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Exploring the utility of high frequency satellite information for wildfire monitoring and attribution

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Introduction

Satellite observations from Low-Earth Orbiting (LEO) and GEOstationary (GEO) platforms play an important role for the detection, monitoring and characterisation of wildfires across the Australian continent. LEO platforms have been the most used due to their availability, but with the drawbacks of having a 12-hour revisit time. Whilst coarser in spatial resolution, newer GEO platforms offer 144 observations during the day for fire detection and fire intensity estimation. This dense diurnal information for highly dynamic wildfires can result in timely detections, a complete record of fire progression that can be used to understand certain fire regimes, as well as new opportunities to estimate fire effects and impact.

Aims

This research aims to **explore the utility** of high frequency satellite information to derive new metrics of wildfire activity and impact. The work presented here corresponds to the assessment of wildfire intensity estimations from Himawari-8/9 AHI and their equivalency to established LEO products for large spatiotemporal scales. It also attempts to **extract new insights** from the data given the increased temporal resolution with which they become available.

Methods

The new GEO **BRIGHT/AHI** fire detection and intensity product (Engel et al., 2022, 2021) is compared to established LEO products from **MODIS** and **VIIRS** sensors, for the continent of Australia between April 2019 and March 2020. Fire intensity is estimated by converting the upwelling Middle-infrared radiation (MIR) of a pixel to **Fire Radiative Power (FRP)** (Wooster et al., 2005). The intercomparisons are conducted for **concurrent observations** between the products as well as for the **independent fire detection records** of each sensor.

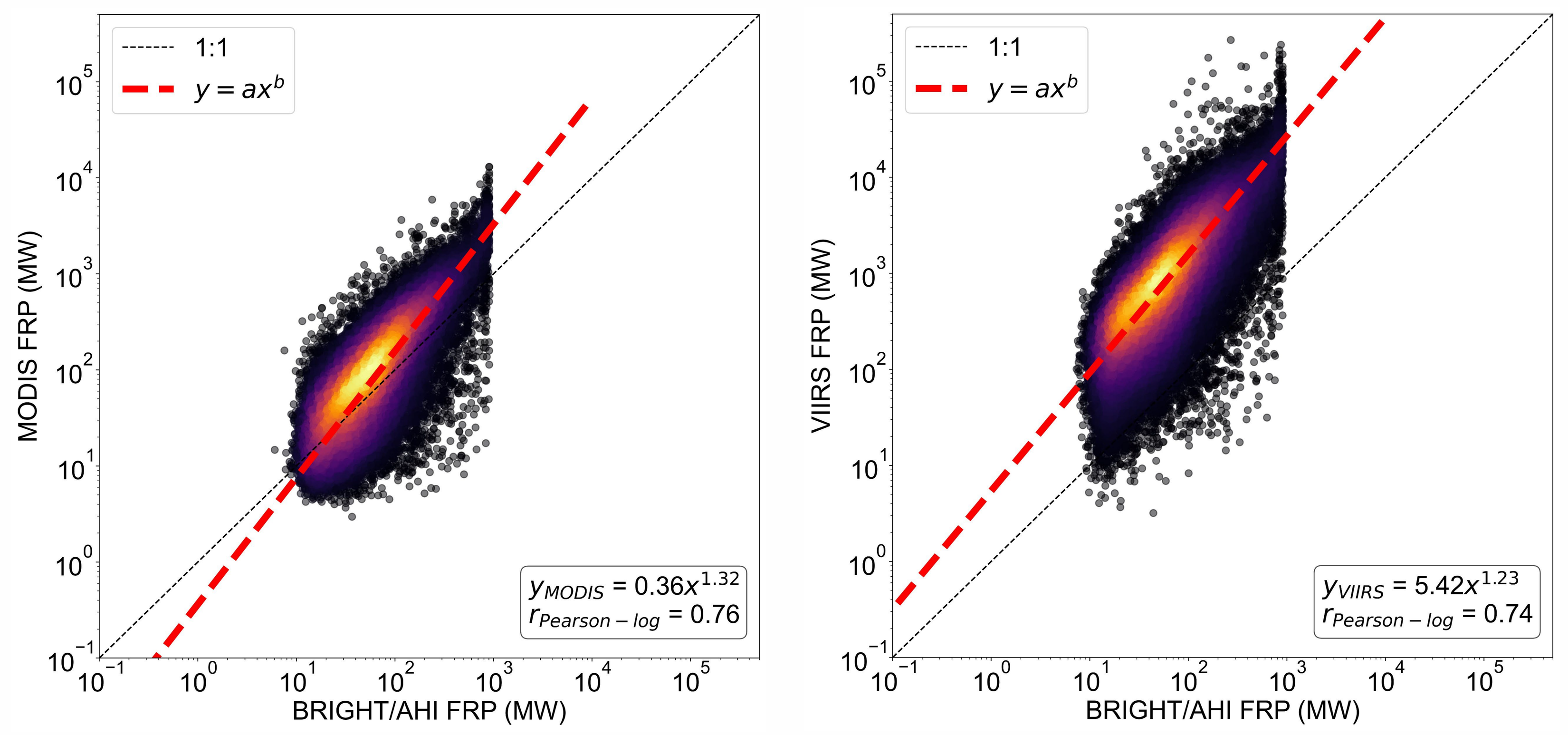

Figure 1 Association between GEO and LEO FRP for concurrent hotspots over Australia between April 2019 and March 2020.

