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Solid Earth Discussions

Interactive comment on "Ammonoid multi-extinction crises during the Late Pliensbachian – Toarcian and carbon cycle instabilities" *by* J. Guex et al.

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General comments about the review We will start that response by making clear which of the results presented in our paper are entirely new: 1) first Toarcian ammonite sequence discovered in Peru 2) first Toarcian d13C curve studied in Peru 3) first revised biochronological ammonite correlation between Pacific and Europe, explaining several false age assignments in the literature. 4) first discussion about the outstanding usefulness of the appearance of atavistic ammonites in the large scale zonal correlations during periods of major ecological unstability. 5) Our work is also one of the few where a strong correlation between biodiversity and d13C record is clarly demonstrated (see

also Guex et al 2012: Palaeo 3) The Pliensbachian Toarcian history is highly complex from many point of views: Evolutionary crises related to major ecological disturbances, climatic changes from ice-house to super-greenhouse, eustatic sea-level changes, probable relationships between these events and the Karoo magmatism. In the original version of our paper, we try to illustrate these imbricated historical pattern by referring to them in a somehow intricated way. This induced some confusion to the reviewer and we managed to restructure the text to avoid that problem. Referee 2 suggests that the part " concerning ammonite morphology and environmental stress (. . ...) could be shortened and gathered to the previous discussion between carbon cycle disturbances and diversity: we have adopted that solution in our revised version of the manuscript". It should be recalled that the general patterns of the Toarcian ammonite evolutionary history is of outstanding importance in the large scale correlations. In particular, the fact that there is an inverse correlation between intra-specific variability (polymorphism) and biodiversity during the crisis episodes is of high importance from a biochronological point of view and not only from a paleontological one. It should also be stressed that we proceded to a new correlation between the Toarcian of the Pacific Realm and the classical NW European ammonite zonation. Our new curve is correlated to the ammonite zonations thanks to totally new biostratigraphical data: the ammonites discovered in the Palquilla section are found for the first time in Peru. It is thanks to these new precise ammonite data that we can be certain of the ages of the different negative trends observed in the d13C curve. In general, the absence of biochronological control over an isotope curve leads to false age assignments (see below: the case of the "chaotic" carbon excursions near the Triassic Jurassic boundary). Reviewer 2, quoting the Triassic Jurassic boundary events, suggests that we use Whiteside and Ward paper to discuss the chaotic distribution of the carbon excursions. In fact he overlooked the fact that, in this paper, the authors confused the uppermost Hettangian positive carbon shift with the one characterizing the lowermost Hettangian : this is due to miscorrelation of the ammonite data (see Guex et al 2010 EGU-abstract and Bartolini et al 2012 in G3) and makes impossible any discussion on

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the origin of these carbon anomalies. Reviewer 2 also states that atavistic ammonites can appear anywhere in the stratigraphic column: we defy him to give a single example of this during the intervals that we have studied. Atavistic forms, always make their first appearance during stress episodes and they can survive for a very long time after their appearance (see the paleontological references of Guex given in our paper). Of course it is always possible to find papers where there is a confusion between local first occurrence and true first evolutionary appearance.

Interactive comment on Solid Earth Discuss., 4, 1205, 2012.

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