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# How well do vegetation models simulate mid-Holocene Amazonia?

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Most climate models simulate drier conditions for Amazonia over the next century. Moisture availability affects tropical forest productivity more than any other climatic variable, therefore the projected changes in precipitation represents one of the biggest climatic threats to Amazonia and surrounding areas, and the ecosystem services these regions provide. The effects of short-term droughts in the region are relatively well understood. Ecological monitoring projects showed that the 2005 and 2010 regional droughts caused an increase in tree mortality and, in the short-term, the region switched from a carbon sink to source. However, the effects of a longer-term drier climate are less well understood. Vegetation models have been used to simulate what effect a future drier climate might have on Amazonian forest ecosystems, with most predicting some degree of forest dieback. However, huge uncertainty exists over the scale of any such dieback.

To gain a better insight into the uncertainties surrounding future vegetation model simulations across tropical South America, we use a palaeo-modelling approach. This involves running the vegetation models for a period in the past where climatic conditions were similar to that projected for the future, and for which we have sufficient palaeo-vegetation data to compare with. This gives us an opportunity to assess model performance outside the present day climatic range for which they may have been tuned. The mid-Holocene (MH, ca. 6,000 years ago) is a period when the region's climate was significantly drier than present, primarily attributed to a decrease in austral summer insolation (driven by the precessional cycle of Earth's orbit) that reduced the intensity of the South American Summer Monsoon (SASM).

We use three dynamic global vegetation models (DGVMs) - JULES, IBIS and SDGVM - driven by the simulated MH climate data from seven of the General Circulation Models (GCMs) that participated in the Paleoclimate Modelling Intercomparison Project (PMIP3), to produce a large ensemble of MH vegetation simulations. In order to put these MH vegetation simulations into context, a synthesis of previously published MH palaeo-vegetation data has been compiled, utilising information from a variety of proxies including pollen, stable carbon isotopes, phytoliths and other geochemical analyses. This will allow us to carry out a model-data comparison exercise to assess how well the models can simulate MH vegetation. Ultimately, this will reveal some more information about how well we can expect these models to simulate future vegetation. The results of this model-data comparison will be presented at this meeting.