Reviewer 1

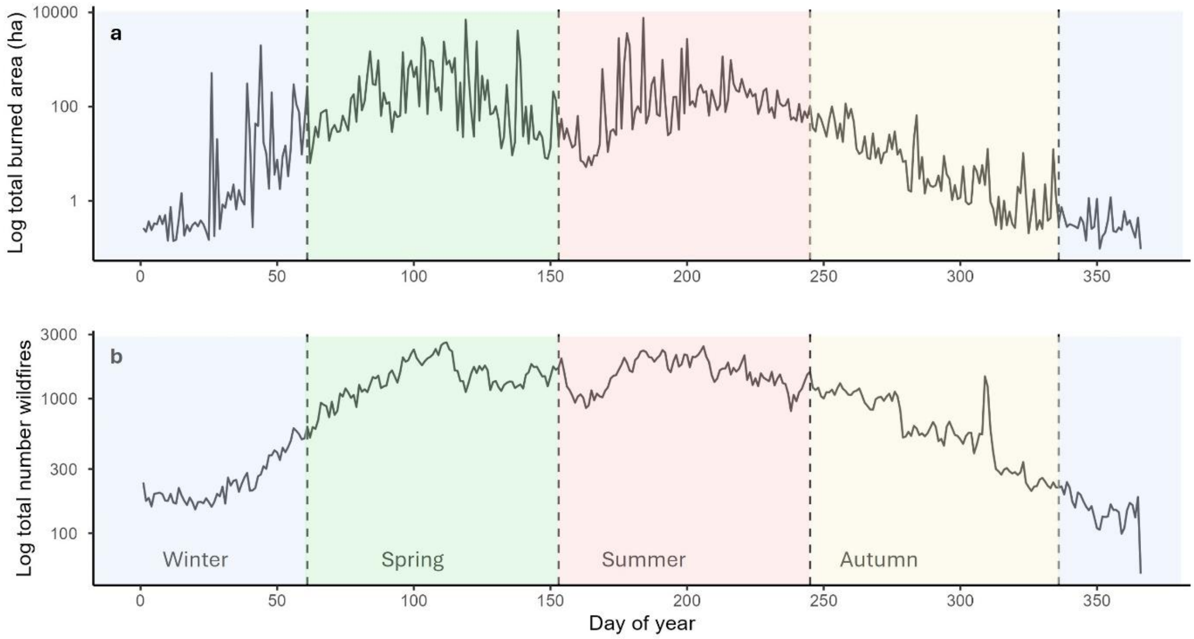
*Thank you for engaging with our manuscript and for your constructive feedback. We have responded to your comments below in blue with *, with substantial changes proposed to the manuscript text being indicated in red with "".

Little et al. explore the relationship between persistent high-pressure systems, surface weather conditions, fire indicators and actual wildfires using a dataset which ranges from March – October 2001-2021 (UK) and 2010-2020 (England), respectively. They find significant relationships between high pressure systems and local weather conditions and wildfire characteristics across seasons. This is an interesting assessment, which could be further improved by accounting for following comments:

Minor:

1. Fig. 1 this is a very informative figure. It could be improved even further, by adding information on months and seasons by e.g. dashed vertical lines or shaded background.

*Thank you for the suggestion, we have now updated Fig. 1 to be more informative and have moved it to become Fig. 4 in the results:



"Figure 4: Total log transformed daily (a) burned area and (b) number of vegetation fires recorded in England between 2010–2020. Day of year on the x-axis is partitioned to show the calendar months (dashed lines) winter (DJF), spring (MAM), summer (JJA) and autumn (SON)."

2. L. 144 is this the best way to implement this? Wouldn't daily max. Temperatures be more informative? Or is this essentially the same value for most of the days.

*The standard implementation for calculating the Canadian Fire Weather Index System (CFWIS) components is to use noon values of surface variables (Van Wagner, 1987), this is what is used operationally (e.g., Vitolo et al. (2019)) and in existing datasets of the CFWIS available online (e.g., McElhinny et al. (2020)) so we used the same for comparability. Historically the reason for using noon values is an operational consideration, seeing as many weather stations reported values at noon local standard time. The CFWIS consequently uses the noon values to calibrate fire danger at the peak burning period.

