

## ***Interactive comment on “A review of the South American Monsoon history as recorded in stable isotopic proxies over the past two millennia” by M. Vuille et al.***

### **Anonymous Referee #1**

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Vuille et al. present an excellent and a timely review of the history of changes in the South American Monsoon “intensity” over the past two millennia as inferred from the stable isotopic data from a variety of proxy archives (speleothem, ice cores, and lake sediments). A salient aspect of this manuscript includes use of an isotope-enabled GCM, which provides additional insights into the distribution and variation of the stable isotopes in precipitation as a function of both local and basin-wide seasonal changes in the atmospheric circulation and precipitation pattern over the core monsoon zone of South America. While the model validation is hampered by lack of long-term observational data, the preliminary application of this approach is indeed promising. Authors suggest that the oxygen isotope variations from a number of sites reflect broadly-

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coherent changes in the intensity of the SASM over the last two millennia in response to changes in the north-south modulation of the ITCZ forced, which is ultimately forced by changes in the Northern Hemisphere temperature. The paper is generally well-written (although, there are far too many punctuation errors) and the Figure 3 can be improved. General Comments: 1) Lines 2-5, Page 642: I applaud Vuille et al. effort for providing a clear distinction between the ITCZ and the SASM. Readers would also benefit if authors can provide relevant references of studies where this distinction was either blurred or incorrectly applied. 2) Lines 11-14, Page 642: Please provide appropriate reference(s). 3) Lines 14-17, Page 643: While it is generally correct that evaporation returns isotopically more enriched vapor to atmosphere, I suspect that the evaporation during the mid-to-late SASM season (for example during 'breaks' ) will return more depleted and not 'more enriched' (relative to Ocean) water vapor back to atmosphere. This phenomenon is clearly seen in the south Asian monsoon domain where the late season monsoon rainfall is often quite depleted. Perhaps, authors can offer some additional insight into whether or not this is the case in the SASM. 4) Authors have widely used the term 'monsoon intensity' throughout the paper. I take it that they are referring to 'precipitation amount'. Nonetheless, I would encourage authors to fully describe what they mean by 'intensity'. I write this because there have been numerous instances in the literature where the word 'intensity' has been interchangeably used for describing both rainfall amount and circulation. 5) Lines 21-23, Page 646: Please correct: The Cascayunga speleothem record only extends to ~ 1100 AD not 540 AD! 6) Figure 3: Because authors argue that there is a "remarkable" coherence among four records on centennial timescale, it would be perhaps appropriate to show some appropriately smoothing curves to highlight the longer-term trends in the records. I would also suggest to show Moberg's record only once on this figure. Combining it with each proxy record is over-crowding this figure.

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