Author response to reviewer and public comments for Brief Communication: Differences between Sundowner and Santa Ana wind regimes in the Santa Ynez Mountains, California" by Benjamin J. Hatchett et al.

Responses to reviewer comments are given in **bold**
New or changed text is given in *italics* (***bold italics*** for emphasis where noted)

Interactive Comments from Clive Dorman (SC1)

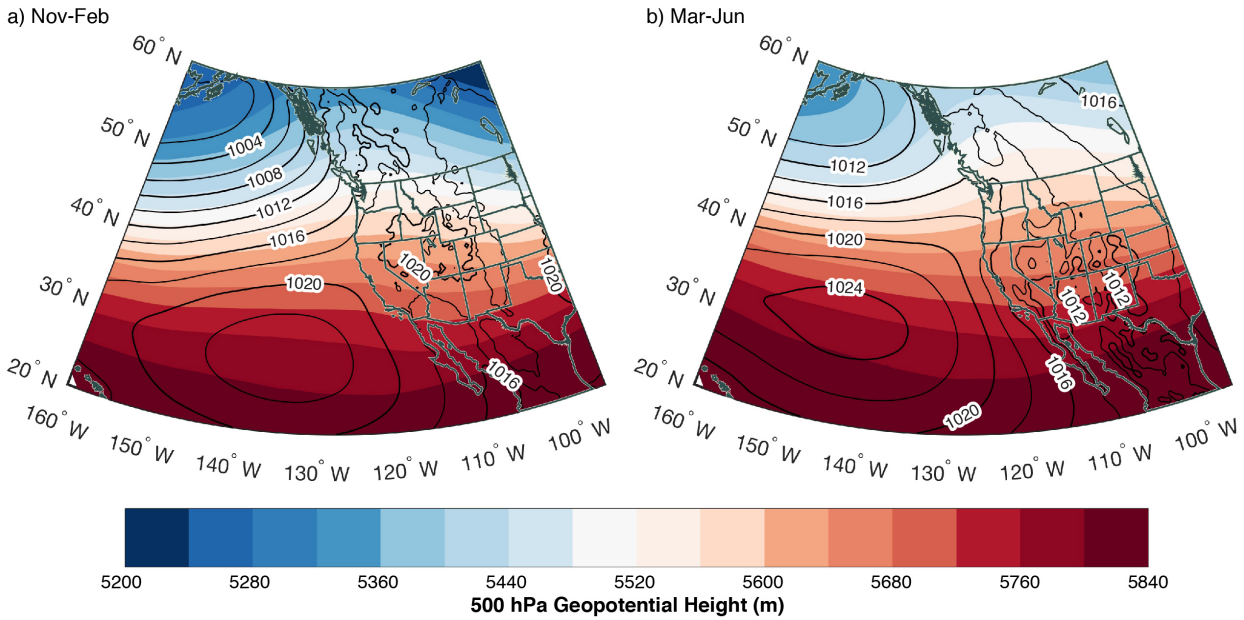
A. General 1. This manuscript is a nice, crisp presentation of the sundowner and the Santa Ana. The differences between them are clear and convincing. The figures are very well done, informative and attractive.

We appreciate the commenter's positive remarks regarding our paper and their subsequent constructive criticism.

2. I would like to see added the mean 500 hPa and mean sea level pressure for both winter and summer. I need to compare with the individual sundowner mean with the seasonal mean of all events and same for the Santa Ana. The result should be that the sundowner, the Santa Ana and the seasonal mean have standout differences that appear significant. The Sundowner + Santa Ana for a season is not as effective for me and is rather like taking the mean of olives and oranges with the final result being dominated by the heavy which is not as useful.

Our intent with the SA+SD plot was to show that when sundowners and Santa Anas coincide, the synoptic setup is similar to Santa Ana events whereas when only Sundowners are observed, there is a markedly different synoptic setup. This may help those interested in forecasting these events or explaining regional wind regimes in southern California. We added this text to our introduction:
"Sundowners that coincide with SAWs are hypothesized to demonstrate similar synoptic patterns to SAW-only events."

We added the Nov-Feb and Mar-Jun 500 hPa and SLP seasonal means as a supplementary figure (Figure S1) for easy reference (also noted by Reviewer 2):



"Figure S2: Seasonal mean 500 hPa geopotential heights (filled contours, contour interval 40 m) and sea level pressures (contours every 2 hPa, thicker contours show 4 hPa intervals) for extended winter (a) and extended spring (b)."

