1. Coastal flashes

We have analysed mean flash properties separately for land, ocean, and coastal regions. The classification was performed based on GTOPO[1] data on a 0.1°grid. Mean flash properties of coastal flashes fall between those of coastal and oceanic flashes (Fig. S1).

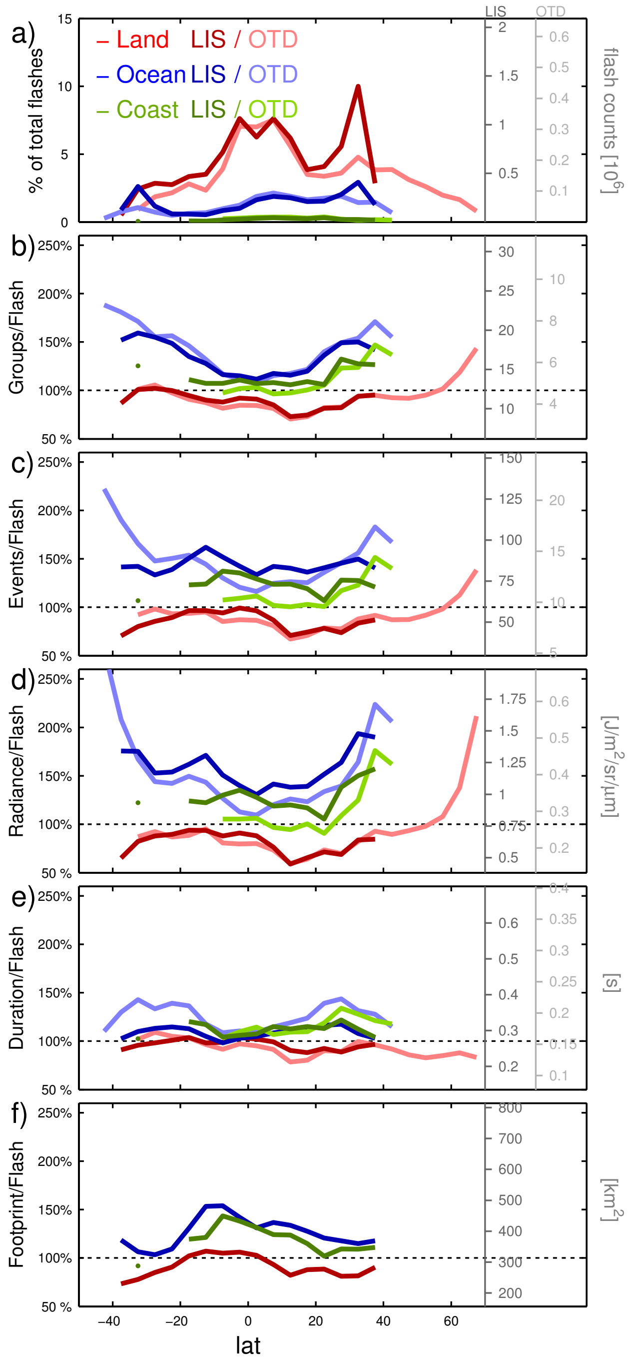

Fig. S1: Latitudinal dependency of mean flash properties separately for land (red), ocean (blue), and coastal regions (green). Error bars (≈10%) are omitted to keep the plot clear.

[1] Data available from the U.S. Geological Survey.

2. Diurnal cycles

The diurnal cycles of flash counts and mean flash properties are shown in Fig. S2. If displayed as function of local time (LT) (Fig. S2a, left), the well-known afternoon maximum of flash counts is visible over continents, while variations over ocean are small (compare Fig. 3, lower panel, in Blakeslee et al. 2014). The interpretation of the dependency of per-flash means on LT, however, is complicated by the diurnal cycle of the satellites' detection efficiency (DE), which is reduced during daytime. Thus, the strong peak of radiances (Fig. S2d, left) at noon (LT) is probably just caused by the reduced DE; i.e. at noon, only flashes with high radiance exceed the background threshold under daylight conditions, and the means are consequently biased.

Flash counts as function of universal time (UT) (Fig. S2a, right) peak in early afternoon. However, due to the conservative masking of the SAA, which removes most of South American flashes from our analysis, the patterns look slightly different compared to previous studies (Mach et al., 2011), as the flash counts in early evening are biased low.