3. L. 245 do these numbers refer to each grid-cell individually or are events defined based on some sort of spatial integration (all anomalous neighboring grid-cells are counted as one event)?

*They refer to events overall, which as you say are based on spatial integration of neighbouring cells. We define this in L187, which we have elaborated on slightly for clarity:

"We identified PPA events by tracking the geometric centroid of spatially contiguous PPA grid cells until they reached a minimum size of 40,000 km^2 after which we labelled it a PPA event."

4. This does not refer to the content, but rather to the way the paper is structured. Data and Methods sections seem to include some results already, which is why the results section is fairly short (mostly the figure, the figure caption and 1-2 sentences of description). The manuscript would be easier to follow if methods and related results were merged.

*We have now removed the study region section of the methods, moving the relevant introductory context to a new section of the introduction that describes the fire situation in the UK (1.2 Vegetation fires in the UK) and moving the figure and associated summary of wildfire statistics to a new section of the results (3.3 Vegetation Fires in England).

"1.2 Vegetation fires in the UK

Vegetation fires are a semi-natural hazard in the UK as ignitions are almost entirely anthropogenic (Gazzard *et al.* 2016). Human use of fire on the landscape has been a traditional practice for centuries in the UK, particularly as a tool for land management and habitat creation, and fire can bring positive ecological benefits (Belcher et al., 2021); however, there is evidence that the risk of severe vegetation fires is increasing (Arnell et al., 2021; Belcher et al., 2021; Perry et al., 2022). In the UK, Fire and Rescue Services Wildfire Operational Guidance defines a vegetation fire incident as 'any uncontrolled vegetation fire that requires a decision or action regarding suppression' (Scottish Government, 2013). Currently, this does not impose a minimum size threshold on the definition of a vegetation fire, and indeed wildfires do not need to be large to be impactful (Belcher et al., 2021; Kirkland et al., 2023; Stoof et al., 2024). The UK has a high population density of 280 people per square km, compared to traditionally fire prone countries like Australia (3 people per square km), Canada (4 people per square km) and USA (36 people per square km) (World Bank, 2022). This means that natural landscapes are highly fragmented and lack the fuel continuity to generate massive burned areas, and fires tend to be detected quickly. Moreover, a high population density means that a high proportion of fires occur in the interface between people, infrastructure and environment. Vegetation fires in these areas can threaten lives and property, despite their often small size (Graham et al., 2020; John and Rein, 2024; London Fire Brigade, 2023). Critically, vegetation fire preparedness still lags behind other countries and response capabilities can be overwhelmed in extreme conditions (John and Rein, 2024; Climate Change Position Statement, 2025; Pandey et al., 2023)."

"3.3 Vegetation fires in England

On average, over 30,000 vegetation fires are recorded in England annually, the majority of which are less than 1 ha, but episodic larger fires also occur (nearly 13,000 fires > 1 ha between 2010–2020). The number of recorded fires is highest within built-up areas and gardens, followed by arable, grassland, and woodland land covers. However, the majority of burned area in England occurs in heathland/moorlands and grasslands (Forestry Commission, 2023). England experiences two main fire seasons, one in spring when shrub fuel moisture is lowest following winter dormancy and prior to green-up, and a secondary season in mid-to-late summer (Fig. 4; Fig. S5; Belcher *et al.* 2021).

