Analyzing the spatio-temporal distribution of fog in French Guiana using ground-based and satellite data

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Fog occurrence is extensively studied in the outer Tropics and in tropical montane cloud forests, but investigations in tropical lowland forests are virtually lacking. The knowledge of temporal and spatial fog dynamics in tropical lowland forests is generally poor. We investigated the spatio-temporal distribution of fog in a tropical lowland forest in central French Guiana. Data of important meteorological parameters were gathered by installation of a climate station directly above the forest canopy (45 m above ground). Horizontal visibility (and thus fog occurrence) was observed by using a visibility and present weather sensor (HSS VPF-730, Biral). The spatial extent of fog was analyzed by means of night-time AVHRR and MODIS satellite data using an algorithm relying on brightness temperature differences between the long-wave and medium infrared bands. The output of the fog detection scheme was validated against horizontal visibility data from the ground station.

It is shown that fog occurs frequently in river valleys of French Guiana. During the measurement period, fog occurred on nearly all days in the dry season and on every day in the rainy season. Comparable high fog frequencies are hitherto only reported from tropical montane cloud forests. Fog frequency shows a clear diurnal course, with a maximum during early morning hours. Solar heating after sunrise leads to rapid fog clearance. First results of the satellite data analysis indicate a widespread distribution of night and morning fog in river valleys throughout the country.