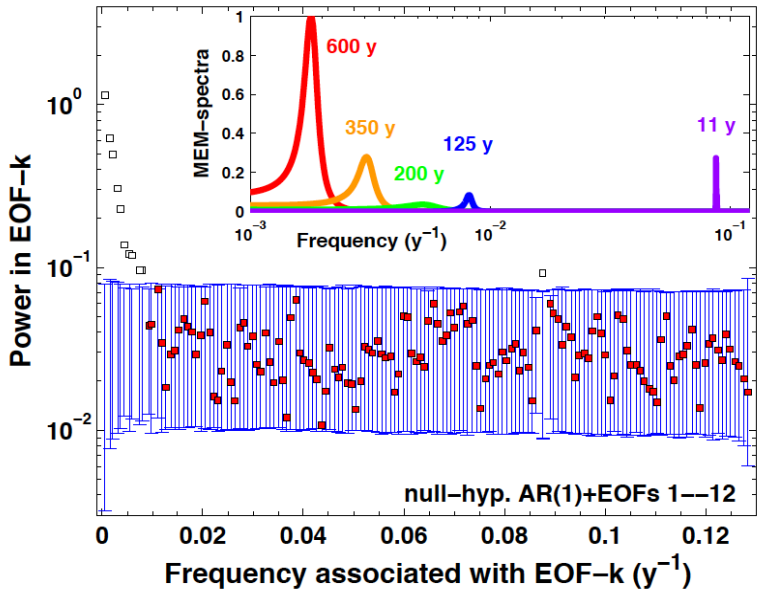
Reply to Comment of Prof. M. Ghil

We are grateful to Prof. Ghil for the careful reading of our paper and for the detailed comments.
We have taken into account his suggestions and modified the text accordingly (the second major comment and all minor comments).

***1.*** *"The number of measured points has been increased from N = 560 to N = 694; this small increase in number of points vs. length of record is clearly due to the loss of information as one goes back in time, even though the sedimentation rate is claimed to be constant (mainly by identifying pyroxene peaks due to Campanian eruptions). But already at 560 points and 2000 yr, this only gives - at Delta t = 3.87 yr, and with ~11 yr/4 yr - roughly 3 points per 11-yr cycle. Given the even lower resolution of the 700 yr added, I would not claim much about the confirmation of the 11-yr cycle in the extended record. Please remove these claims and associated portions of figures."*

With regard to the first major comment, we would like to remark that for the 134 new added points we have no reasons to deem that the time resolution has changed so that the extended part of the series covers a time interval of about 500 years (and not 700 years, as understood by the Referee).
Regarding the comment about the 11 years cycle, which we detected at high confidence level (99%) both in the shorter series and in the prolonged one, its period is not too close to the Nyquist period (7.7 years), as shown in Fig.4 of *Taricco et al., Climate of the Past, 2009, reported* below.




Moreover the amplitude of this cycle during the newly added portion of the record is not damped, but it is comparable with that detected in the shorter record.
We deem that this high-frequency cycle is real not only for the previously mentioned reasons but mainly because the experimental procedure rules out the issue of frequency aliasing. Indeed the discretization of our series is not related to a punctual sampling of a continuous signal, but it derives from the measurement of consecutive sediment slices performed after mixing the material contained in each slice. This mixing cancels out any possible frequencies

higher than the Nyquist frequency, thus acting as a low-pass filter, wich avoids the frequency aliasing.

***2.*** *“EOFs do not "explain" anything, although statisticians often use such terminology to accompany fractions of variance; they only "capture" or "describe" parts of the variance. Only theory or modeling - physical, chemical, biological - explain. Please modify the language of the text accordingly.”*

Done.

***“Pretty minor and truly minor.*** *The paper is clear and well written, the references are plentiful and mostly correct. Here are just a couple of items I’d suggest fixing. 1. Jim Kennett used to write his name with two t’s; please fix the citation in the text and the reference "Shackleton & Kennett" accordingly. 2. Page 4066 contains the important argument about the change in salinity. Its being just one single, long paragraph doesn’t help following the train of thought. Please break the page up into 3 or 4 paragraphs to clarify and help understanding. 3. p. 4061, l. 4: "each sample" - sing., not pl. 4. p. 4065, l. 11: "which not only confirms" - not "what" 5. Table 1 is barely legible. Please change to landscape format, on two pages, if necessary. 6. Please state clearly, the first time you refer to a "bicentennial oscillation" - either in the text or in a figure caption - that you mean the 170-yr one.”*

Done.