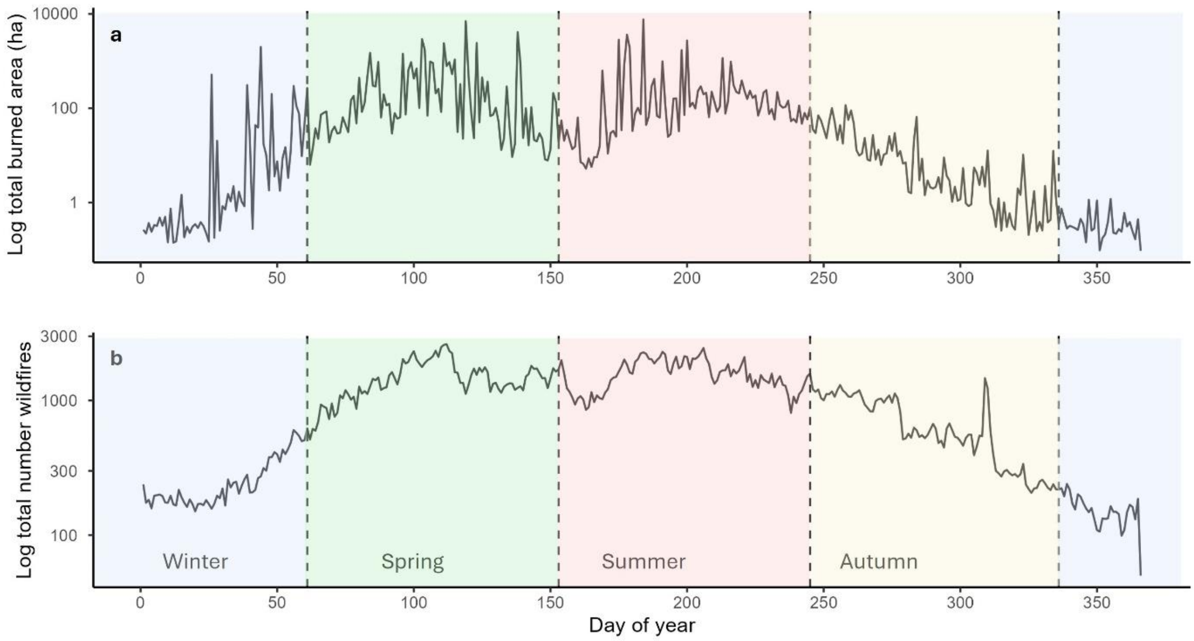
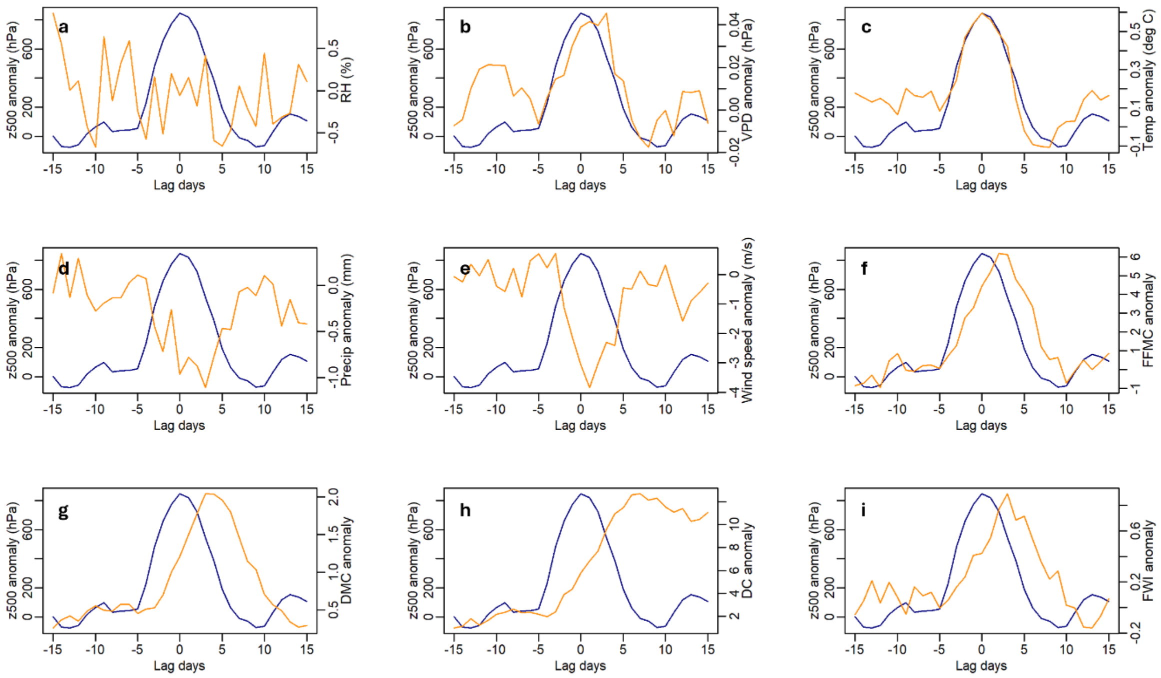


Figure 4: Total log transformed daily (a) burned area and (b) number of fire occurrences recorded in England between 2010–2020. Day of year on the x-axis is partitioned to show the calendar months (dashed lines) winter (DJF), spring (MAM), summer (JJA) and autumn (SON)."

