Trends in global fire occurrence and the role of large-scale atmospheric drivers

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We are exploring the role of large-scale atmospheric drivers in influencing fire occurrence and variability across the globe. To effect this we are extending the approach we have taken in connection with the variability of fire numbers across the Australian continent (Earl and Simmonds 2017). In particular we are employing the ERA-Interim reanalysis (Dee et al. 2011), and particularly the global atmospheric winds, temperature and humidity.

We are using the ‘active fire’ (AF) product, giving the location of burning fires, developed by the MODIS Fire Team (June 2000–present), available for download at the NASA Earth Observations website (http://neo. sci.gsfc.nasa.gov/view.php?datasetId=MOD14A1_M_FIRE). The MODIS AF product builds on heritage algorithms for operational fire monitoring used with the Geostationary Operational Environmental Satellites and Advanced Very High Resolution Radiometer sensors, providing information on the specific location of fires, allowing for estimations of emitted energy and the flaming and smouldering ratio. These data have been gridded at 0.1° resolution from the 1 km official MODIS AF product (MOD14A1), which is a level 3 tile-based product from the recently developed MODIS Collection 6. Each pixel assigned to ‘fire’ has a count of the number of fires within the pixel. We here show the trends and variability of seasonal fire counts over the two hemispheres and the globe.

Figure 1 shows the global distribution of fires that have occurred over the period 2001–2016. Figure 2 exhibits the global and hemispherical fire time series from 2001 to 2016. There is a very strong decline in global fires (statistically significant at $p < 0.001$), present in each season except December–February ($p < 0.1$). The NH is also experiencing a very strong decline ($p < 0.001$) largely resulting from trends in the June–November semester. The SH also displays a strongly significant trend ($p < 0.01$), though not as strong as for the globe or NH. There is much interannual variability across the globe, with 2013 experiencing just 75% of 2001 total. This level of variability is also apparent in both hemispheres.

Similar analyses have been performed for each of the regions indicated in Fig. 1. For further details see Earl and Simmonds (2018).

References

Dee, D. P., et al., 2011: The ERA-Interim reanalysis: Configuration and performance of the data assimilation system. *Quart. J. Roy. Meteor. Soc.*, **137**, 553-597.
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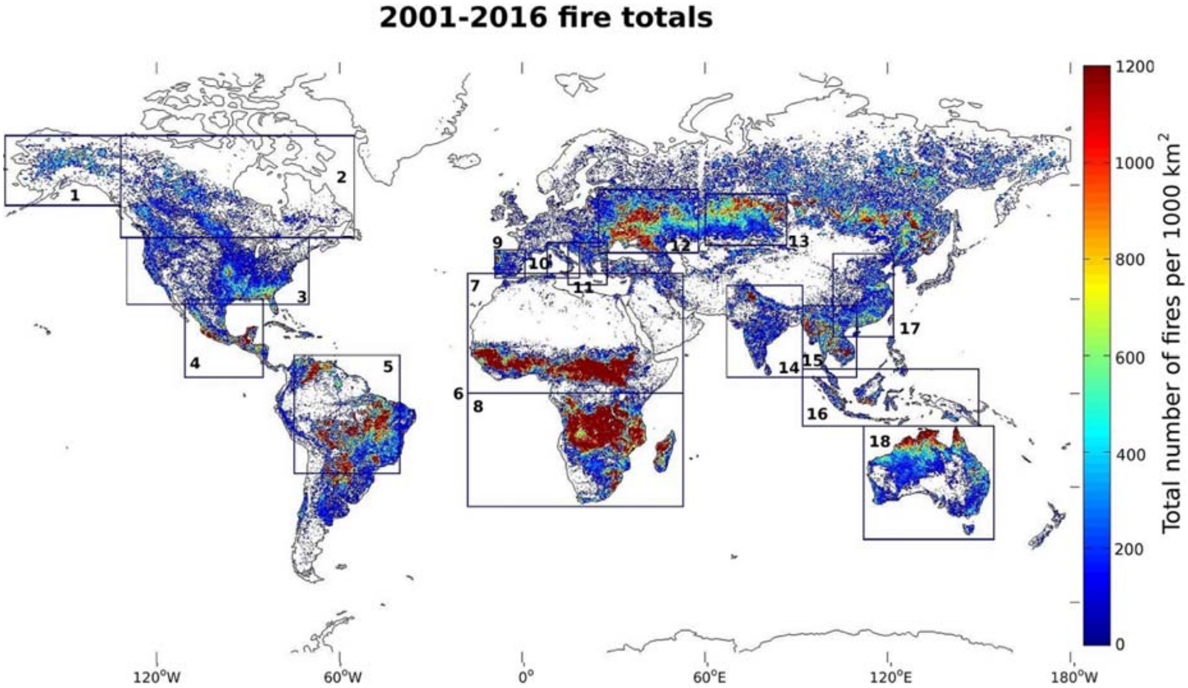

Fig. 1: Total number of annual active fires for the period 2001–2016. The units are fires per 1,000 km^2.

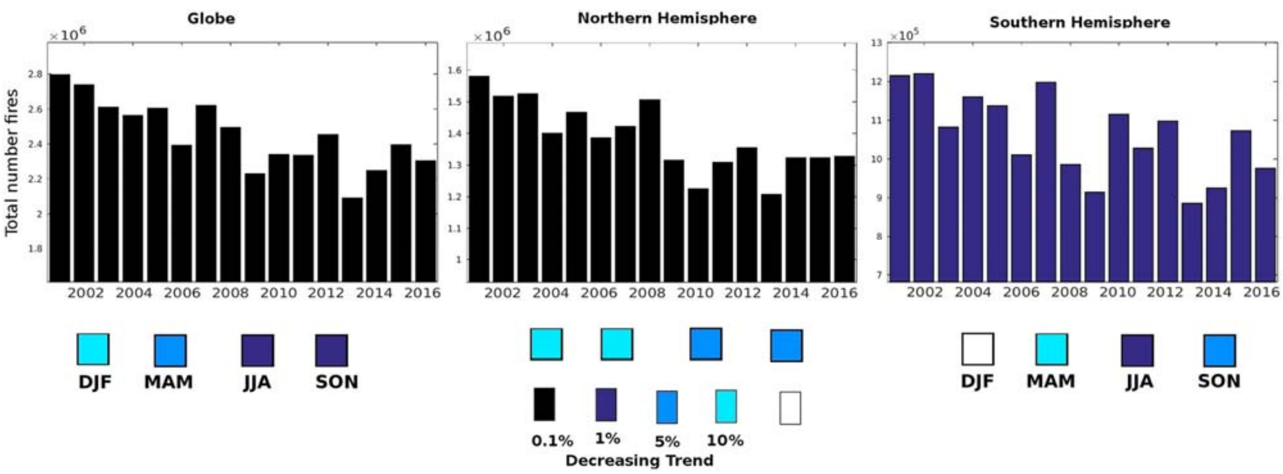

Fig. 2: Global and Hemispherical 2001–2016 fire counts. Levels of significance displayed for the annual trends (colour of bars – decreasing trend: black $p < 0.001$, dark blue $p < 0.01$, middle blue $p < 0.05$, light blue $p < 0.1$) and for each season (represented by the 4 boxes beneath each histogram).