Answer to N. Kallel (Referee)

We thank N. Kallel for his appreciation of our work and for his valuable comments, that help us improving the quality of the manuscript. We follow his recommendations by modifying the text in order to complete the discussion and to clarify some points in the revised version of the manuscript.

Remark#1

A weak point of the paper is in the discussion that does not address the interaction between climate and depositional environments of clay and other minerals. For example the Palygorskite is neoformed today in salty and confined environments in southern Tunisia.

We agree with this comment, and precisions concerning the interaction between climate and depositional environments of clays were added in the text:

Page 2931, line 19 - Palygorskite is typical of arid and sub-arid environments from the Mediterranean characterized by chemically restricted conditions (Singer and Galan, 1984; Chamley, 1989). In these Mg-rich environments, alternating moist and drought periods promotes chemical concentration and favours the authigenic formation of palygorskite when evaporitic conditions prevailed (Singer and Galan, 1984). Saharan dust-blown particles contain palygorskite reworked from Neogene North African deposits, in addition to present-day neoformed palygorskite (e.g. Chamley, 1989; Coudé-Gaussen et al., 1982; Molinaroli, 1996, Regaya, 1984; 1992; Elloy and Thomas, 1981). The observed changes in clay mineralogy are rather abrupt, and are thus considered to primarily reflect varying terrigenous provenance/transportation patterns, because alteration/weathering processes are often slow (Thiry, 2000). But interaction between climate (rainfall/temperature) and the neoformation of clays has to be taken in account, because these processes are quite rapid in such evaporitic environments. However, an overview of the main sources of palygorskite related to their geological ages suggests that ancient formations constitute the main source of palygorskite, even if contribution from present-day neoformed palygorskite may be locally of importance (Verrecchia and Le Coustumer, 1996).

Remark#2

The disappearance of this mineral during the Holocene wet period is not surprising. So I do not agree with the authors that use the absence of palygorskite in the sediment during the last sapropel as an indicator of distant origin of the smectite.

We agree that this part of the text may be confusing. In order to clarify the discussion, we modified the discussion as follow:

Page 2938, line 20 - The enhanced supply of smectite may also be eolian, originating from Tunisian loesses, which are characterized by their high content in smectite and palygorskite (Fig.1) (e.g. Bout-Roumazeilles et al., 2007). However, smectite and palygorskite display opposite variations during the sapropel, suggesting that they are not reworked from the same geological formation.

Remark#3

The studied core presents also a record of the surface water oxygen isotope composition (directly linked to salinity, Essallami et al., 2007). This record indicates precisely the timing of the last wet period in the Central Mediterranean Sea. It would be interesting to add this record to the figures and to integrate it in the discussion.

We totally agree with the referee about the pertinence of using the salinity record. We added this record on Figs. 3 and 5d, and modified their legends accordingly. We now use the oxygen and carbon isotope record and the $\Delta\delta_w$ record (Essallami et al., 2007) to constrain the water masses hydrological properties and the salinity decrease associated with the sapropel event in the studied core, and to support the proposed interpretation.

Page 2927, line 13 - We compare our data with previously published $\delta^{18}O$ and $\delta^{13}C$ records and with the reconstructed salinity ($\Delta\delta_w$) from core MD04-2797 (Essallami et al., 2007). These data will help constraining the hydrologic properties of the overlying water masses and evidencing alterations of freshwater input/evaporation budget in the Central Mediterranean. The reliability of the $\Delta\delta_w$ reconstruction is high when sea-surface temperature (SST) changes are small (Essallami et al., 2007).

Page 2935, line 18- Salinity is low during the YD in central Mediterranean (Fig. 3), as during cold events – H1-, suggesting enhanced contribution of less saline waters originating from the Atlantic Ocean (Essallami et al., 2007).

Page 2937, line 10 - The $\Delta\delta_w$ signal shows a decrease between 9 and 6.5 ka BP including the deposition of sapropel S1 (Fig. 5d).

References

Elloy, R., and Thomas, G.: Dynamique de la génèse des croutes calcaires (calcretes) développées sur séries rouges pléistocènes en Algérie N. Occ., Contexte géomorphologique et climatique, Pétrographie et géochimie, Bull. Centre Rech. Explo.-Prod. Elf-Aquitaine, 5, 53-112, 1981.

Regaya, K.: Les accumulations calcaires dans les limons de Matmata de la region de Gabès en Tunisie, B. Soc. Geol. Fr., 37, 387-398, 1984.

Regaya, K.: Les croutes calcaires de Tunisie orientale aux environs de Sousse, Signification climatique et historique, B. Soc. Geol. Fr., 45, 99-107, 1992.

Thiry, M. : Paleoclimatic interpretation of clay minerals in marine deposits: an outlook from the continental origin, Earth Sci. Rev., 49, 201–221, 2000.

Verrecchia, E.P., and Le Coustumer, M.-N.: Occurrence and genesis of palygorskite and associated clay minerals in a Pleistocene calcrete complex, Sde Boqer, Negev Desert, Israel, Clay Min., 31, 183-202, 1996.