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Hydrology and Earth System Sciences Discussions

Interactive comment on "El-Niño southern oscillation and rainfall erosivity in the headwater region of the Grande River Basin, Southeast Brazil" *by* C. R. Mello et al.

Anonymous Referee #2

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I think the relevance of this work is more related to questions about the impact of climate change on soil conservation. For instance, if global warming will increase the frequency of El-Nino events, then it is important to know that soil erosion will also increase. Rainfall erosivity forecasting, on the other side, seems to me less important. I don't see how short term or even seasonal forecasting of rainfall erosivity can be helpful.

The authors state that there is a significant intra-annual variability in rainfall in Southeast and South Brazil due to the South Atlantic Convergence Zone. This is only true for

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Southeast Brazil. South Brazil rainfall is not affected by the SACZ, and average rainfall is well distributed all over the year. Maybe the authors should add Center-west Brazil to Southeast Brazil in this sentence.

In the introduction, from page 10709 to page 10710 the authors seem to confound intra-annual variability with inter-annual variability. This two modes of variability should be appropriately described.

Mudslide is a very particular type of erosion. I don't think that traditional forms of calculating rainfall erosivity have any relation with the generation of mudslides.

The first sentence in page 10711 ("Thus, we can affirm that ... and flow regularization into the Furnas reservoir...") should be reviewed to improve the English. The same for "to construct a long-term pluviographical data sets" in page 10711.

Statements about land use change should be more precise. When did the changes occur? What are the references? A 1997 book entitled With Broadax and Firebrand: The Destruction of the Brazilian Atlantic Forest, written by Warren Dean, describes the deforestation in a vast region which includes the region described by the authors. According to this book, deforestation in the Rio Grande region may have started centuries ago.

In part 2.1 the word slopeness should be replaced by slope. In page 10718 the authors are discussing rainfall erosivity and suddenly change to a phrase about the influence of relief on soil erosion and sediment transport: "This behavior was associated with the topography of subregions contributing not only to soil erosion but also with the sediment transportation." It is not clear what "this behaviour" means. Is it the concentration of 70% rainfall during erosive events? How can these two facts be related?

In page 10719 the authors relate Cumulus clouds with rainfall. This is not strictly correct, since Cumulus are only the first phase of clouds formed by convective processes which may or not evolve to other cloud forms and then produce rainfall.

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The whole text should be reviewed to improve the English language. Errors such as "we used a pluviometric data sets ..." are very common in the text.

The overall conclusion of the paper is that there exist a significant relation between ENSO and rainfall erosivity in the studied region. Given the low frequency of SST temperature variation and the short period of data, this conclusion seems precipitated. From the figure I made from annual rainfall erosivity and SST data from table 1 it is difficult to see how a signifficant relation between the variables can be drawn. Annual data pictured in the figure I have attached do not support the conclusion that there is a significant relation between SST and rainfall erosivity in the region. The author's conclusion that "correlation coefficients were highly significant between monthly erosive rainfall variables and SST positive oscillations" may be related to the direct use of monthly data instead of monthly anomaly data, or annual data. In my opinion this may have lead to a false correlation, because two peaks of SST casually occur during the austral summer, when rainfall is higher in the region (this can be seen in figure 4 of the manuscript).

Finally, the main conclusion is not in accordance with most of the literature on ENSO effects in South America. There are two regions in east South America where it is normally recognized that there is strong influence of ENSO events. The first is located south, close to Uruguay and South Brazil, while the second is in Eastern Amazon. Southeast Brazil, the region studied by the authors is not among the regions where ENSO is recognized to have a strong influence. The studied region is between the two regions with strong ENSO effects. For instance, the paper by Grimm, Alice M., Vicente R. Barros, Moira E. Doyle, 2000: Climate Variability in Southern South America Associated with El Niño and La Niña Events. J. Climate, 13, 35–58, did not found coherent influence of ENSO in the Rio Grande area.

Therefore the authors should address the two following questions: 1. How can the monthly SST and erosivity data have a strong relation while the annual data show no clear relation? 2. How can the present results, which show a strong ENSO influence

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in the region, be explained when compared to results of other authors which did not found coherent influence of ENSO over the region?

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 10707, 2011.

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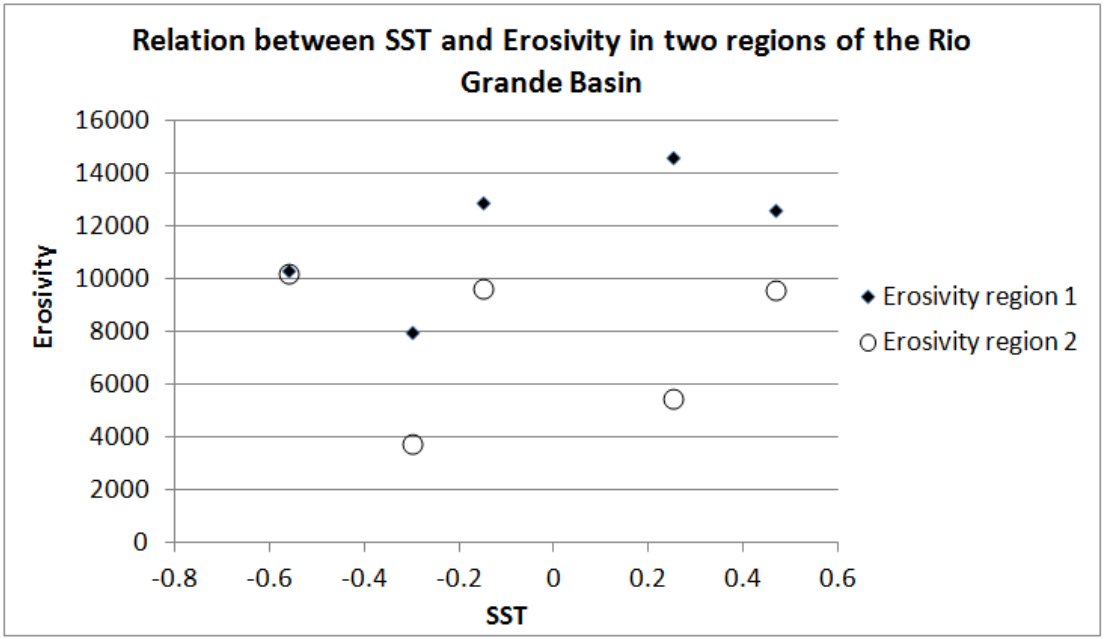

Fig. 1. Annual data of SST vs. erosivity

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