5. Figure 3. It would be helpful (also for the description of the results in the paragraph before and for the caption) to have the subplot labeled with e.g. letters a-i. Abbreviations should be written out fully in the caption.

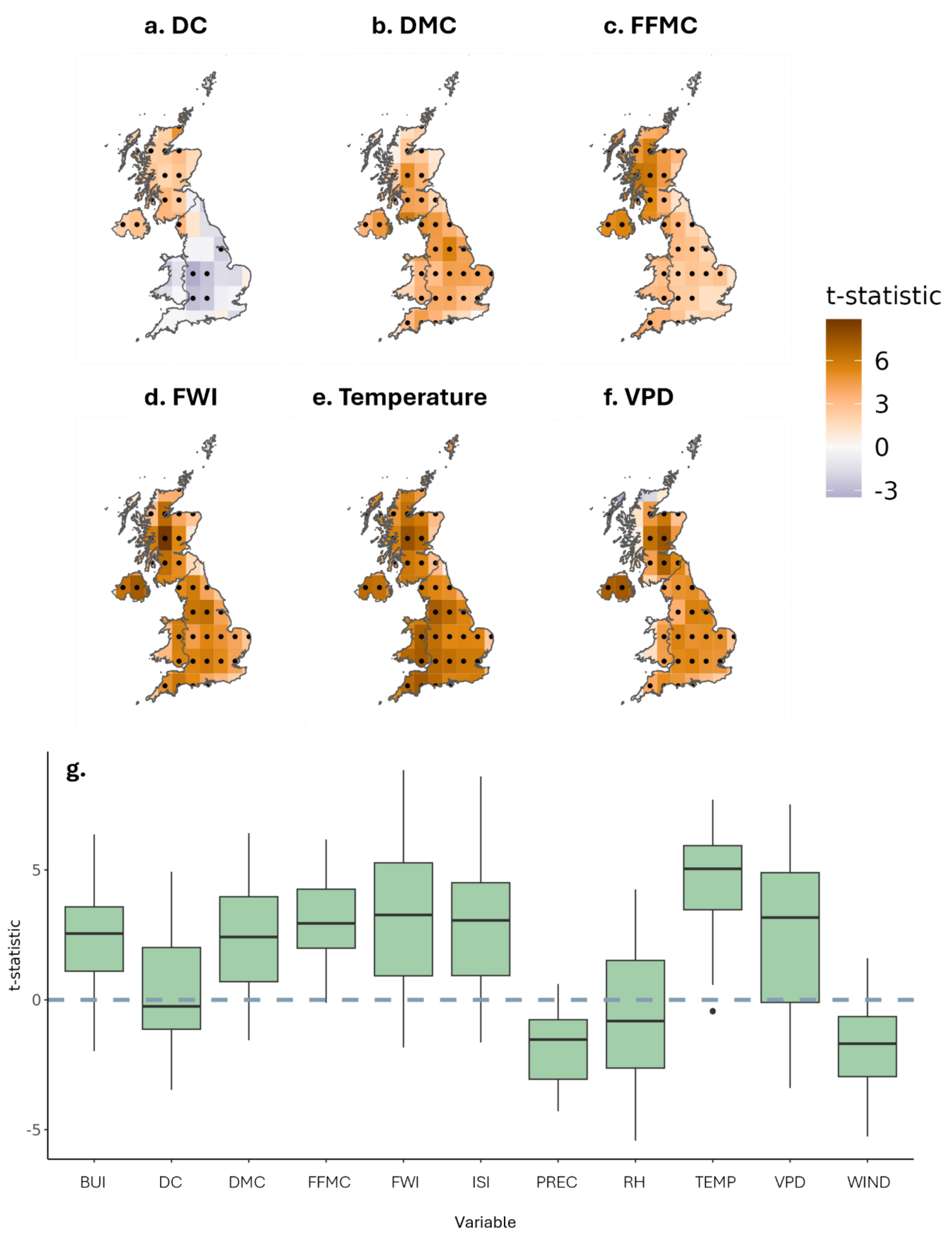
*Thank you for this suggestion, we have updated Figure 3 to be clearer (note, this is now Figure 2 in the revised manuscript).



