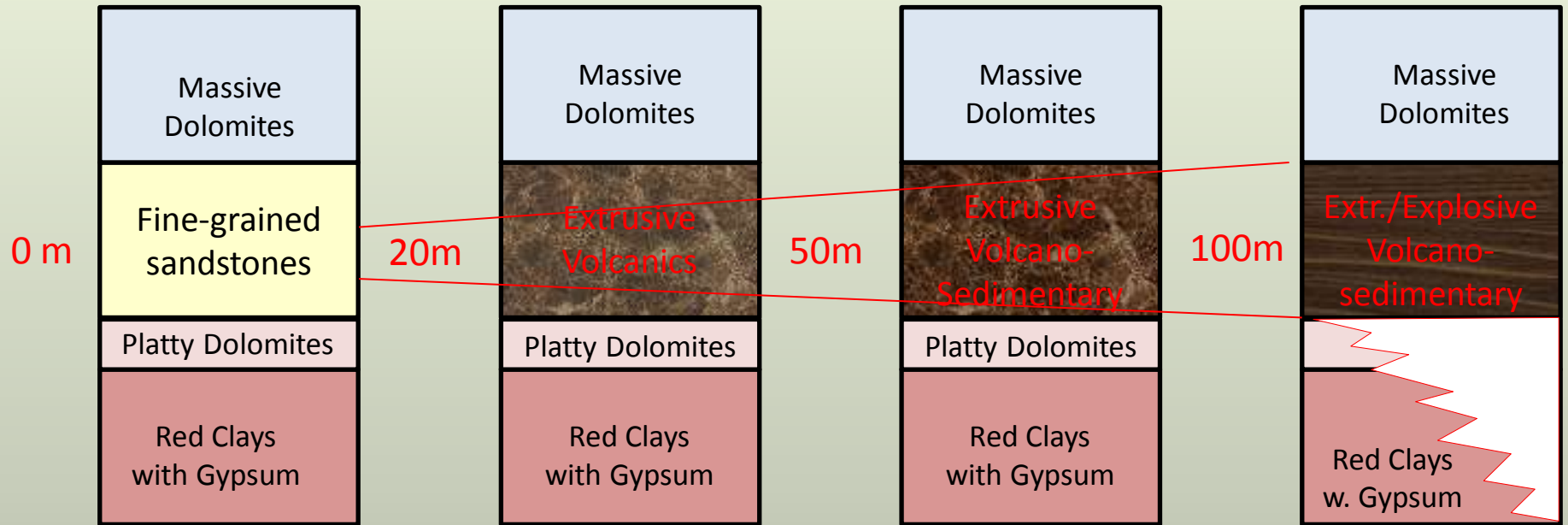
## W ALGARVE BASIN

The CAMP-related volcanics lie over an erosive surface, directly on Triassic red clays and sandstones or even Paleozoic shales.

This situation is interpreted as a result of the regional thermal intumescence and basin structures reactivation



# SYNTHESIS – the CAMP record in Western Iberian Basins



# CONCLUSIONS

1. The Western Iberian Basin records the northern boundary of a CAMP-related volcanic event.
2. This record increases in thickness and complexity towards South, where the main CAMP is developed.
3. At the Algarve Basin, deep erosive features (over 100 meters, reaching the Paleozoic basement) indicate that the CAMP-related event triggered an up-lift in the Southern Iberia.
4. This regional magmatic and geodynamic event marks the end of an Late Triassic intra-continental rifting (with siliciclastics and evaporites), and the beginning an Early Jurassic carbonate platform development (with dolomitic sedimentation).
5. Where CAMP-related event is absent (most of the Lusitanian Basin) this Early Jurassic shallow sedimentation would rapidly evolve towards a deep ramp with high-TOC marls, deepening to the NW.
6. This regional geometry could point to a relation between the absence of a CAMP record and the high potential of Sinemurian-Pliensbachian deposits as a source-rock.