Referee #1

Dear Referee,

We very appreciate your helpful comments on our manuscript. We carefully revised our manuscript according to your comments. These comments help us to make our reconstruction more perfect and accurate. All detailed revision and response are as below.

Detailed comparison of paleoclimatic records between land and ocean is essential to evaluate the global paleoclimate pattern. This study constructed new data across the Cretaceous-Palaeogene boundary in the Nanxiong Basin (SE China). On the basis of previous paleomagnetic studies, authors provided a new interpretation of magnetostratigraphy, and found that patterns of paleoclimatic proxies (magnetic susceptibility and Neel temperature) from the studied profile are similar to the global d18O curves. Then they divided the results into three stages with distinct patterns. Overall, this study is interesting because it provides new results from the terrestrial media and thus has global paleoclimatic significances. However, the following two issues need further clarifications:

1) The fidelity of the magnetostratigraphy Authors provided an new interpretation in section 4.1. This new interpretation is the foundation of the whole story. From lines 302-309, there are still presence of ambiguities even for the new interpretation. Therefore, more subtle discussions on the magnetostratigraphy are still needed.

Response: The new chronological framework was constrainted by two established ages, one is radiometric age and another is palaeontological age (see section 4.1). We add more subtle discussions on the magnetostratigraphy: Although the calculated boundary age of the Zhenshui and Zhutian Formations is ~71.5 Ma according to the new age model, that is slightly differ from the biostratigraphic age (~72.1Ma, i.e. the boundary age between Maastrichtian and Campanian), the reasons probably are 1) the samples for biostratigraphic age were collected from the whole Zhutian Formation that is more than 1000m in depth, while the Zhutian Formation in Datang Profile is just the top part of the whole Zhutian Formation (Fig.1), and 2) the dereferences in sampling or time resolution between these two dating methods; therefore, it is reasonable to cause a little error between palaeomagnetic and biostratigraphic ages. If 72.1Ma (within C32N.2n) was regarded as the boundary age of the Zhenshui and Zhutian Formations，then 30R (0.173 Ma), 31N (0.9 Ma), 31R (2.18Ma) and 32N.1n (0.24Ma) were missing due to the covered farmland, and thus only 45.2m sediments deposited during more than 3.4Ma, which seems unreasonable to have such a low sedimentary rate in this period.

2) Magnetic susceptibility is a complicated proxy. Authors need more discussions on the exact variation mechanism for susceptibility. It seems that hematite is the dominant magnetic minerals, it will be more direct to measure hematite-related proxies, e.g., HIRM, DRS results, etc.

Response: 1) We add more discussions on the variation mechanism for susceptibility that probably related to the paleomonsoon: Hasegawa et al., (2012) found that the subtropical high-pressure belt was located between ca. 31 °N and 37 °N during the Late Cretaceous based on spatio-temporal changes in the latitudinal distribution of deserts in the Asian interior, thus the Nanxiong Basin (~20 °N, Scotese, 2014) was out of the area covered by subtropical high-pressure belt. Besides, computer simulation results revealed that the prevailing wind directions showed a remarkable seasonal variation over East Asia at 66Ma, which indicates a monsoon feature over East Asia at that time (Chen et al., 2013), and even more remarkable compared to the present day, this was supported by the geological evidences (Jiang et al., 2008), rainfall also showed a seasonal variation between dry and wet seasons corresponding to the monsoon (Chen et al., 2013). In addition, the root traces in Zhenshui Formation consisting of elongate gray mottles with red or purple hypocoatings (Fig. 7E) indicate a relatively well-drained soil condition (Krous et al., 2006), which is favourite for the formation and preservation of haematite. Therefore, the monsoon system already existed and the rainfall also showed seasonal variation across the Cretaceous–Palaeogene boundary, but the climate was more hotter and drier than present, so a great deal of haematite generated during pedogenic processes under well-drained condition, and thus recorded the global climate evolutions.

2) HIRM has been shown in section 3.3 and Fig. 4 already.

3) We add DRS results in the revised manuscript as below:

The DRS technique provides a quantitative method to determine the haematite and goethite, which has been successfully used in marine deposits (Balsamand Deaton, 1991) and loess sections from the Chinese Loess Plateau (Ji et al., 2001; Balsam et al., 2004; Torrent et al., 2007). The peaks of the bands at 575 nm and 435/535 nm in the first derivative spectral (FDV) patterns are interpreted as haematite and goethite, respectively. However, the clay minerals (such as Chlorite and Illite) also show peaks at 435nm (Ji et al., 2006). In Fig.2, all curves show significant peak at ~575 nm, indicating the existence of haematite. Besides, there are small peaks at ~440nm which maybe related to goethite or clay minerals. However, the ~440nm peaks are still exist even after 200℃heated for 2 hours (Fig. 2B). Goethite will be transformed to haematite under 200℃ (Ma et al., 2013), so the ~440nm peaks probably related to the clay minerals but not goethite.

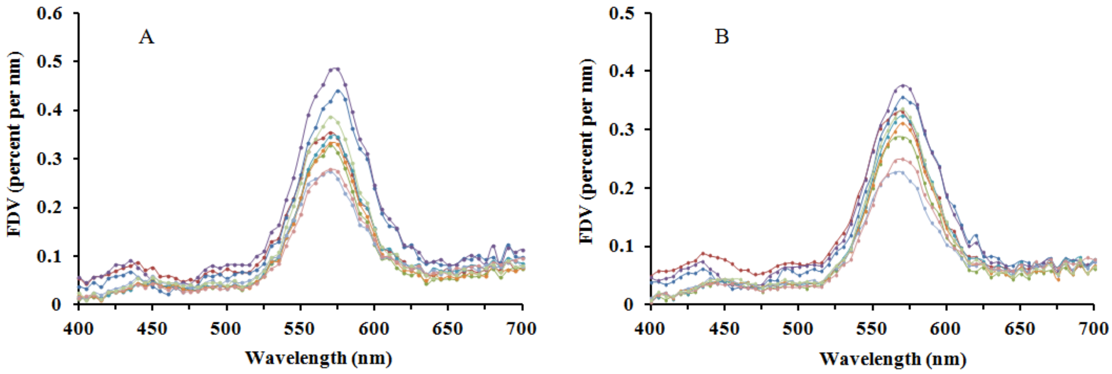

Fig.2 First-derivative curves of pilot samples before (A) and after 200℃ heated (B). After 200℃ heated, the presence of first-derivative peaks are similar with before heated. All curves show significant peak at ~575 nm, indicating the existence of haematite.