"Figure 2: Lead-lag relationship between PPA strength and surface anomalies. Blue line = z500 geopotential height anomaly for PPA strength with maximum strength on day 0. Orange line = average surface anomaly for the maximum PPA strength area 15 days either side of maximum PPA strength for (top left to bottom right) (a) noon relative humidity, (b) maximum vapour pressure deficit, (c) noon temperature, (d) 24-h accumulated precipitation, (e) noon wind speed, and (f) FFMC, (g) DMC, (h) DC, and (i) FWI anomalies."

6. Figure 4. The subplot labeling and the figure caption could be made more intuitive by labeling each plot separately. Abbreviated variables should be written out. A clear description of what the boxplot boundaries, whiskers and dots refer to is missing.

*We have also updated Figure 4 to address this lack of clarity (note, this is now Figure 3 in the revised manuscript).



"Figure 3: (a–f) t-statistic for linear regression models comparing anomalies of the Canadian fuel moisture codes (a) drought code (DC), (b) duff moisture code (DMC), and (c) fine fuel moisture code (FFMC) (d) the overall Canadian fire weather index (FWI); (e) daily noon temperature; and (f) daily max vapour pressure deficit (VPD) during PPA days compared to non-PPA days for each 1x1 grid cell over the UK in June. All months and variables are shown in Fig. S2–S3. t-statistics > 0 (orange) show grid cells where surface anomalies are higher when there is a PPA present (larger t-statistics indicate a larger difference between PPA and non-PPA days). t-statistics < 0 (purple) show grid cells where surface anomalies are lower on PPA days. Significant differences ($P < 0.05$) are marked by a dot in the corresponding grid cell. (g) Boxplots showing the range of t-statistics for grid cell linear regression models of surface variable anomalies between PPA and non-PPA days across the UK in

June (For each boxplot, the centre line is the median, the box is the interquartile range, dots are outliers, and the upper and lower whiskers are maximum and minimum values, respectively). From left to right, the variables presented are the Canadian Fire Weather Index System build-up index (BUI), drought code (DC), duff moisture code (DMC), fine fuel moisture code (FFMC), fire weather index (FWI), and initial spread index (ISI); and daily total precipitation (PREC), daily noon relative humidity (RH); daily noon temperature (TEMP); daily maximum vapour pressure deficit (VPD); and daily noon wind speed (WIND). t-statistics > 0 indicate larger positive anomalies when there is a PPA present. Boxplots for all months shown in Fig. S4."

7. I would suggest to merge the conclusions into the discussion section and possibly add a bit more context.

*After considering your comment, we have opted to remove the conclusion section (which wasn't really adding anything) in favour of rounding out the last section of the discussion on implications to come back to PPAs:

"The UK does not have a fire danger rating system although the Met Office Fire Severity Index (MOFSI), an adaptation of the Canadian FWI, is used to trigger land closures in England and Wales during the most extreme conditions (England and Wales Fire Severity Index, 2023). The evolution of PPA events through 500 hPa geopotential height forecasts could be tracked to identify periods of sustained elevated fire weather that may challenge or overwhelm available resources for fire management (Jain et al., 2024). Synoptic indicators of elevated wildfire danger periods would therefore provide significant benefits for near-to-medium range wildfire preparedness and awareness in emerging fire-prone regions like the UK where tailored assessments of fire danger do not yet exist."

Major:

1. How are PPA events being associated with surface anomalies? Are relationships being quantified for events that are detected over the same grid-point, during the same time period only? How are the lead lag relationships accounted for and how are vertical shears in PPAs and surface response integrated in the regression shown in Fig. 4?

