

## ***Interactive comment on “Paleohydrological changes over the last 50 ky in the central Gulf of Cadiz: Complex forcing mechanisms mixing multi-scale processes” by A. Penaud et al.***

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This paper presents a new high resolution dinoflagellate cyst record from the bay of Cadiz, covering the last 50 ka, with an emphasis on the Marine Isotopic Stage 3 and interstadials. The variations in dinocyst assemblages are explained as a complex interaction between orbital forcing (precession and obliquity) as well as land-ocean interactions. Overall, this study should be published as it highlights the complex answer of the ocean to environmental changes but the text would need some moderate revisions as it is not always well expressed or structured. Given that Reviewer#1 has highlighted mistakes that I have seen, my review is focused on some other aspects. Lines 47-51: This introductory sentence gives the wrong information as it leads the

C1

reader to assume that this paper is about CO<sub>2</sub> sequestration, but that is not the case. You may want to start to talk about marine regions in the world where productivity is at its highest (shelves, upwelling cells, river mouths, etc) and how they play an important role as a carbon sink. Restructure your introduction to be clearer where you are going. Line 64: include sea-ice cover duration Line 70: This sentence could be better structured, please rephrase such as: “The central Gulf of Cadiz is a place of low present-day marine productivity, with a moderate responsibility for CO<sub>2</sub> storage (REF). However, it may not have been the case in the past with the potential migration of proximal productive centres (e.g. Portugal and Moroccan upwellings) through time . . . . In fact, it was demonstrated that productivity changes in this region involve. . . Our study aims to explore how these changes may have impacted dinoflagellates, here viewed as an. . . Line 93: replace focussed with located Lines 109-110. Give values of Chlor. and PP if possible. Line 143: Start with: “Core MD99-2339 (35.89°N; 7.53°W; 1170m water depth; 18.54m length; Figure 1), was recovered from a contouritic field (Habgood et al., 2003) by the R/V Marion Dufresne during the 1999 International Marine Global Change Studies V 146 (IMAGES V-GINNA) cruise (Labeyrie et al, 2003). Either Ky or Ka but not both Line 156: six instead of 6 Line 167: delete dinocyst, as already mentioned earlier in the text Lines: 169-171. Rephrase as suggested: 161 samples were analysed for their dinocyst content (every 10 cm in average, representing a sample resolution of around 300 years [ $\sigma=210$ ]) for the whole MD99-2339 core, using an Olympus BX50 microscope at 400X magnification (75 slides from 0 to 740 cm / 0 to 27 ka BP: Penaud et al., 2011a; 86 slides from 750 to 1844 cm / 27 to 49 ka BP: this study). Line 176: cold HCl (10%) and cold HF (??%) Line 180: following the taxonomy in Fensome and Williams (2004) and Fensome et al. (2008). Percentages were calculated based on a total dinocyst sum that excludes reworked . . . Lines 206-209: rephrase as suggested: A qualitative thermic index “Warm/Cold” (W/C) that has previously been used (Turon and Londeix, 1988; Versteegh, 1994; Combourieu-Nebout et al., 1999; Eynaud et al., 2016) to qualitatively address SST change issues, was calculated for core MD99-2339 (cf. Table 1). Line 218: Protoperidinium in italics Lines 221-22: correct Heterotroph-

C2

ics/Autotrophics Line 226: Suggested rephrasing: Quantifying taxonomical diversity in study samples was carried out through a variety of statistical analyses using "Past version 1.75b" software (Hammer et al., 2001); most of these indices being explained in. . . Line 241: replace 5 with five. You may want to explain this number, rather than 10 or less. Line 244. Give a source for the modern-day sea-surface conditions. Lines 250-251: Consider rephrasing: A total of 40 taxa was identified, with an average diversity of 20 main species. Your diversity does not decrease, in fact, there is a slight increase from bottom to top. Line 256: suggestion: "thus probably indicating enhanced fluvial inflows" Lines 261-265: I sort of understand what you mean but it is not well expressed. Suggestion: "Large increase of monospecific assemblages (when dominance is close to 1) will. . ." Lines 266-273: suggestion: Concentrations are generally low, with the exception of two large maxima, one centered around GIS 12 (. . .) and another one around ~ GIS8. Line 280: *L. machaerophorum* is considered as mixotrophic, can you please explore this a bit further? Line 364: Not sure that you can cite a paper in preparation. May be Pers. Comm. Would be more suitable. Correct spelling of Sanchez-Goni Line 449: replace "deduced" with "suggested" Line 450: replace "and" with "as well as" Line 451: occurrences of the thermophilic. . . Line 452: replace "attest of" with "indicate". Suggestion: warmer surface conditions at a time when bottom MOW velocity was reduced. Line 455: suggestion: peculiar and unique when comparing to other GIs in the core. These two intervals Line 460: you mean figure 8? Line 471: replace "attest" with "suggest extremely" Line 482: replace "are obviously related" with "seem to be related" Line 503: At the onset of the Holocene, . . . Line 532: correct "contributes" Conclusion: It is a bit weak. Your first sentence should refocus on the hypothesis from the introduction, i.e. change of primary productivity recorded by the dinocysts. The rest is a bit weak, more like a summary than a conclusion. Line 955: add a after 2009

Some references in the list are not in the right chronological order (Ambar et Howe, 1979; Bar-Matthews et al., 2000 Give all authors' names for Barker et al. 2009; Magny et al., 2013; Rogerson et al, 2010 Some references in the list are not in the text (Dale and Fjellsa. 1994, Dale et al 1999, Daniau et al 2007; de Vernal et al 1994 ; Devillers

C3

and de vernal 2000 ; Ellegaard, 2000 ; Eynaud, 1999 ; Eynaud et al 2004 ; Fiuza et al 1998 ; Harland, 1983 ; McMinn, 1991; Mertens et al., 2009b ; Morzadec-Kerfourn et al., 1990 ; Nehring, 1994 ; Persson et al 2000 ; Sanchez-Goni et al., 2008 , 2009 ; Sprangers et al 2004 ; Vink et al 2000 ; Waelbroeck et al 2002 ; Wall and Dale 1973 References not in the list: Fatela and Taborda, 2002 Gasse, 2000 Guiot and de Vernal, 2007 Radi and de Vernal, 2008

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C4