Mean flash properties as function of UT show a clear minimum at 14:00, when thunderstorms over central Africa have the highest activity.

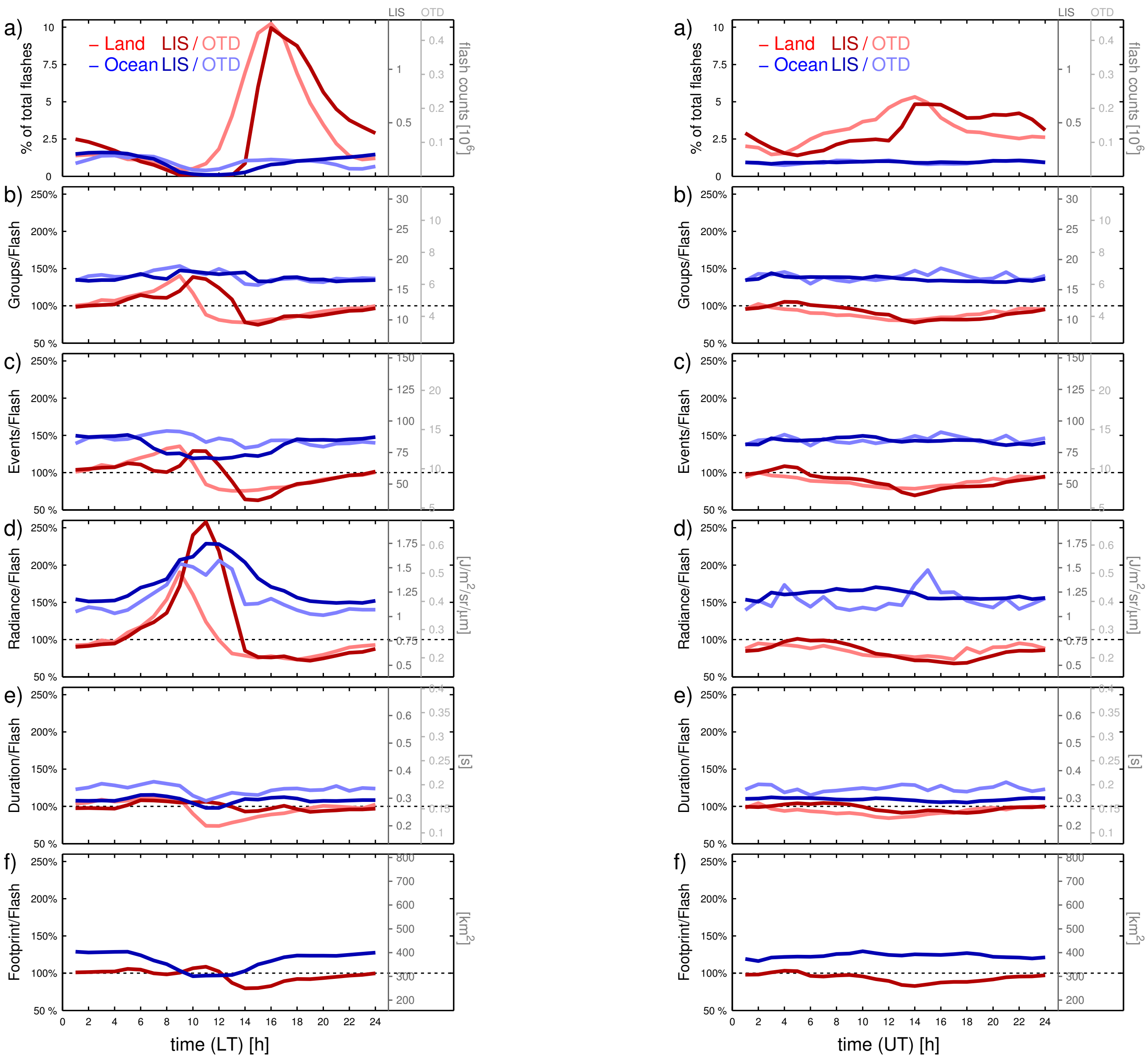

Fig. S2: Dependency of mean flash properties on time of day in LT(left) and UT(right), separately for land (red) and ocean (blue).