*We look at the association between PPA events and surface anomalies in multiple ways. Figure 2 in the revised manuscript looks exclusively at lagged variables, which presents a composite of spatially averaged surface anomalies for the area of the PPA at maximum strength for 15 days prior to and following maximum PPA strength. This shows the response of surface anomalies to the evolution of PPA events. We then conduct the linear regression analysis for differences in surface anomalies for each grid cell monthly on days there is a PPA present over the grid cell compared to days where there is no PPA present, for the same time period 2001–2021 (note this is now Fig. 3 in the revised manuscript). The inclusion of the FWIS indices accounts for lagged weather in this analysis through the time lags applied to the fuel moisture codes FFMC (16-h), DMC (15 days), and DC (52 days). Because PPAs are defined by a single level of 500 hPa geopotential heights, it is not meaningful to discuss vertical shears in PPAs.

2. The Dataset is fairly short for a trend analysis, but it would be very insightful to acknowledge and assess changes in wildfire characteristics over the past decade(s). Have increased temperatures, precipitation or landcover changes led to significant increases (or decreases in regional wildfires?). An increased threat from Wildfires to the UK is mentioned in l.363 but is not backed up with any quantitative results.

*As you state, the dataset is short for a trend analysis and a presentation of wildfire statistics for the UK has already been published in Forestry Commission (2023) "Wildfire statistics for England: Report to 2020-21" so we do not look to comprehensively cover this topic within this paper and instead reference previous studies to support these statements. However, a trend analysis would be very interesting to consider within future work looking at surface fire weather and wildfires in the UK, and we will look to take this comment onboard in future work.

3. Various fire weather indicators were calculated in this study. Which indicator is best suited to predict actual fires in the UK?

*This is a very interesting question that is being considered in an ongoing study that focuses more on the actual vegetation fire dataset and surface fire weather in the UK. We agree that there is a need to clearly establish the relationship between surface fire weather and vegetation fires in this manuscript but wish to keep the focus of the manuscript on the core PPA analysis and prevent the manuscript from becoming overly long. We propose to include a section within the results presenting the distribution of fire weather indicators for vegetation fire occurrences by season and fire size, to show the following: (1) surface fire weather is anomalously high when vegetation fires occur, (2) surface fire weather is highest for larger fires, (3) there are differences in which indicators are higher during vegetation fires, namely the FFMC in spring compared to the DC and BUI in summer. The stronger performance of the FFMC in spring compared to the FWI in summer is supported by previous research, which we have added references to in the discussion section.

"3.4 Surface fire weather and vegetation fire occurrence across England

Surface fire weather, as indicated by the CFWIS indices, tends to be anomalously high when vegetation fires occur in England (Fig. 5). This is true for both spring and summer fires less than and greater than 50 ha, though fire weather anomalies are highest for larger fires in summer. In spring, the FFMC is the most elevated when vegetation fires occur, while the other indices are distributed around the average or slightly above average in the case of the FWI. In summer, the DC and BUI are anomalously high when vegetation fires occur and the FWI is positively skewed for large fires but not fires < 50 ha.

