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Interactive comment on "Orbital control on the timing of oceanic anoxia in the Late Cretaceous" *by* S. J. Batenburg et al.

Anonymous Referee #2

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This study can be regarded as an extension of an earlier investigation on cyclicity and astrochronology of the same successions, published by Mitchell et al. 2008. This study includes a detailed C-isotope data set and it adds new radioisotope data. The results of this study are mostly in agreement with the earlier study. Additional information is gained on the mode of circulation during OAE2 and on the behaviour of the global carbon cycle before, during and after OAE2.

Carbon isotopes and carbon cycle:

Since the carbon isotope data are the most relevant new data in this study, the carbon isotope results deserve more in-depth discussion. The authors see an obliquity pattern in their data but they do not really discuss these data. In most Cretaceous data sets available from the literature, the obliquity pattern seems not preserved in C-isotope

records, in few others there is some evidence, especially in the amplification of the signal within longer cycles (see Laurin et al.: .... "net transfers between reservoirs are plausibly controlled by ∼1 Myr changes in the amplitude of axial obliquity"). The authors may add some comments on the obliquity – carbon residence time enigma in this study (see also Laurin et al. 2015). They may also discuss possible causes of the remarkable changes in the C-isotope pattern through time. The Turonian C-isotope curve is, across several long eccentricity cycles much more stable than the Cenomanian curve. The authors may also comment on possible reasons, why the C-isotope pattern remains quite noisy throughout two eccentricity cycles from 476m to 484 m.

Climate and oceanography:

It will be important to integrate new information on ocean chemistry, including new Nd-isotope data, into new ocean circulation models. It seems remarkable, that OAE 2 was characterised by a change in Tethys-Atlantic circulation, if Nd-isotope data are integrated into circulation reconstructions (e.g. Martin et al., 2012). An integration of geochemistry into improved circulation models will add value to this study which otherwise may be regarded just as a repetition of the Mitchell et al study. Carbon isotopes and oceanography (p.6): Relatively low values of δ13 C are be associated with stratification of the water column and reduced yearly integrated primary productivity (Sprovieri et al., 2013): » Do these peculiar water mass conditions in the western Tethys control the C-isotope composition of the global marine carbon pool, or do you suggest "global stratification"? Conversely, high δ13 C values likely do reflect good bottom water ventilation during eccentricity minima, with a prolonged avoidance of seasonal extremes, allowing for more stable primary productivity over the annual cycle which may have caused the increase in marine δ13C Âň see e.g. Nd-isotope work by e.g. Martin et al (2012) and others on deep-water formation during OAE 2.

Figures

Please, add a stratigraphy figure to the chapter “geological setting” and to the regional map. This is fundamental information for the reader

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