3. Seasonal cycles

Figures S3-S6 display seasonal maps and zonal means. Note that the y-axis of the latter was extended compared to Fig. 3 of the paper in order to cover the variability of per-flash quantities.

Most striking result of the seasonal analysis are the high values of groups and events per flash and in particular the mean flash radiance in hemispheric winter. Extraordinary high values are found for Japan in winter, where mean radiance per flash is increased by a factor of 5 for LIS and even 8 for OTD (see tables 2 and 3 in the paper).

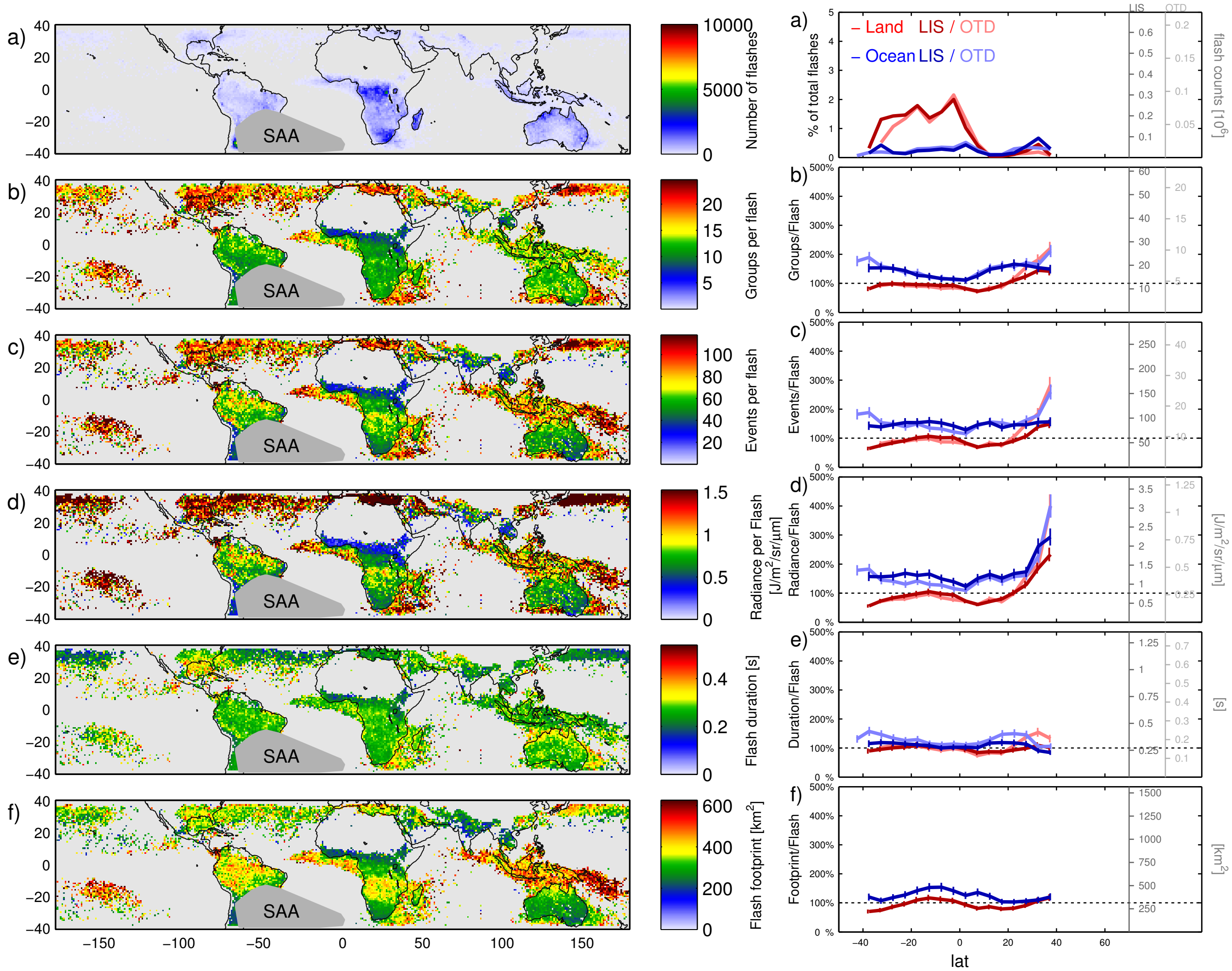

Fig. S3: Mean flash property maps for LIS (left) and latitudinal dependencies (right), as in paper figures 2 and 3, for winter (December, January, February).

