

## **The upper Cretaceous palaeo-slope transition: an integrated calcareous nannofossil and microfacies approach (Ionian Islands, Preapulian Zone, Western Greece)**

Ioulietta Mikellidou<sup>1</sup>, Stefano Patruno<sup>2</sup>, Maria V. Triantaphyllou<sup>1</sup>, Fotini Pomoni-Papaioannou<sup>1</sup>

(1) Department of Geology and Geoenvironment, University of Athens, Panepistimiopolis 15784, Athens, Greece, julietmikellides@gmail.com

(2) Oranje-Nassau Energie, London, UK

The Ionian islands are situated on the west portion of the Hellenic Arc, part of the most active plate margins in the Mediterranean. The westerly-verging Hellenides fold-and-thrust belt in this area comprises the deformed Meso-Cenozoic basinal succession of the Ionian Zone, which thrusts over the time equivalent slope unit of the Preapulian Zone. The basal front of this tectonic contact outcrops along the eastern edges of Kefalonia and Zakynthos (Zante) islands.

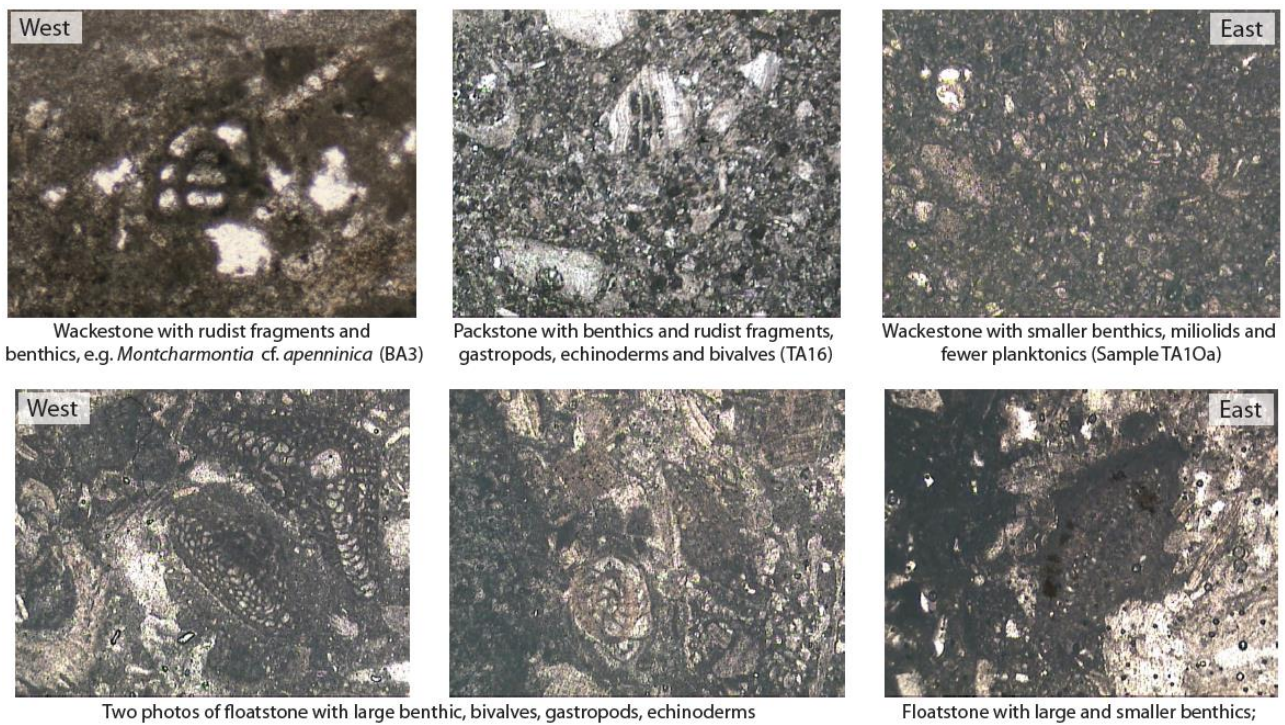
The palaeoenvironmental transition between the Late Cretaceous persistent carbonate platform ‘Apulian’ facies and the time-equivalent ‘Pre-Apulian’ facies is very close to the westernmost edge of the islands of Zakynthos (Zante) and Cephalonia (c.f., Bosellini, 2002; Karakitsios, 2013); however these islands are thought to be composed almost entirely of Pre-Apulian facies (with Ionian facies confined to the easternmost fringes of the island, in the hangingwall of the main overthrust).

