# Paleoenvironmental changes in a Kimmeridgian platform (western France) revealed by calcareous nannoplankton and ascidian spicule variations

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The Kimmeridgian carbonate ramp environments of western France are characterized by limestone-marl alternations with abundant storm deposits. Different orders of cyclicities were recognized in these deposits, revealing a climatic control of the sedimentation linked to changes in orbital cycles. The aim of this work is to study the paleontological content of autochthonous marl-limestone deposits in order to reconstruct paleoenvironmental changes prevailing during the Kimmeridgian. The carbonate fraction was examined in the field and in thin sections for macro- and microfossils, and the fine carbonate fraction was studied in smear slides for calcareous nannofossils. Smear slides were prepared following the random settling method of Geisen *et al*. (1999) in order to calculate absolute abundance. The essential component of the carbonate fraction is mud. The coarse carbonate fraction, which is minor, is composed of benthic organisms (bivalves, echinoderms, agglutinated foraminifers and gastropods). Macro- and microfossils observed are ubiquitous organisms, and do not allow determination of precise paleoenvironmental conditions. The fine carbonate fraction is constituted of three types of calcareous nannofossils (ascidian spicules, coccoliths and schizospheres). Calcareous nannoplankton and ascidian spicules were counted separately. The ascidian spicules, which were attributed in a preceeding work to the genius *Didemnum* (Busson *et al*., 1996), are the dominant contributor. The total abundance of calcareous nannofossils (ascidian spicules and calcareous nannoplankton) is negatively correlated with the calcium carbonate content. However, in marls, ascidian spicules constituted the major part of the fine carbonate fraction. According to Brookfield (1988), ascidians are important members of shallow-water benthic communities. They are rarely described in ancient sediments, and in particular in the Mesozoic. Busson *et al*. (1996) considered that they may not have been recognized, or misinterpreted as calcareous nannofossils. A recent study has shown that ascidian spicule variations were linked to surface-water productivity, revealing the importance of this group in paleoceanographical reconstructions (Toledo *et al*., 2007).

Among the calcareous nannoplankton recognized in the Kimmeridgian limestone-marl alternations, the assemblages are dominated by the small placoliths of *Watznaueria* (in particular, small morhotypes of *W. britannica* described in Giraud *et al*., 2006) and *Cyclagelosphaera margerelii*. Schizospheres, when present, are characterized by small sizes (between 5 and 8 $\mu$m). The decrease through the Kimmeridgian in the *Watznaueria*/*Cyclagelosphaera* ratio suggests more proximal conditions, or progradation of the carbonate platform, in the Late Kimmerdigian, with respect to the Early Kimmerdigian. The variations of the nannofossil assemblages (calcareous nannoplankton) and benthic community (represented here by ascidians) through the Kimmeridgian are indicative of variable trophic levels, related to changes in climatic conditions.

## References

Busson, B., Noël, D., Monniot, F. & Cornée, A. 1996. Attribution de corpuscules calcaires observés dans des marnes du Jurassique supérieur à des spicules du genre *Didemnum* (Ascidie, Tunicier). *In*: F.G. Bourrouilh-le Jan (Ed.). *Carbonates intertropicaux. Mém. Soc. géol. France, n.s.*, **169**: 145-154.

Geisen, M., Bollmann, J., Herrle, J.O., Mutterlose, J. & Young, J.R. 1999. Calibration of the random settling technique for calculation of absolute abundances of calcareous nannoplankton. *Micropaleontology*, **45**: 123-138.

Giraud, F., Pittet, B., Mattioli, E. & Audouin, V. 2006. Paleoenvironmental controls on morphology and abundance of the coccolith *Watznaueria britannica* (Late Jurassic, southern Germany). *Mar. Micropaleontol*., **60**: 205-225.

Toledo, F.A.L., Cachão, M., Costa, K.B. & Pivel, M.A.G. 2007. Planktonic foraminifera, calcareous nannoplankton and ascidian variations during the last 25 kyr in the Southwestern Atlantic: A paleoproductivity signature? *Mar. Micropaleontol*., **64**: 67-79.