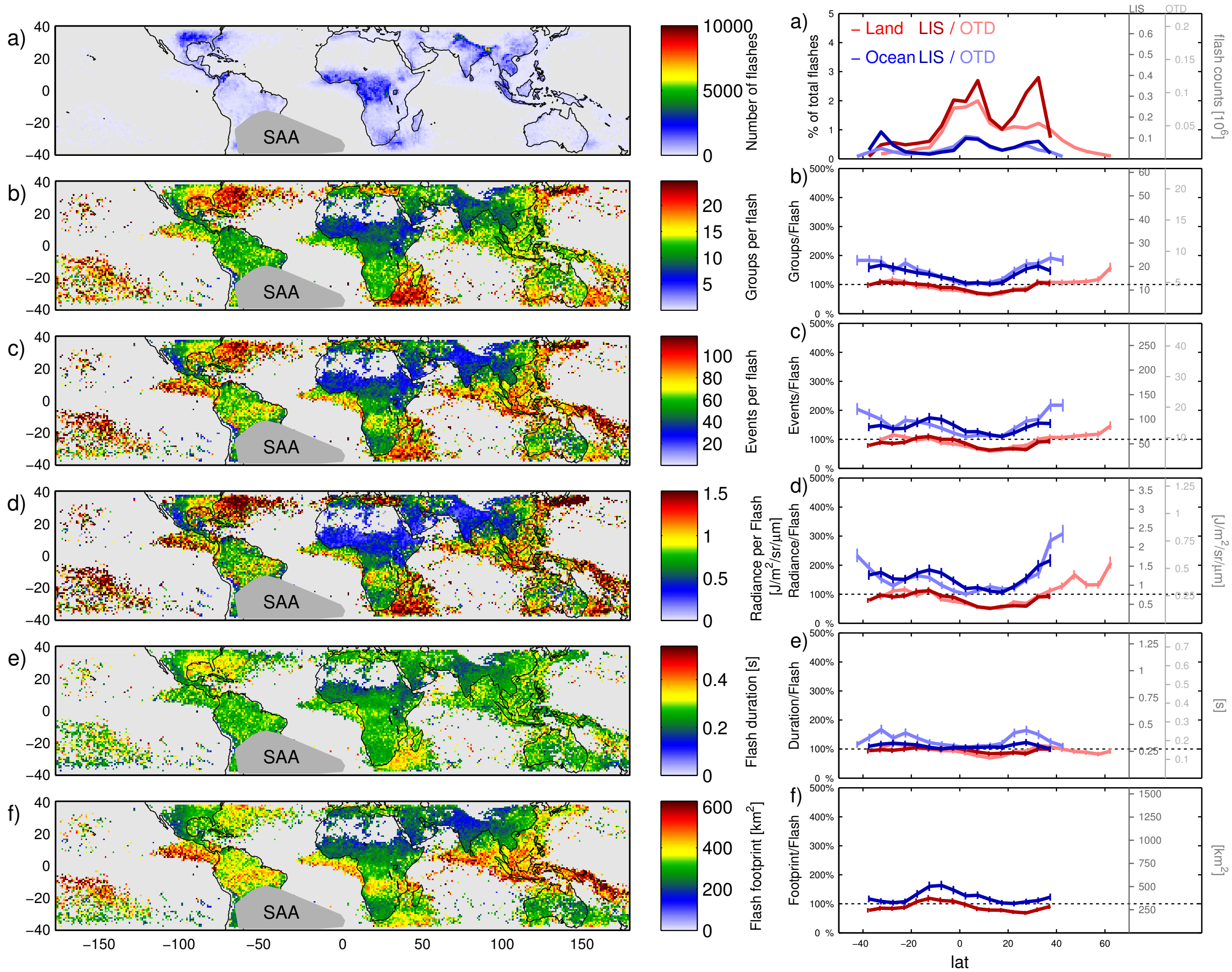

Fig. S4: Mean flash property maps for LIS (left) and latitudinal dependencies (right), as in paper figures 2 and 3, for spring (March, April, May).

