

Previous study (Beirle et al., NHESS, 2014)

Mean LIS flash properties (events per flash, radiance, etc.) reveal systematic spatial patterns, with generally higher values over ocean. Over land, regions with high (US) and low (India) flash properties can be distinguished. Several possible reasons for the differences in flash properties have been discussed, but a clear explanation, in particular of the land-ocean contrast, is still missing.

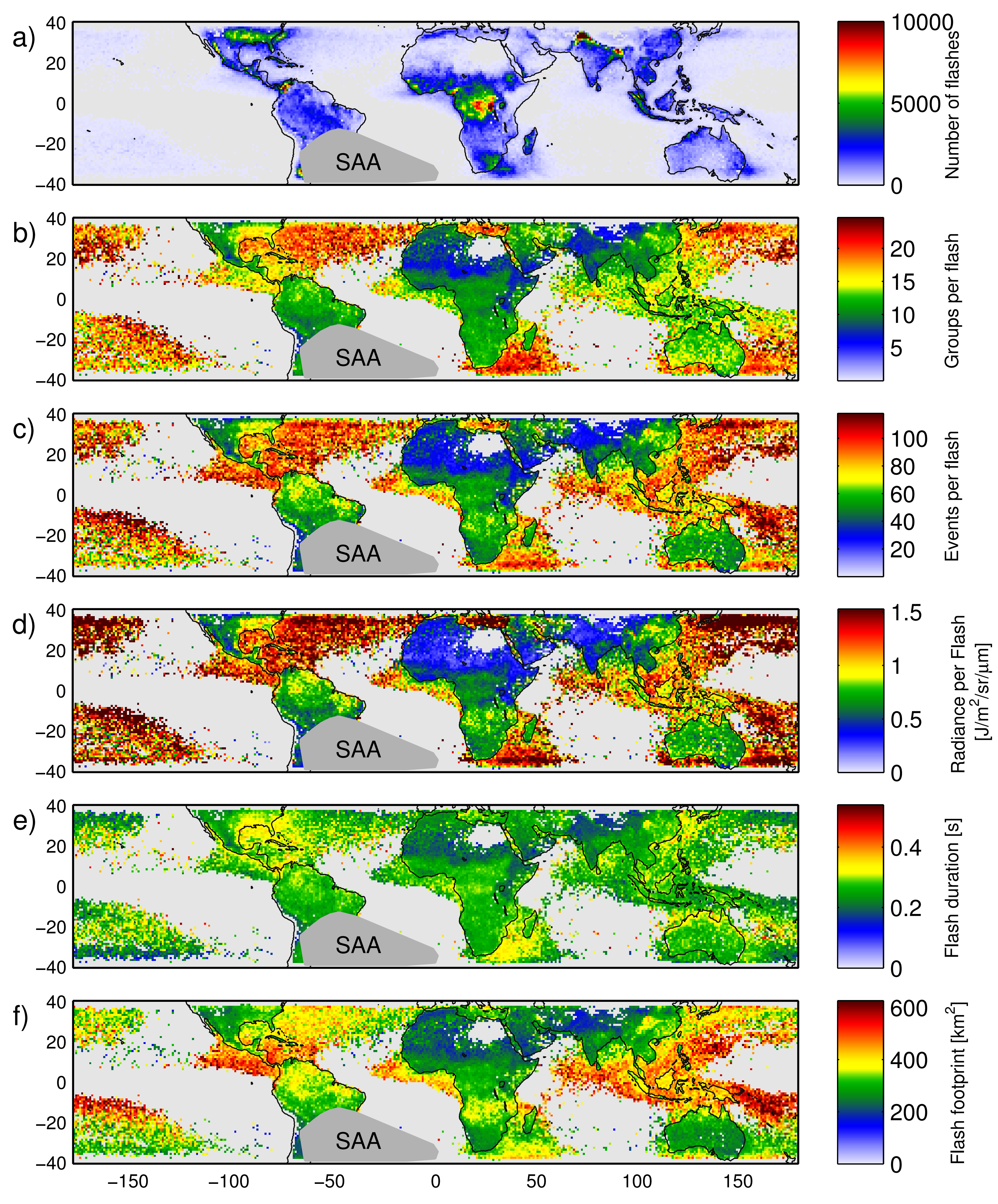


Figure 1: (a) Total number of flashes derived from LIS (1998–2012) on $1^\circ \times 1^\circ$ grid. (b–e) Mean flash properties, i.e., groups (b), events (c), radiance (d), and duration (e) per flash. Grid pixels with less than 50 flashes and the area affected by the SAA are discarded (light/dark grey). The max value of the colorbars of panels (b)–(e) equals twice the respective global mean value. Figure from Beirle et al., NHESS, 2014.

Idea

Here we analyse how far mean LIS flash properties are related to cloud characteristics as derived from TRMM.

Method

LIS flashes are related to coincident cloud information from TRMM, if available. Here we focus on 3 quantities from the PR2A23 data product: Storm height (SH) (from radar), Freeze height (FH) (from surface Temperature climatology), and Height of Bright Band (HBB) (from radar). Focus is set on Oceanic flashes versus continental regions with high flash rates and different flash properties: US (east), Congo, and India.

