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Climate of the Past Discussions

Interactive comment on "Exposure dating of Late Glacial and pre-LGM moraines in the Cordonde Doña Rosa, Northern/Central Chile (∼31° S)" *by* R. Zech et al.

Anonymous Referee #1

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The manuscript by Zech et al. presents new age results for moraine deposits in an attempt to discuss the regional glacial advances during the Late Pleistocene over Andes Cordillera. This is an important contribution for the regional knowledge of timing of moraine depositional events in central Chile. In addition it is very relevant to discuss the relative importance of factors such as moisture availability and changes in temperature for the glacial advances over South America. I acknowledge their efforts to use the 10BE surface exposure technique as one of the few methods available for dating moraines. However, the difficulties to precisely estimate the ages of individual moraines boulders together with some stratigraphic discrepancies make more limited the paleoclimatic inferences from their current results. I think all the assumptions made here for

the LGM are quite inconclusive because age uncertainties and lack of results for this period. Instead, I suggest the authors focusing on the main events they identify at ~ 32 and between 14.7 and 11.6 ka BP. with a significant number of ages. Besides the dating limitations, the punctual nature of moraine depositional events makes almost impracticable to explain the glacial advances as a direct result of changes in insolation, as they have been presented in the Fig. 6. For example, the authors associate the glacial event between 14.7 and 11.6 ka BP to an increased contribution of tropical moisture coming from Amazon and Atlantic Ocean, which is consistent with other records in tropical Andes and Brazil. However, the South American Summer Monsoon is unlikely to be intensified at periods of low insolation in southern hemisphere. Was this event influenced by millennial events like Younger Dryas? The authors attempt to link the glacial events in Cordon de Doña Rosa to climate events and insolation in high-latitude e.g. Young Dryas, Antarctic Cold Reversal and also to the December insolation at 90°S. Although some coincidence apparently exists between them, the discussion of the climate mechanisms responsible for the glacial advances has not been appropriately addressed, especially in the section 4.3.3. Southern Hemisphere summer insolation doesn't influence directly changes in (sub)tropical climate but through the impact it produces on atmospheric circulation patterns. Furthermore there is no evidence of climate forcing by winter insolation at 30°S and also by summer insolation at 90°S. Cooler temperatures due to the impact of events such as Young Dryas and Antarctic Cold Reversal is certainly a controversial issue on South American paleoclimatology. Before making any assumption the authors should discuss the deglaciation time in South America and also worldwide at high-latitude regions. There are some evidences for an abrupt change to warmer temperatures beginning at about 20-18 ka BP. Therefore the importance of changes in temperature for glacial advances during the transition from LGM to Holocene might be significantly subdued. Without ruling out the temperature dependence on the glacial advances during this period, the authors would emphasize the possible effects of increased transport of tropical moisture down south in Central Chile on the development of these glacial events. Changes in

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the dominant precipitation regime in the Cordon de Doña Rosa from extratropical to tropical is an interesting hypothesis to explain the events at ~ 32 ka BP and between 14.7 and 11.6 ka BP, as the study site is situated at the transition zone between climate systems. This hypothesis could be more clearly addressed in a better description of moraines deposits mapped to the south and north of the study site and a more detailed discussion of their consistence with other paleoclimate records.

Interactive comment on Clim. Past Discuss., 2, 847, 2006.