

The Land-Use Changes in the Brazilian Amazonia and The Consequences on the Regional Precipitation and Temperature over Southern America for the 2070-2080 Period, as Evaluated with Regional Climate Model PRECIS



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Background

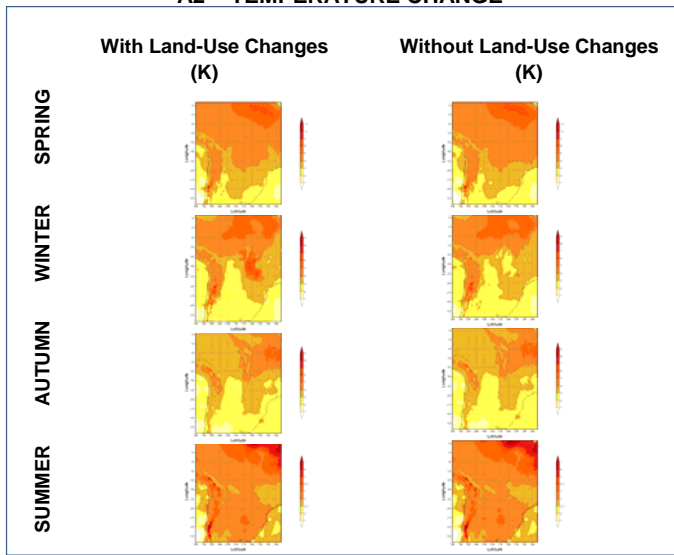
Currently the major problem in the Brazilian Amazonia and subtropical forests of Argentina, Bolivia and Paraguay is large scale deforestation. This is a common practice that has allowed cropland expansion, e.g., 3.6 millions hectares (ha) during 2001-2004. The Brazilian State Mato Grosso has both the highest deforestation rate and the largest soybean production increase since 2001. The 87% of the increase in cropland area belong at this State and 40% of the new deforestation has been in the present period.

Methodology

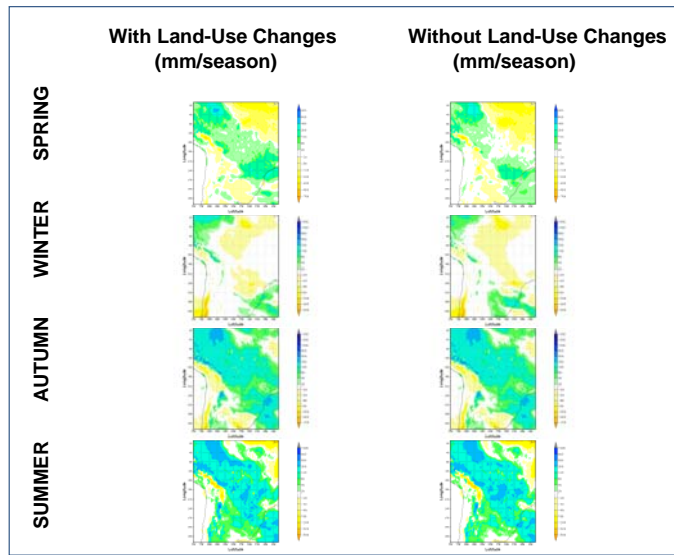
In this work the Regional Climate Model PRECIS (Providing REgional Climate for Impacts Studies) developed by Hadley Center UK is used. The model has a horizontal resolution of 50 Km in this study, and a vertical resolution 19 levels and run with the HadAM3P-baseline (1960-1990), HadAM3-A2 and HadAM3-B2 datasets. The output model are the results of changes the land use in the Brazilian Amazon that has been severely deforested. Current land-use changes, with respect to the 1976 state provided in the model were used in the present analysis as the reference. The parameters analyzed were rainfall and temperature in the 10 years period 2070-2080.

Results

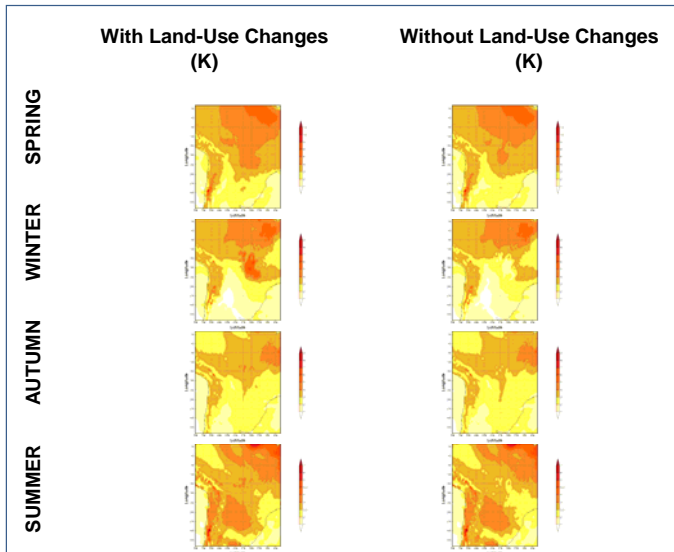
A2 – TEMPERATURE CHANGE



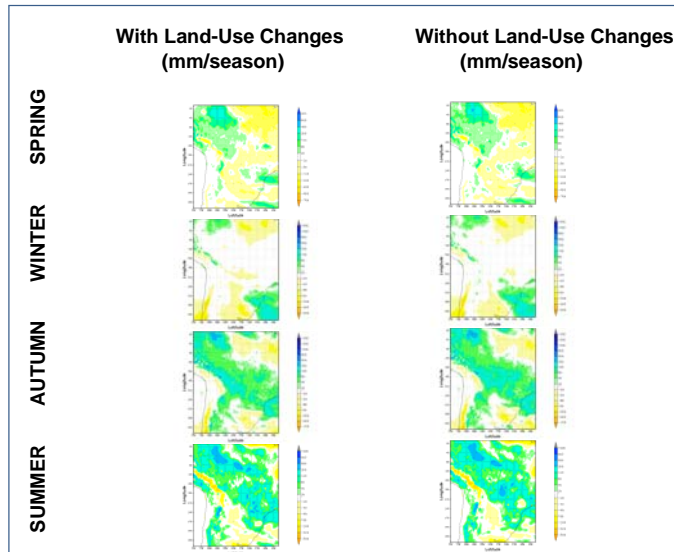
A2 – PRECIPITATION CHANGE



B2 – TEMPERATURE CHANGE



B2 – PRECIPITATION CHANGE



Conclusions and future plans

- Analyzing the PRECIS Model output, potential impacts of land-use changes on temperature and rainfall can be detected in the Pampa and Chaco regions. It must be emphasized that the deforestation process has been exclusively included in the Mato Grosso State of Brazil, using the observed present state of deforestation there with respect to the 1976 land-use, as originally provided in PRECIS.
- Overall, the potential changes in temperature are larger in winter and spring than in summer. The rainfall also shows the potential changes during those seasons. Autumn does not appear to undergo significant changes.
- In the B2 scenario, land-use change impacts are more prominent than for the A2 scenario, being more evident in particular for temperature.
- The A2 scenario rainfall increases in summer are not significant, i.e., 40 to 80 mm/season.
- Both scenarios consistently suggest a minor decrease in precipitation in the lower Parana-La Plata and Uruguay basins in winter, i.e. during the dry season. A slightly reduced warming in summer are also observed equatorward of the deforested region, in the northeastern corner of the study area, for the A2 scenario.
- Change in temperature and, to a lesser extent, rainfall are prominent primarily in the vicinity the deforested area in Mato Grosso, and that current deforestation does not represent a significant major additional change in temperature and rainfall over all the region of the study. Nevertheless some potential changes appear to arise at some locations, as mentioned above.
- Relative humidity changes are not, but a preliminary analysis suggests decreases of up to 30%.
- Future studies will include 30-year runs, as well as a more extensive analysis of deforestation/land-use change throughout the region, given that this is a widespread process in Bolivia, Paraguay and Argentina as well, and a study of the impacts of savannization of tropical and subtropical forests in the region of the study.