# Jurassic and Cretaceous evolution of Tethys: Palaeoceanographic events

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Jurassic and Cretaceous evolution of Tethys Ocean is characterized by extension of oceans basins, rifting, development of carbonate platforms and sea level fluctuations. Ocean basins and platform margins were sides of records of collaboration of oceanic, sea level and climate changes in different scales. Deposition of organic sediment increased on the margins of the ocean basins at certain time intervals due to changes in oceanic circulation and chemistry, productivity, climate and sea level. Oceanic Anoxic Events (OAE) stated to took place at aperiodic time intervals and generally associated with organic matter deposits and anoxic water columns. Records of oceanic anoxic event can also be associated by potential source rocks in Jurassic and Cretaceous along Tethys Ocean basins and can be tracked by stable isotope shifts, turnover of fossil groups, presence of black shales/organic rich mudstones, change in redox sensitive elements. Volcanic contribution in oceans is also considered as one of the collaborators of OAE generations. OAE records in Jurassic is seen in Toarcian interval and stated as Toarcian OAE. In Cretaceous, OAE records can be stated as Weissert, Faraoni, Selli (OAE1a), Noir, Fallot, Jacop, Kilian, Paquier (OAE1b), Leenhardt, Amadeus (OAE1c), Breistroffer (OAE1d), Bonarelli (OAE2), and OAE3. Generally, Cretaceous OAE are globally correlated or at least hemispherical. Some of them can be weakly correlated due to different duration and magnitude. Stratigraphic positions of OAE can also be used better marker levels in sequence stratigraphic interpretations. Therefore, positions of OAE are very important in terms of higher resolution for platform to basin correlations and even basin to basin. Cretaceous Oceanic Anoxic Events in eastern Tethys Ocean in Pontides and Taurides can be seen in Cretaceous successions (Mid-Barremian, Aptian, Albian, Cenomanian-Turonian) of Central Pontides (NW Turkey) and Central Taurides (S Turkey) (Yilmaz *et al*., 2004, 2010, 2012) as presence of black shales. The Mid-Barremian black shales (MBE) have been recorded within turbidite succession in deep marine setting in central Sakarya zone of Pontides following the drowning of the platform (Yilmaz *et al*., 2012). 2‰ shifts in carbon isotope curve is recorded in parallel with European basins, but with low TOC value. The Aptian black shales (OAE1a) are recorded in pelagic carbonate slope environments in central and north of Sakarya zone of Pontides and represented by a negative carbon isotope shift with 2‰, and TOC around 2% (Yilmaz *et al*., 2004; Hu *et al*., 2012). In Sakarya zone of Pontides, OAE2 is recorded in pelagic slope carbonates with carbon isotope curve more than 1‰ positive shift and >2% TOC. Another OAE2 was recorded in Antalya Nappes of Taurides without carbon isotope curve but TOC > 20% (Yurtsever *et al*., 2003, Bozcu *et al*., 2011). OAE1a equivalent in Tauride Carbonate platform can be interpreted as presence of dark colored thick stromatolite bearing platform carbonates transgressivley overlying the karstic sequence boundary. The OAE1a and OAE2 levels recorded in Turkey can easily be correlated with European examples and mainly controlled by sea level and tectonics in large-scale and climate and oceanographic changes in small-scale. The most extensive distribution of the OAE records in Turkey belong to OAE1a and OAE2, and display potential for source rocks for hydrocarbon exploration.

## References

Bozcu A., Baudin, F., Danelian, T., Vrielynck B., Bozcu M. & Poisson A., 2011. New evidence for the record of the Cenomanian–Turonian oceanic anoxic event (OAE2) in the Pamphylian basin (Akdoğan Section, Antalya Nappes, SW Turkey): Comparison with surrounding basinal settings. *Cretaceous Research*, 32(6): 823–832. https://doi.org/10.1016/j.cretres.2011.05.010.

Hu X., Zhao K., Yilmaz I.O. & Li Y., 2012. Stratigraphic transition and palaeoenvironmental changes from the Aptian oceanic anoxic event 1a (OAE1a) to the oceanic red bed 1 (ORB1) in the Yenicesihlar section, central Turkey. *Cretaceous Research*, 38: 40–51. https://doi.org/10.1016/j.cretres.2012.01.007.

Yilmaz I.O., Vennamann T., Altiner D. & Satir M., 2004. Stable isotope evidence for meter scale sea level changes in lower Cretaceous inner platform and pelagic carbonate sucessions of Turkey. *Geologica Carpathica*, 55(1): 19–36.

Yilmaz I.O., Altiner D., Tekin U.K., Tuysuz O., Ocakoglu F. & Acikalin S., 2010. Cenomanian–Turonian Oceanic Anoxic Event (OAE2) in the Sakarya Zone, northwestern Turkey: Sedimentological, cyclostratigraphic, and geochemical records. *Cretaceous Research*, 31: 207–226. https://doi.org/10.1016/j.cretres.2009.10.005.

Yilmaz I.O., Altiner D., Tekin U.K. & Ocakoglu F., 2012. The first record of the "Mid-Barremian" Oceanic Anoxic Event and the Late Hauterivian platform drowning of the Bilecik platform, Sakarya Zone, western Turkey. *Cretaceous Research*, 38: 16–39. https://doi.org/10.1016/j.cretres.2012.04.010.

Yurtsever T.S., Tekin U.K. & Demirel I.H., 2003. First evidence of the Cenomanian/Turonian boundary event (CTBE) in the Alakırçay Nappe of the Antalya Nappes, southwest Turkey. *Cretaceous Research*, 24(1): 41–53. https://doi.org/10.1016/S0195-6671(03)00021-1.


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