Evaluating the new ORDHIDEE-GM (Grassland Management) Model to tropical Area in Brazil

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The elevation on greenhouse gases (GEE) concentration is causing significant changes to the climate, with important economical and social consequences. In Brazil, cattle is under the spotlight both due the magnitude of GEE flow and because of its potential to mitigate emissions, particularly when considering the capacity of carbon sequestration in soils under pastures. On the other hand, cattle may suffer significant impacts with climate change. Forage species, animal breeds and productive systems, previously adapted, may be vulnerable under future scenarios, mainly due to thermal and hydric stress, resulting from adverse climate.

To evaluate the net balance of gases flows and the impacts of climate on livestock production systems, models of pasture ecosystem must be used. In this context, the new model ORCHIDEE-GM (Grassland Management), which is enabled with a management module inspired from a grassland model (PaSim, version 5.0), has been successfuly used within European sites. The main objective of this work was to evaluate ORCHIDEE-GM against Brazilian field data. Biophysical parameters of Mombaça Guinea grass (*Panicum maximum Jacq.*) were set based on an experiment carried out at Embrapa's Southeast Cattle Research Center at São Carlos, São Paulo, Brazil.

ORCHIDEE-GM showed a good performance to simulate leaf area index (LAI) (R^2=0.79; p-value>0.0001; RMSE=1.93), leaf biomass (R^2=0.79; p-value>0.0001; RMSE=929.7 kg/ha) and dry matter (R^2=0.89; p-value>0.0001; RMSE=4443.5 kg/ha). However, the results were not good at simulating specific leaf area (SLA) (R^2=0.4; p-value =0.0198; RMSE=48.54 g/cm^2). Total biomass was overestimated, particularly in winter. Analyzing seasonal response, the best correlation to LAI occurred in summer and spring (R^2=0.83), followed by winter (R^2=0.79) and autumn (R^2=0.76). To leaf biomass, the best correlation occurred in spring (R^2=0.89), followed by autumn (R^2=0.83), summer (R^2=0.78) and winter (R^2=0.76). To dry matter simulation, the best correlation happened in autumn (R^2=0.93), followed by summer (R^2=0.87), spring (R^2=0.85) and winter (R^2=0.66). To specific leaf area, the best correlation happened in summer (R^2=0.51), and the correlation to other seasons was inferior to 0.2.

The ORCHIDEE-GM showed good responses and good correlations when compared to real data, especially to leaf area index and leaf dry matter. Results indicate the model needs improvement in estimating variations in specific surface area and total biomass.