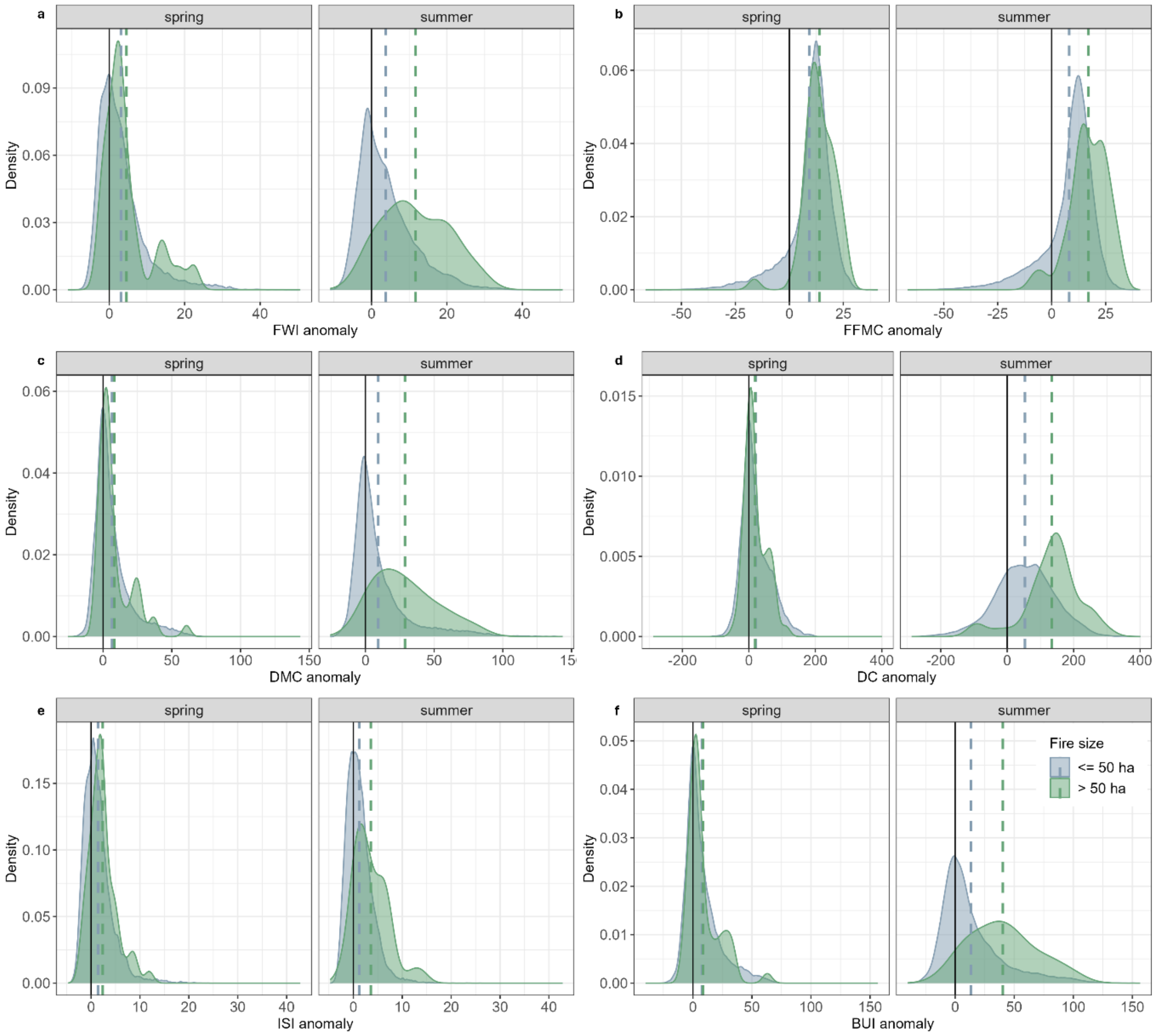


Figure 5: Density plots showing the distribution of the Canadian Fire Weather Index System indices anomalies: (a) FWI, (b) FFMC, (c) DMC, (d) DC, (e) ISI and (f) BUI for spring (left subpanel) and summer (right subpanel). Distributions are presented for fires less than or equal to 50 ha (blue fill shows the distribution, dashed blue vertical line shows the mean value) and fires greater than 50 ha (green fill shows the distribution, dashed green vertical line shows the mean value). The black vertical line at zero separates positive anomalies (indices are higher than average during fires) from negative anomalies (indices are below average during fires). Note the independent axes labels for readability."

Addition to the discussion in Section 4.2:

"To date, the dual spring and summer fire seasons have been a major challenge for predicting fire weather in the UK as the fuels burning and their drivers differ seasonally (Belcher et al., 2021). Surface fire weather indices like the FWI subcomponent of the CFWIS perform reasonably well in summer but fail to capture the spring fire season (Davies and Legg, 2016; de Jong et al., 2016; Nikonovas et al., 2024), while phenological indicators (for example, vegetation greenness indices like the Enhanced Vegetation Index 2 (EVI2) (Nikonovas et al., 2024)) improve spring fire season predictions but do not capture the heatwave events during summer that can lead to extreme drying of live fuels (Ivison et al., 2024; Nikonovas et al., 2024). It is important to consider all available tools to accurately predict different periods of fire danger, including surface variables like weather, landcover, and phenology, but also synoptic indicators."