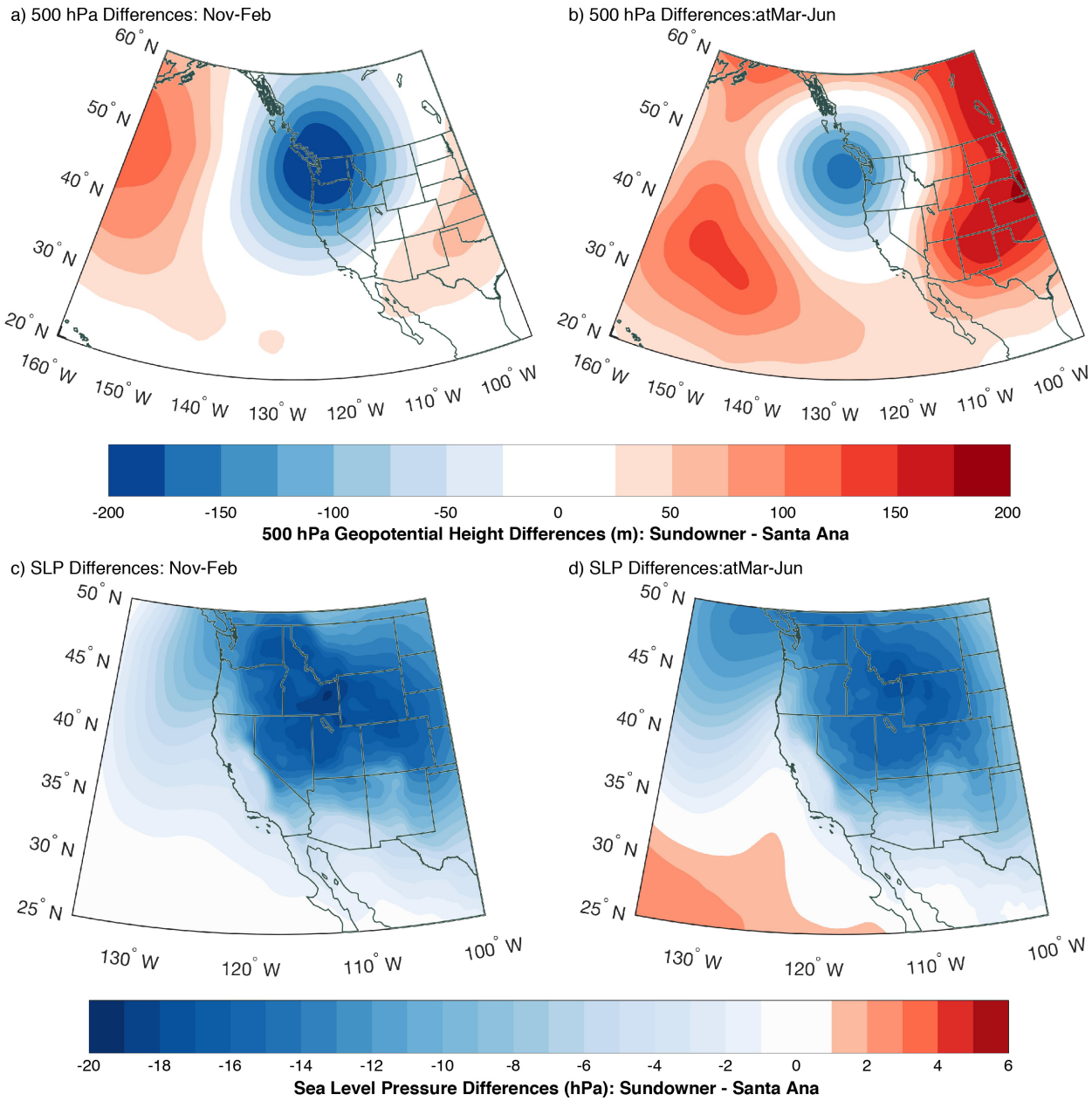
3. While the sundowner and Santa Ana means look significant, it would be good if there was a way to say so other than just by eye. However, I am not sure how this might be done.

This is a good suggestion and we have now calculated the Sundowner minus Santa Ana Only mean differences (500 hPa geopotential heights shown in the top row (a and b) and SLP shown in the bottom row (c and d)) for each season.

These have been added to the supplementary material as Figure S2. These nicely show that the Sundowners have lower 500 hPa heights centered along the Washington/British Columbia coast (on the order of 100-200 m) and higher heights (50-100 m) further east and west of this region than do Santa Ana only events. Sundowners also show much lower inland sea level pressures compared to Santa Ana Only events (>-12 hPa).

We added the following text:
"For comparison, seasonal means of geopotential height and MSLP and differences between Sundowner-only and SAW-only for these fields are both provided in the supplementary material (Figures S2 and S3, respectively.)"

New plot shown below:



"Figure S3: 500 hPa geopotential height differences between Sundowner Events and Santa Ana Only events during extended winter (a) and extended spring (b). Contour interval is 25 m. (c-d) As in (a-b) except for sea level pressure differences. Contour interval is 1 hPa."