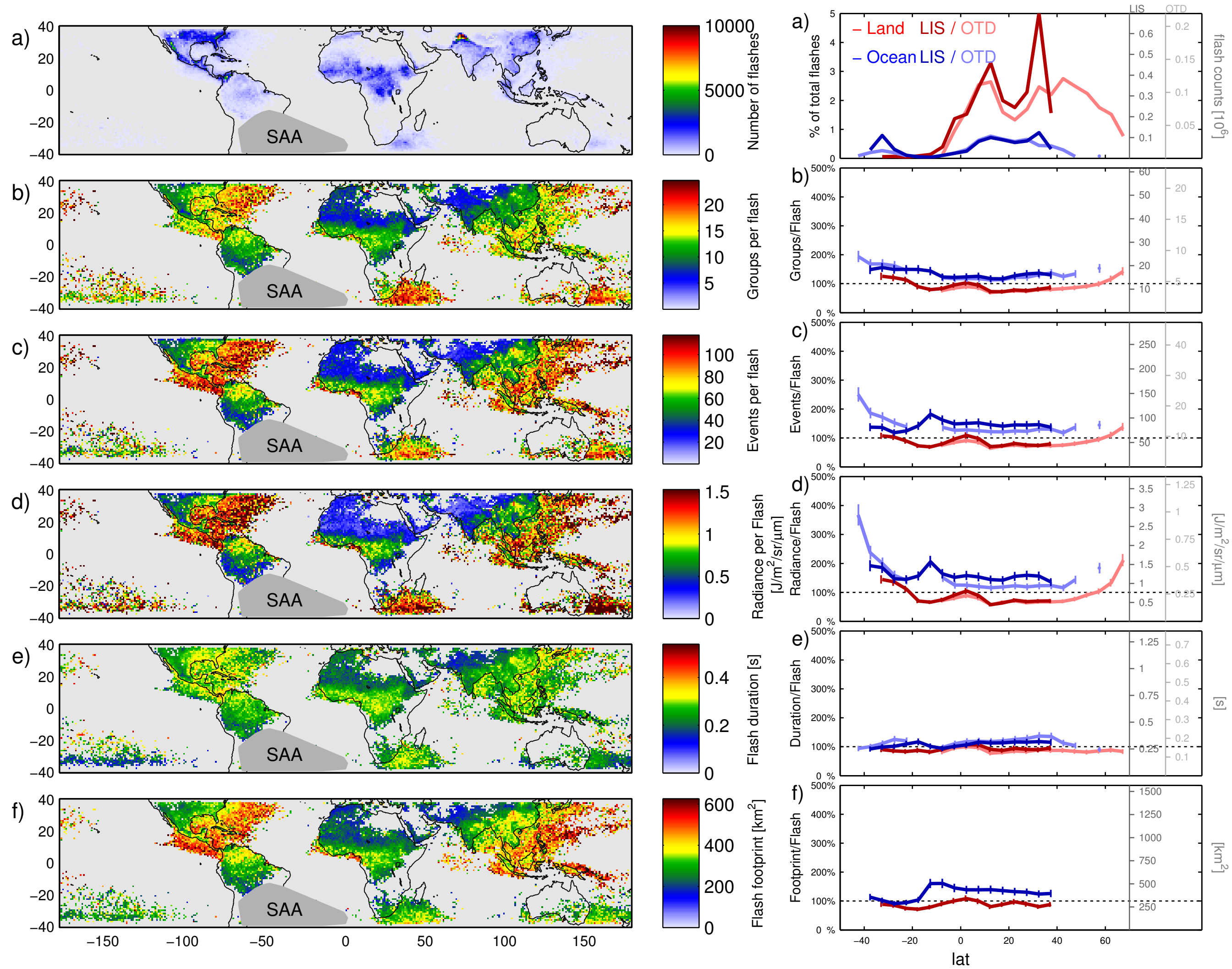

Fig. S5: Mean flash property maps for LIS (left) and latitudinal dependencies (right), as in paper figures 2 and 3, for summer (June, July, August).