Results

Despite its lower spatial resolution of 2km compared to 1km (MODIS) and 375m (VIIRS), the GEO product **correlates well** with the equivalent LEO products for **simultaneous observations** of fire intensity (Figure 1).

An asymptote is observed in the GEO FRP (Figure 1) towards the higher intensity values, indicating the **saturation** of the MIR channel of the GEO sensor AHI.

Due to their orbit, LEO sensors have **multi-hour gaps** in their observation record throughout a day and especially during the morning hours where fire activity is at its lowest and wildfires are easier to deal with. In contrast, the GEO observations offer a **complete diurnal cycle of fire intensity** (Figure 2), which can assist with fire preparedness by being able to anticipate diurnal fire activity for specific regions and seasons and inform fire-fighting operations with a 10-minute interval fire activity information over large areas in near-real time.

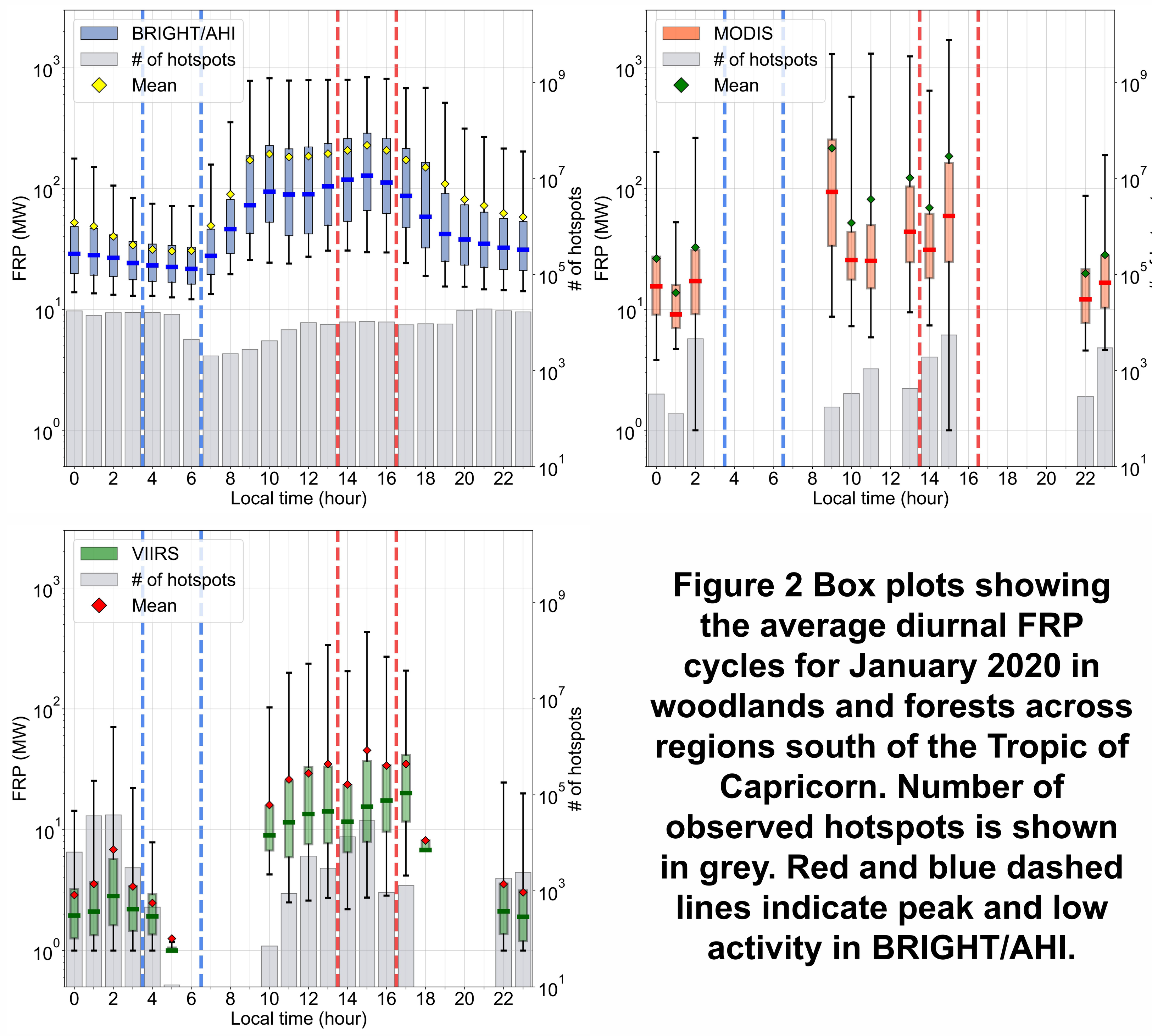

Figure 2 Box plots showing the average diurnal FRP cycles for January 2020 in woodlands and forests across regions south of the Tropic of Capricorn. Number of observed hotspots is shown in grey. Red and blue dashed lines indicate peak and low activity in BRIGHT/AHI.

References

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