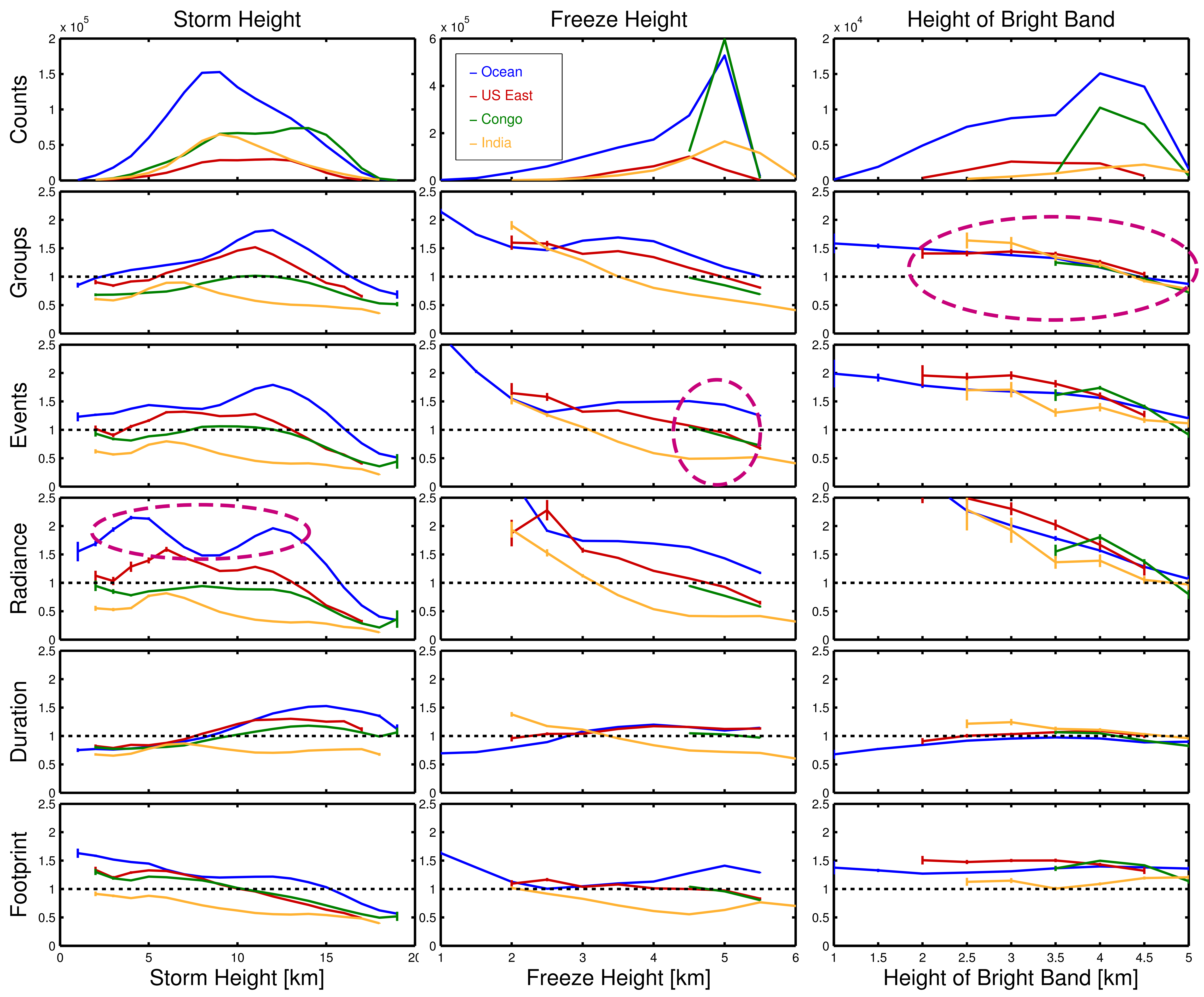


Figure 2: Dependency of mean flash properties on storm height (left), freeze level height (center), and height of bright band (right) for flashes over ocean, US east, Congo, and India. Flash counts (top) are given in absolute numbers per bin. All other quantities are given relative to the respective global mean. Error bars represent the standard mean error, which is negligible for high number of flash counts. In magenta, the selected results discussed in the text are highlighted.

Selected results

- Over ocean, flash properties depend strongly on SH. Groups and events per flash are highest for SH of 12 km, while radiance shows two clearly separated peaks at 4 km and 12 km. Over continents, dependencies on SH are more ambiguous.
- Dependency on FH is very similar for US and Congo: If only flashes with FH around 5 km are considered, flash properties over US are same as in Congo. However, oceanic flashes are still "stronger" and Indian flashes "weaker" for this selection.
- The dependency on HBB is very similar for all regions. Number of groups and events and in particular flash radiance are increasing towards lower HBB. However, HBB is only detected for 3% of all flashes.

Discussion

Thursday, 17:30-19:00, interactive!

Summary

The PR2A23 data provides independent, coincident information to the LIS flash measurements. This raises new questions, but might eventually help to understand the dominant physical mechanisms causing regional differences of mean flash properties.

Acknowledgements

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Contact

steffen.beirle@mpic.de