

Term Project: Explore Climate Data and Models

Temperature Trends in Tropical Rain Forest Regions

REPORT by Julia Übelhör

Forests play an important role from an adaptation as well as a mitigation perspective. On the one hand, they represent an important sink for greenhouse gases (according to the WWF Living Forest Report, deforestation and forest degradation make up around 20 per cent of CO₂ emissions cause by people), on the other hand, climate change damages forests, e.g. drying out tropical rain forests.

I have chosen six stations within the seasonal tropical vegetation regions in Africa, Asia and Latin America in order to analyze whether these rainforest regions experience similar proportions of warming and cooling trends.

Having a look at the Climate time series browser, the data situation of the stations for these regions seems to be rather weak. In Africa, long term data series are particularly scarce. I selected Ouesso and Bangui because they seem to present most data. In Asia, Dibrugarh and Gauhati have been selected and in Latin America Manaus and San Juan Bautista.

I had a look at three different models (CCSM4, GISS E2H, and NorESM1-M) running three different scenarios (historical, rcp 26 and rcp 85). Even though the trends presented by these models seem comparable for most of the cases (i.e., rising temperature), there are considerable differences in scale.

The temperature trends from 1850 to 2013 for the selected stations show remarkable differences, not only between the regions, but also within them. Whereas most of the stations present an upward coefficient (Gauhati: 0.05, San Juan Bautista 0.11, Dibrugarh: 0.12, Manaus: 0.17), the most remarkable difference is between Ouesso (0.21) and Bangui (-0.15). This seems interesting, because looking at the historical models, all of the three scenarios show comparable upwards trends in a range from 0.04 - 0.07 for the selected stations, except for San Juan Bautista, where the CCSM4 historical model even shows a rise by 0.11 (and 0.10 by NorESM1-M historical).

Considering future scenarios, no model displays a negative trend. It seems noticeable that the GISS E2H model indicates 0.0 for the rcp 26 scenario for each of the selected stations, whereas the others show upward trends in a range of 0.06 (Ouesso, CCSM4) to 0.13 (Dibrugarh and San Juan Bautista, CCSM4).

The NorESM1-M model shows for the rcp 85 scenario a stronger upward trend than the other two models for all of the analyzed stations but for Ouesso, where it indicates the same uprise as the CCSM4 model (0.35). In other cases, the difference seems quite noticeable: for Dibrugarh, the CCSM4 model indicates a 0.33; the NorESM1-M model 0.58 temperature rise.

So, based on the data presented, there is no clear trend for one region of seasonal tropical stations differing systematically from another in the proportions of warming and cooling trends. The contrasts between the models are more accentuated between different models than between different regions.