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Climate of the Past Discussions

Interactive comment on "Extreme warming, photic zone euxinia and sea level rise during the Paleocene/Eocene Thermal Maximum on the Gulf of Mexico Coastal Plain; connecting marginal marine biotic signals, nutrient cycling and ocean deoxygenation" *by* A. Sluijs et al.

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I would like to comment on the chronostratigraphy of the Tuscahoma Formation and the Bashi Marl Member of the Hatchetigbee Formation in Alabama and Mississippi. The writers identify a carbon isotope excursion (CIE) within the uppermost Tuscahoma Formation in the Harrell core from near Meridian, Mississippi and correlate it with the Paleocene-Eocene Thermal Maximum (PETM). This correlation is based pri-

marily on the biostratigraphic work on planktonic foraminifera by Mancini and Oliver (1981) and Mancini (1984) as well as studies on calcareous nannofossils by Gibson et al. (1982) and Siesser (1983). While the stratigraphic data in these studies can be taken at face value, the correlation of the Tuscahoma and Hatchetigbee Formations made by the writers must take into account the formal definition of the Paleocene-Eocene boundary as established in the Ypresian Global Stratotype Section and Point (GSSP) at Dababiya, Egypt (Aubry et al., 2007).

Mancini and Oliver (1981) described the planktonic foraminifera of the marl beds of the Tuscahoma Formation. They identified a diverse fauna of 16 species including *Acarinina soldadoensis, Pseudohastergerina wilcoxensis, Morozovella velascoensis*, and *M. occlusa*. Based on the planktonic foraminifera present, they correlated the Bear Creek Marl bed, the Greggs Landing Marl Member, and the Bells Landing Marl Member of the Tuscahoma Formation were with the Paleocene. This was based on the presence of the planktonic foraminiferan *Morozovella velascoensis* in the Tuscahoma assemblages. Mancini and Oliver (1981) correlated the Bashi Member of the Hatchetigbee Formation with the early Eocene based on the presence of *Morzovella subbotinae* in the absence of *M. velascoensis*. At the time Mancini and Oliver (1981) completed their study, the Highest Occurrence (HO) of *Morozovella velascoensis* was a conventional way to identify the base of the Eocene (Hardenbol and Berggren, 1978) and thus the highest stratigraphic occurrence of *M. velascoensis* was a reasonable criterion for identifying the top of the Paleocene Series in Alabama and Mississippi.

Nannofossil assemblages from the Tuscahoma were reported by Gibson et al. (1982) and Siesser (1983). Both listed *Discoaster multiradiatus* in the presence of the planktonic foraminiferan *Morozovella velascoensis* as the primary reason for assigning the Tuscahoma to the Paleocene. Additionally, Siesser recorded the presence of *Fasciculithus involutus* and *Discoaster mohleri* both of which he considered to be restricted to the Paleocene. Perch-Nielsen (1985) documented the range of *F. involutus* into the Eocene but *D. mohleri* is a Paleocene species. Siesser also reported *D. mohleri* from the Bashi Marl Member of the Hatchetigbee Formation so the possibility of re-working in the nannofossil assemblages of the Tuscahoma must be considered.

The establishment of the GSSP for the Ypresian at Dababiya, Egypt (Dupuis et al., 2003) established a formal definition for the Paleocene-Eocene boundary. The primary guide event for the Ypresian GSSP is the base of the Carbon Isotope Excursion (CIE) representing the initiation of the PETM. This is the CIE to which the writers are correlating the excursion in the Harrell Core. The problem with this correlation is indicated by the presence of the planktonic foraminiferan *Psuedohastergerina wilcoxensis* in the Dababiya section above the CIE (Berggren and Ouda, 2003). The Lowest Occurrence (LO) of *Pseudohastergerina wilcoxensis* is a globally recognized datum in the early Eocene (Wade et al., 2011). Mancini and Oliver recognized *P. wilcoxensis* in the lowest part (Bear Creek Marl bed) of the Tuscahoma and in both the Greggs Landing and Bells Landing Marl Members. The presence of *P. wilcoxensis* requires correlation of the Tuscahoma Formation with Eocene rocks above the CIE in the Dababiya GSSP. I have re-studied the Tuscahoma and Bashi samples used by Mancini and Oliver (1981) and confirmed the identification of *Pseudohastergerina wilcoxensis*. In these samples, *P. wilcoxensis* is abundant and well preserved.

The carbon isotope excusion that the writers have identified in the Harrell Core is interesting but it is stratigraphically above the PETM. The writers make a strong case that the Harrell Core CIE is older than Eocene Hyperthermal 2 of Lourens et al (2005) but based on correlation with the Dababiya section, it must also be younger than the PETM.

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