

## ***Interactive comment on “Deforestation decreases resistance of simulated Easter Island climate to drought” by Alexander Lemburg et al.***

### **Anonymous Referee #1**

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In the article the COSMO mathematical model is proposed to simulate climate and landscape changes on the Easter Island that occurred in the past. The model works with immediate changes in the landscape that occurred uniformly the whole extent of the island. The changes with which it is speculated in the model include three extremely different situations: completely tree-covered island, grass-covered and a state of bare-soil. It is said that the landscape changes modeled can be applied to those that occurred on the island during the period of the LIA. The model is fed with data from climate instrumental series from the island, these covering the last 35 years. The conclusion is that deforestation itself increases soil temperature and the degree of drought. This process probably exacerbated the effects of past climate drought in the island from its occupation and deforestation by humans.

Two major problems, in part related to each other, would be found in the article. The

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article must update the literature both in the introduction and in the discussion on paleoecology, biostratigraphy and paleoclimate of the Eastern Island that has been published during last years. A model as that is proposed by the authors should be applied on the basis of advanced discussions on the paleoenvironmental and paleoclimatic processes occurring at centennial-millennial scale on the island since the Last Glacial Maxima and that have been discussed and demonstrated in Saez et al., Rull et al., Canellas-Bolta et al., Margalef et al., Nunn, Horrocks et al. among others works.

The COSMO model proposed is too simple and difficult to apply to complex situations of climatic, anthropic and landscape change as those occurred on the island during the late Quaternary, both before and after its occupation by humans. Sedimentological and pollen studies on lacustrine sediments of the island (published by the above author cited) show that: (1) the island has undergone several periods (at millennial to centennial time scale) of changes in climate from wet to dry and dry to wet during last 70,000 years; these changes were by different intensities and could included transitional phases, (2) during the last deforestation episode, the coastal part of the island was deforested hundreds of years before the interior part of the island, and the deforestation was a stepped process over the time. These and other overlapping anthropic processes invalidate simulations results of the model applied by the authors because, among other simplifications, the model works with the assumption of "immediate" and "uniforms" changes in the island. Also, a situation of totally bare soil, used in the simulations of the model, is not known on the island for the Quaternary period, except for small sectors that appeared during the 20th century in the Poike Peninsula (Mieth & Bork, 2005).

For these reasons, I consider that the submitted article, in its present state, is a simple theoretical exercise that would be applied only on the present day conditions of the island. Their findings are not applicable to situations of environmental and climate change occurred in the past in Easter Island. So I think the article is not suitable for the theme of the publication *Climate in the Past*.

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