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Lightning climatology in the Congo Basin

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Abstract. The lightning climatology of the Congo Basin including several countries of Central Africa is analysed in detail for the first time. It is based on data from the World Wide Lightning Location Network (WWLLN), for the period from 2005 to 2013. A comparison of these data with Lightning Imaging Sensor (LIS) data for the same period shows the relative detection efficiency of the WWLLN (DE) in the 2500 km × 2500 km region increases from about 1.70 % in the beginning of the period to 5.90 % in 2013, and it is in agreement with previous results for other regions of the world. However, the increase of DE is not uniform over the whole region. The average monthly flash rate describes an annual cycle with a strong activity from October to March and a low one from June to August, associated with the ITCZ migration but not exactly symmetrical on both sides of the equator. The zonal distribution of the lightning flashes exhibits a maximum between 1°S and 2°S and about 56 % of the flashes are located south of the equator in the 10°S – 10°N interval. The diurnal evolution of the flash rate has a maximum between 1400 and 1700 UTC, according to the reference year. The annual flash density and number of stormy days show a sharp maximum localized in the eastern part of Democratic Republic of Congo (DRC) regardless of the reference year and the period of the year. These maxima reach 12.86 fl km⁻² and 189 days, respectively, in 2013, and correspond to a very active region located at the rear of the Virunga mountain range at altitudes that exceed 3000 meters. The presence of these mountains plays a role in the thunderstorm development along the year. The estimation of this local maximum of the lightning density by taking into account the DE, leads to a value consistent with that of the global climatology by Christian et al. (2003).

Keywords: lightning, detection efficiency, lightning density, Congo Basin.

1. Introduction

Space observations have shown that the highest concentrations of lightning on the Earth are mostly in the territory of the Democratic Republic of Congo (DRC). The global climatology of lightning activity developed by Christian et al. (2003) and based on data recorded during five years (May 1995-March 2000) by the Optical Transient Detector (OTD) loaded on board the satellite

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