B. Specific Comments:

1. Page 3, Lines 7-8. "The hourly SAW index used for comparison against our Sundowner climatology was developed for southern California by Guzman-Morales et al. (2016) using output from a dynamically downscaled regional climate model." More should be given on this index so that the reader understands what variables Guzman-Morales et al. (2016) used and

how they are applied. This way the reader does not have to go to the reference to dig out this key aspect. Briefly elaborate how this index was actually applied for this manuscript as has been done for Sundowners (starting page 2, line 27, ending page 3, line5).

Thank you for the suggestion. We have added an additional two sentences detailing how Guzman-Morales et al. (2016) calculated their Santa Ana Wind index to aid the reader in understanding their work (also noted by Reviewer 2).

New text in italics:

"The hourly SAW index used for comparison against our Sundowner climatology was developed for southern California by Guzman-Morales et al. (2016) using output from a dynamically downscaled regional climate model *at 10 km horizontal resolution. Guzman-Morales et al. (2016) defined SAWs at each grid cell by first identifying winds with a negative u-component (between 0 and 180°) that exceeded the upper quartile of wind velocities at this cell. To be categorized as a SAW event, they required a 12-hour period of continuous winds that had at least one hour when velocity exceeded the grid cell velocity threshold. They allowed discontinuities of up to 12 hours to account for breaks in SAWs, and their index reflects the regional average wind speed during periods of time that satisfied the direction-magnitude-continuity study design.*"

2. Page 3, line 23, cite a reference for the August-Roche-Magnus approximation

We have added a citation for this calculation (also noted by Reviewer 1):

Added citation:
"Lawrence, M.G.: The Relationship between relative humidity and the dewpoint temperature in moist air: A simple conversion and applications. Bull. Amer. Meteor. Soc., 86, 225–233, https://doi.org/10.1175/BAMS-86-2-225, 2005."

3. Page 4, Lines 24-29: "The similarity in 500 hPa geopotential height patterns between the two SAW regimes supports the hypothesis that coinciding SAW and Sundowner events are dynamically linked. This linkage likely results from the large-scale thermal gradient and momentum fluxes resulting from the amplified ridging that produces broad offshore flow and downslope warming throughout southern California (Hughes and Hall 2010). The lack of highly amplified flow during Sundowner-only events suggests that these events are synoptically distinct from the conditions characterizing SAWs."

Comment: I am not sure of the intent here. This text seems to be conflicting.

We understand the reviewer's confusion and have attempted to more clearly explain the similarities in the two SAW regimes versus the Sundowner-only regime, notably the midtropospheric wave patterns (Sundowner is zonal versus SAW is meridional).

New/altered text:
"The similarity in 500 hPa geopotential height patterns between the two SAW regimes supports the hypothesis that SAW and SAW+Sundowner events are both created by large-scale thermal gradient and momentum fluxes resulting from the amplified ridging that produces broad offshore flow and downslope warming throughout southern California (Hughes and Hall 2010). The more zonal conditions, during Sundowner-only events (Figure 3a,d) suggests that these events are synoptically distinct from the meridionally amplified conditions characterizing SAWs (Figures 3c,f)."

4. Page 5, Lines 27-29 "We postulate that for the Santa Ynez region, similar findings would occur for Sundowner events as Peterson et al. (2011) found for SAW events, i.e., Sundowner intensity should also explain variance in modeled fire size and likely fire growth rate given broad similarity in fuels, terrain, and climate. "

Comment: This sentence seems a little awkward and might be rewritten.

We have re-written the sentence to hopefully more clearly convey our idea here:
"*Further investigation of historical relationships between fires in this region and associated weather conditions can be clarified using mechanistic fire models driven by fine scale (>5 km) weather inputs (e.g., Peterson et al. 2011). Such an approach could also help to constrain the range of possible future shifts in fire frequencies and behaviors under varying scenarios of future land use change such as WUI growth, shifts in ecosystems in response to disturbance and climate, and climate itself.*"

However, due to the length constraints, we ended up removing this text and opted just for a citation of Peterson et al. (2011) in the summary:

"Such information could improve spot weather forecasts (Nauslar et al. 2016), evaluating future fire-weather-climate interactions *(Peterson et al. 2011)*, and aid mitigating fire hazard in the Transverse Ranges."

5. Page 11, Suggest adding the mean 500 hPa and sea level pressure mean charts for both seasons as note in the preceding General Comment.

Mean charts have been added as supplemental figures (see response to general comment above).

6. Page 11, Fig. 3a. ”Sundowner Only: Winter” Comment: ”Winter” should be Mar-Jun

Thank you for pointing this out. As the first row is for the Nov-Feb (extended winter), we altered the figure title accordingly (see response to comment 7 below for the new figure).

7. Page 11, Fig. 3a-f. Comment: Dashed lines are rather faint, hard to see. Suggest that they be made more bold.

Thank you for the suggestion. We have increased the line width of the dashed lines by 0.35 points. New figure: