Geophysical Research Abstracts
Vol. 19, EGU2017-16367, 2017
EGU General Assembly 2017

Evaluation of DGVMs in tropical areas: linking patterns of vegetation cover, climate and fire to ecological processes

Donatella D'Onofrio (1), Jost von Hardenberg (1), and Mara Baudena (2)

(1) Institute of Atmospheric Sciences and Climate (CNR-ISAC), Torino, Italy (d.donofrio@isac.cnr.it), (2) Copernicus Institute of Sustainable Development, Utrecht University, Utrecht, the Netherlands (m.baudena@uu.nl)

Many current Dynamic Global Vegetation Models (DGVMs), including those incorporated into Earth System Models (ESMs), are able to realistically reproduce the distribution of the most worldwide biomes. However, they display high uncertainty in predicting the forest, savanna and grassland distributions and the transitions between them in tropical areas. These biomes are the most productive terrestrial ecosystems, and owing to their different biogeophysical and biogeochemical characteristics, future changes in their distributions could have also impacts on climate states. In particular, expected increasing temperature and CO_2, modified precipitation regimes, as well as increasing land-use intensity could have large impacts on global biogeochemical cycles and precipitation, affecting the land-climate interactions.

The difficulty of the DGVMs in simulating tropical vegetation, especially savanna structure and occurrence, has been associated with the way they represent the ecological processes and feedbacks between biotic and abiotic conditions. The inclusion of appropriate ecological mechanisms under present climatic conditions is essential for obtaining reliable future projections of vegetation and climate states.

In this work we analyse observed relationships of tree and grass cover with climate and fire, and the current ecological understanding of the mechanisms driving the forest-savanna-grassland transition in Africa to evaluate the outcomes of a current state-of-the–art DGVM and to assess which ecological processes need to be included or improved within the model.

Specifically, we analyse patterns of woody and herbaceous cover and fire return times from MODIS satellite observations, rainfall annual average and seasonality from TRMM satellite measurements and tree phenology information from the ESA global land cover map, comparing them with the outcomes of the LPJ-GUESS DGVM, also used by the EC-Earth global climate model. The comparison analysis with the LPJ-GUESS simulations suggests possible improvements in the model representations of tree-grass competition for water and in the vegetation-fire interaction.

The proposed method could be useful for evaluating DGVMs in tropical areas, especially in the phase of model setting-up, before the coupling with Earth System Models. This could help in improving the simulations of ecological processes and consequently of land-climate interactions.