# Organic matter composition and thermal maturity assessment by the use of the Palynomorph Darkness Index method: a case study from the middle-upper Cenomanian OAE Black-Shales (Göynük-Sünnet section - NW Turkey).

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**Abstract**

A palynological study from the Upper Cretaceous Uzumlu Member of Yenipazar Formation (NW Turkey) of the Mudurnu-Goynuk Basin was yielded with the aim to assess the organic matter composition and to evaluate the thermal maturity. For this purpose, in the pelagic succession of the Göynük-Sünnet section (north-western Turkey) located in a rift basin along the Sakarya continental margin twenty-seven black shale levels of middle-upper Cenomanian age were sampled. Such levels intercalated with marly shale/calcareous marl rhythmic alternations and chronostratigraphically constrained to Cenomanian stage by the planktonic foraminifer *Rotalipora cushmani*, Additionally, the planktonic foraminifer *Wheitenella archeocretacea* was recorded across the Cenomanian-Turonian boundary (Yilmaz, 2008) allowing to associate these black shales to mid-Cenomanian Oceanic Anoxic Event and to the Bonarelli Event OAE2. The organic matter content analysed was mainly of continental origin showing abundance of oxidised and partially oxidised ligneous particles, pollen, spores and less frequent marine elements as dinoflagellates and acritarchs. To evaluate the thermal maturity of organic matter, optical semi-quantitative method as the Palynomorph Darkness Index (PDI; *Goodhue and Clayton, 2010*) was used. PDI was measured on smooth, unfolded trilete spores and bisaccate pollens and calibrated with other thermal index as the Spore Colour Index (SCI; Waples, 1985; Marshall, 1991). PDI value varies based on the taxon measures. Generally, trilete spore shows PDI values ranging from 13% to 34%. The SCI observations (SCI 3.2 to 4.2) also indicate that organic matter content experienced a very immature stage with conversion vitrinite reflectance values (Clayton, et al., 2017) below 0.40%. In this study for the first time Palynomorph Darkness Index has been calibrated on Upper Cretaceous deposits thus opening new scenarios to other types of studies as sedimentary basins thermal history assessment. Moreover, further studies are in

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progress to rigorously calibrate the microflora with foraminifera biozones as well as with the OAEs.

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