

Interactive comment on “Persistent decadal-scale rainfall variability in the tropical South Pacific Convergence Zone through the past six centuries” by C. R. Maupin et al.

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Comments by Thierry Corrège

General comments

Maupin et al. present an interesting new stalagmite record from the Solomon Islands, just below the influence of the SPCZ. Given the paucity of instrumental data in the Pacific Ocean, such long and well-constrained paleo-records are essential to gain a better understanding of climatological variability in this region. Speleothems are being increasingly used to provide records of past rainfall, and the present work has the potential to become a benchmark for the tropical Pacific. The question of the SPCZ

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behaviour in the past millennium and in the future is a crucial one for Pacific islanders, and is therefore of interest to a wide community. The paper is clearly written and well illustrated although a few changes are necessary to make it acceptable for publication in *Climate of the Past*. The most disturbing fact is that no comparison is made with the speleothem record from Vanuatu published three months ago in *Geology* by the same authors. The two records look quite similar, and the Vanuatu record should be discussed.

Specific comments

I do not like the title of section 1.1. “Significance” is not a very punchy term, and I think terms like “need” or “relevance” would be more appropriate 5595 line 10: it is not clear why the emphasis is put on sunspot numbers in this paragraph. Important references are also missing, particularly references dealing with modelling work. The Cai et al. paper in *Nature* (2012) is a good example. The authors know this article because it is cited in the Partin et al. *Geology* paper. 5596 line 20: ...the broader tropical SPCZ domain: are you referring to the box on figure 1? This box is probably not well chosen anyway. Given the high spatial resolution of the dataset ($0.25^\circ \times 0.25^\circ$), you could have selected an inclined box encompassing the SPCZ. 5597 line 4-5: the Cai et al. *Nature* 2012 reference would be useful here to discuss the long term displacement of the SPCZ towards the Equator. 5597 line 15: Not everyone is familiar with CE, define it when first used. 5597 last two sentences: I agree but, as you discuss later in the ms, the wavelet analysis does not really allow you to spot changes due to global warming. 5598 chapter 2.1: You should give the length of both speleothems 5598 line 23: “...milled from the stalagmite...”: which one, you collected two 5598 line 25: delete “the” 5599 lines 20-21: you talk about knots, but they are not visible on figure 3. 5600 lines 4-24: you describe the replication work, and mention the Hendy test, but where is this shown? 5603 line 24: “...record is decadal in nature (12 to 62 yr)”: should be “decadal to multidecadal” 5604-5605: the last paragraph needs additional modelling references because global warming may also affect the record

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(e.g. Cai et al. 2012 and others) 5605 chapter 3.3: I think the authors do not treat this part properly. They find a 11 yr cycle in their record. Sometimes, it fits the solar cycle very well, sometimes it doesn't. So their conclusion is that the speleothem 11 yr cycle is due to internal forcing of the ocean-atmosphere system. This could be true, but I think an alternative explanation can be put forward. The authors never mention the effect of volcanic eruption, although it is well-known that they will affect the climate and also cloud nucleation. It is for example quite striking to see that the in-phase relationship between the speleothem and the solar records breaks down at about the time of the Krakatoa eruption (figure 8, around 1883), to reappear after a few decades. Thus, there is the potential for volcanic eruptions to momentarily disrupt the solar-precipitation relationship (another kind of a "perturbed oscillator"), and this should be discussed in the text. 5606 chapter 3.4: Figure 9 you be cited in the text 5606 line 24: "Coral-based reconstructions of SSS and SST. . .": where? Under the spcz? 5606 line 25: Clement, Deser and Dong do not contain any coral data, these references are not appropriate. And it should be noted that some coral records from under the SPCZ do not show obvious decadal variability (Lebec et al., GRL 2000 or Juillet-Leclerc et al., GRL 2006 for example). 5607 first sentence of chapter 4: Some models predict a more zonal SPCZ with global warming, so the increase of rain within the SPCZ might be displaced towards the Equator. 5608 lines9-18: this paragraph is misplaced and should be deleted Comments on figures: Figure 1: I am not sure part c is needed. I am not an expert on statistics, but since part b is the spatial correlation between one point and the rest of the map, it seems that what is shown in part c is just the same as part b seen with a different parameter. Indeed, low values of p seem to correlate perfectly with high values of r. Figure 1: In the caption of part b what do you mean by "rainfall anomalies in the southwestern Pacific"? Is it in the box, or is it a wider area (if so, define it). Figure 2: Some paths seem parallel to the growth lines, are they sampling lines for the Hendy test? Maybe show them with a different colour and mention it in the caption. Figure 3: I don't really see a thin black line. It looks grey to me.

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