

Interactive comment on “Environmental and climatic changes in Central Chilean Patagonia since the Late Glacial (Mallín El Embudo, 44 S)” by M. E. de Porrás et al.

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This manuscript provides a new record of vegetation and fire history along the forest-steppe transition at 45S and a nice comparison with other paleoclimate records in the Central Chilean Patagonia. The data look excellent and the record is reasonably well dated. The comparison with other records is informative and nicely illustrated. The study contributes to our overall understanding of the environmental history in central Patagonia and its links to large-scale change in climate.

The paper has abundant grammatical, spelling, and syntax errors and some of the sentences are difficult to understand as a result. Some rigorous editing is warranted

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before final publication. Also note that at least two of the plant taxa are misspelled.

Some of the fire terms should be used carefully and defined. Terms like “high” and “low” fire severity should probably be replaced by “surface” and “crown” fires or “non-stand-replacing” and “stand-replacing” fires. The use of charcoal peak size as a measure of fire magnitude should be defended. In other words, what evidence suggests that the size of a charcoal peak (spanning several decades) is proxy for fire size?

Assertions are made about the influence of fire versus volcanism versus humans on the past vegetation that should be explained: The fire reconstructions are based on charcoal analysis, including charcoal identifications, but no information is presented to link volcanic eruptions to vegetation change. There are tephra layers in the core, but what is the evidence that ashfalls influenced the course of vegetation development? What is “microscopic volcanic particle analysis” on p.8?

The human story is also a little unclear: in the Introduction, we are told that there were few people before 2.8 kyr. But later in the text, the some of the changes in fire activity in the early and middle Holocene are attributed to people. This needs clarification, and put into context, since recent burning by European settlers seems to exceed anything in the past.

Finally, could the bamboo *Chusquea* be responsible for the high Poaceae and grass charcoal in the late Holocene? If so, it would greatly change the vegetation reconstruction and climate interpretations, because it would imply closed forest with bamboo openings rather than open forest was present and conditions were humid. If bamboo is burning, it would also explain the low charcoal peak magnitudes and low fire frequency at that time (See Whitlock et al., *Quat Res.* [2006]).

Finally, while I appreciate the effort to explain the record in terms of changes in seasonality, a clearer description of the fire climatology is needed. What conditions give rise to ignition and fire spread and what season is critical for fire occurrence at this latitude? A conceptual model of the fire-climate linkages would be helpful: If sum-

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mers were wet and winters were dry, what would happen to vegetation (fuels), ignition frequency, and fire spread? If winters were wet and summers were dry, what would happen? Statements like p. 15, l. 13 are cryptic to me without more information: "It is probable that the development of a closed forest (high fuel availability) together with a gentle dry season may have triggered persistent but low magnitude crown fires that did not severely affect the forest." (Note: Does a "gentle dry season" mean that it was wet?)

p. 16, l. 17 The statement: "These pollen assemblages suggest the establishment of modern climatic conditions but [why "but"] probably associated with interannual or interdecadal fluctuations in moisture given that the increased occurrence of less severe fires (surface fires) is conditioned by short-term fluctuations in moisture favoring fuel growing and later desiccation to be burned (Veblen et al., 2003)." Is this relevant for this latitude and vegetation? Is there independent evidence of a link between fires and increased climate variability based on tree-ring data in this region?

p. 20, l 20: The statement: "In combination, vegetation and charcoal records point out a slight increase in precipitation and increased summer temperatures." What season is getting wetter and how does this specifically connect vegetation response with inferred fire activity?

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