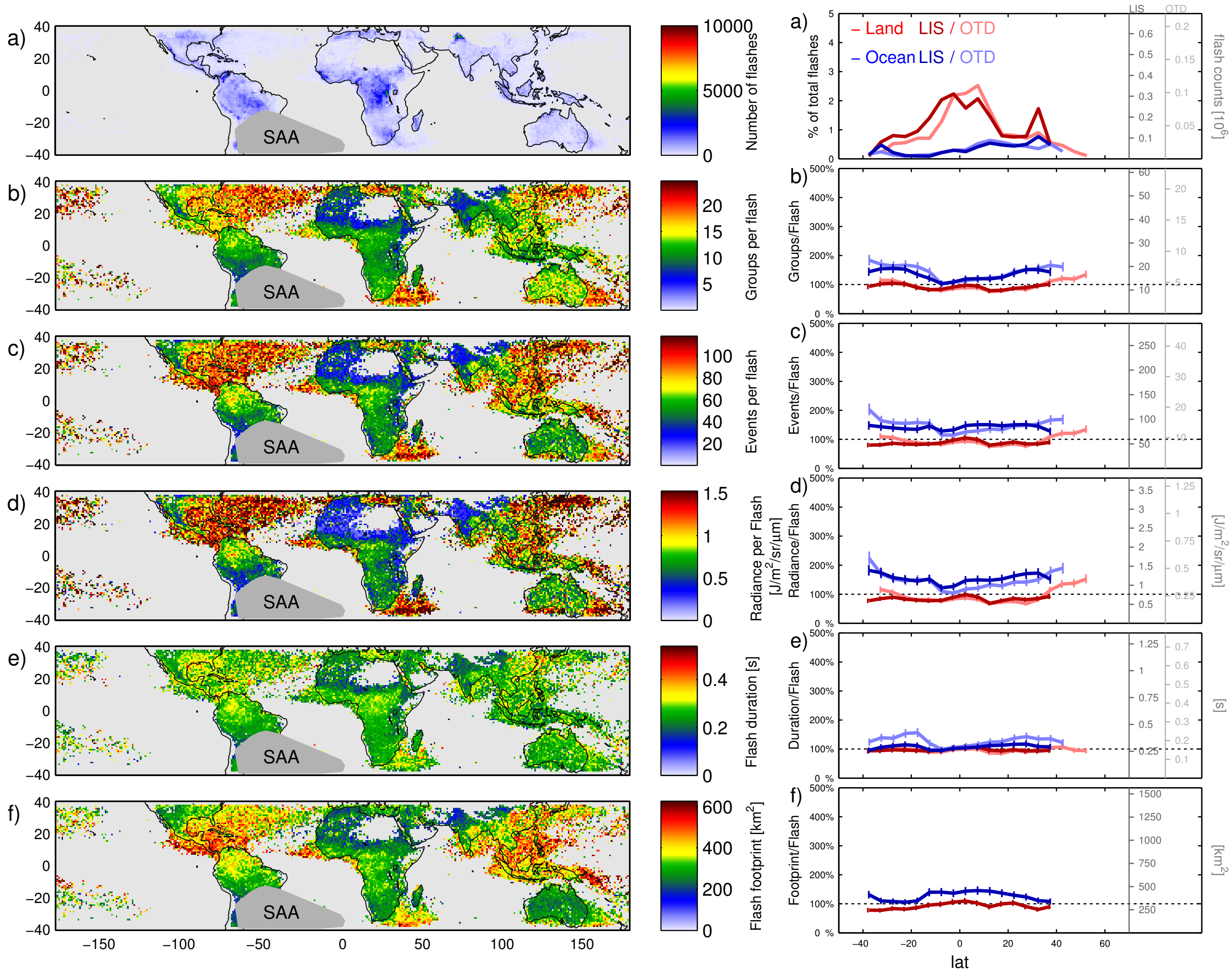

Fig. S6: Mean flash property maps for LIS (left) and latitudinal dependencies (right), as in paper figures 2 and 3, for autumn (September, October, November).