We carried out a geological fieldwork in the islands of Zakynthos in 2012 and Cephalonia in 2015, with the aim to describe a rarely described near-continuous distal-to-proximal transition from a pelagic slope (eastwards) to a neritic platform (west). Our work focuses predominantly (albeit not exclusively) on the Cretaceous sections, with nannoflora analyses conducted for the first time. Also, Cretaceous microfacies are investigated to interpret the changes of palaeoenvironments from platform margin to distal slope. Stratigraphic sections were logged on the field, and a total of 267 samples were collected along 6 east-to-west transects for successive biostratigraphic analyses: 95 samples in Zakynthos and 172 samples in Cephalonia.

This study shows thin-bedded, ‘platform slope’ formations to the east of Zakynthos (Campanian-Maastrichtian), and thicker bedded, carbonate platform-like calcareous formations westwards (usually ?Cenomanian-Turonian). A palaeoenvironmental transition between the two facies was recognized, with a gradual general increase of proximality and ‘platform influence’ in slope facies towards the west (Fig. 1). The presence of gradually older rocks towards the east is explained by the consistent westerly monoclinial dip of the outcropping strata; a potential hiatus is present between the Campanian-Maastrichtian and the ?Cenomanian-Turonian packages. Presence of gradually shallower-marine and more proximal palaeo-facies towards the west are explained by the close vicinity of the edge of the Apulia platform. Accordi et al. (2014) argue that southern Zakynthos in the Late Cretaceous was characterized by a toe-of-slope sequence. Our analyses of the Agalas section (southern Zakynthos), however, point out to a more proximal depositional setting, becoming increasingly shallower to the west, where we recognized potential occurrences of in-situ neritic carbonates.

In Cephalonia similar palaeoenvironmental trends were also identified, with even clearer outcrops of inner carbonate platform facies identified to the west of the island, around Argostoli (hereby named “Argostoli Platform”). This is characterized by evidence of inner carbonate platform facies, including peritidal cycles and development of redded palaeosol layers encased between thick-bedded or massive fine-grained carbonate units. Arguably, the Argostoli Platform represents the easternmost edge of the Apulian platform, and these facies belong to the Apulian facies domain rather than to the transitional Preapulian ones. Elsewhere in Cephalonia, similar to Zakynthos, from west to east there is a transition between very proximal slope facies dominated by massive megabreccias with neritic clasts and distal slope to basinal facies on the eastern coast of the island (e.g., Agia Efimia location)

The biostratigraphic and microfacies analyses are still ongoing for the Cephalonia samples. The final aim of this study is to reconstruct the position of the Apulian platform edge in western Greece, which may have significant implications in oil exploration.



**Figure 1. Examples of typical Preapulian upper Cretaceous microfacies transitions from the east (distal slope) to the west (proximal slope) in the Island of Zakynthos. Agalas section (southern Zakynthos)**

## References

- Accordi et al, 2014. Microfacies analysis of deep-water breccia clasts: a tool for interpreting shallow v.s. deep-ramp Palaeogene sedimentation in Cephalonia and Zakynthos (Ionian Islands, Greece). *Facies*, Vol.60, Issue 2, 445 – 466
- Bosellini, A., 2002. Dinosaurs “re-write” the geodynamics of the eastern Mediterranean and the paleogeography of the Apulia Platform. *Earth-Science Reviews*, 59, 211– 234
- Danelian, T., Tsikos, H., et al., 2004. Global and regional palaeoceanographic changes as recorded in the mid-Cretaceous (Aptian–Albian) sequence of the Ionian zone (NW Greece). *Journal of the Geological Society, London*, 161, 703–709
- Etiopie, G., Papatheodorou, G., et al., 2006. Methane and hydrogen sulfide seepage in the northwest Peloponnesus petroliferous basin (Greece): Origin and geohazard. *AAPG Bulletin*, 90, no. 5, 701–713
- Karakitsios, V., 2003. Evolution and Petroleum Potential of the Ionian Basin (Northwest Greece). AAPG Search and Discovery Article #90017©2003 AAPG International Conference, Barcelona, Spain, September 21-24, 2003
- Karakitsios, V., and Rigakis, N., 2007. Evolution and Petroleum potential of Western Greece. *Journal of Petroleum Geology*, 30 (3), 197 – 218
- Karakitsios, V., Triantaphyllou, M. et al., 2010. Preliminary study of the slump structures of the Early Oligocene sediments of the Pre – Apullian zone (Antipaxos Island, North Western Greece). *Bulletin of the Geological society of Greece, Proceedings of the 12th International Conference Patras, 2010*
- Karakitsios, V., 2013. Western Greece and Ionian Sea – conventional and unconventional hydrocarbon potential. Presentation