

We thank the reviewers for their helpful comments. We have provided our responses to comments below in blue.

REFEREE 1

The authors have done a thorough and commendable job revising the manuscript based on my comments/suggestions, as well as those of Dr. Witte. I have just one minor comment regarding the southerly vs. northerly flow in the model output compared with the observations.

If the authors have any questions, please do not hesitate to contact me.

Zachary J. Lebo

Response: We thank Dr. Lebo for their positive response to our changes.

MINOR POINTS

I am still a bit concerned about the southerly vs. northerly winds shown in Fig. 2 from the model simulations compared with the differences shown in Table 3 from observations. The added note about the model not fully capturing the wind reversal is great, and it does help recognize that the model is perhaps a bit deficient here but at the very least the mechanics of the wind slowing are captured. One thing that comes to mind though about the difference between the observations shown in Table 3 and the model output shown in Fig. 2 is that perhaps there is a mismatch in the sampling of the vertical? The model output is averaged over the lowest 5 levels, does the complete lack of a wind reversal appear at all levels? I guess what I am after is trying to understand if the model predicts a change in the wind direction at some level or at some time, but when averaged spatially and temporally, the instances where the model does capture a reversal are overwhelmed by the instances where it does not.

Response: This is a great comment. We went back and did some digging, and found that across the first five vertical levels, the magnitude and directionality of the northward wind was pretty consistent for any given day. Any changes observed in magnitude and directionality for a given day were across the four times we investigated: 0000, 0600, 1200, and 1800 UTC.

Looking at all of the southerly wind days, there were some instances of southerly wind across a full day at all five vertical levels, namely in MACAWS and CSM. However, as you theorized, these days were overwhelmed by instances where southerly wind was not captured by the model.

To address this, we have added in some text to the manuscript:

L396-401: “Generally, NAAPS was not able to fully capture southerly winds over the ocean and along the coast in that v_{wind} was not clearly positive (i.e., not northward); however, when looking at southerly flow for individual campaigns, NAAPS was sometimes able to capture areas with

positive northward wind (i.e., southerly flow). When looking at the five vertical levels closest to the surface during periods when NAAPS was able to simulate positive northward winds, this feature was observed across all the levels, primarily along the coast near Marina, CA or south of 34° N at 1800 UTC, with lower wind speeds closer to the surface.”

L854-856: “During cases when there was known southerly wind, NAAPS was only sometimes able to represent it, which is a topic encouraged for pursuit in future work.”

We want to thank Dr. Lebo for bringing up this excellent question and believe that diving further into this topic would be a great aspect for a follow-up paper.

REFEREE 2

I thank the authors for their work in responding to my comments. My major concerns have been adequately addressed. A few more minor points have arisen in the revised version that I ask the authors to respond to, at which point I believe the manuscript will be suitable for publication.

MKW

Response: We thank Dr. Witte for the positive reply.

MINOR COMMENTS

Difference figures: We may have opened Pandora’s box a little with the colormap switch in figures 2 and S4, but it strikes me that the difference plots you show in many of the right columns of these and other multi-panel figures (Figs. S2, S5-10) would also benefit from a colormap that shows a “neutral” shade for “no difference.” Then you’d only be using the jet/rainbow colormap for scalar variables. I don’t think this is a requirement but I strongly encourage you to give it a try and see if it improves interpretability.

Response: We have updated the following figures to use colormaps with a “neutral” shade for the “Difference” panels of the following figures:

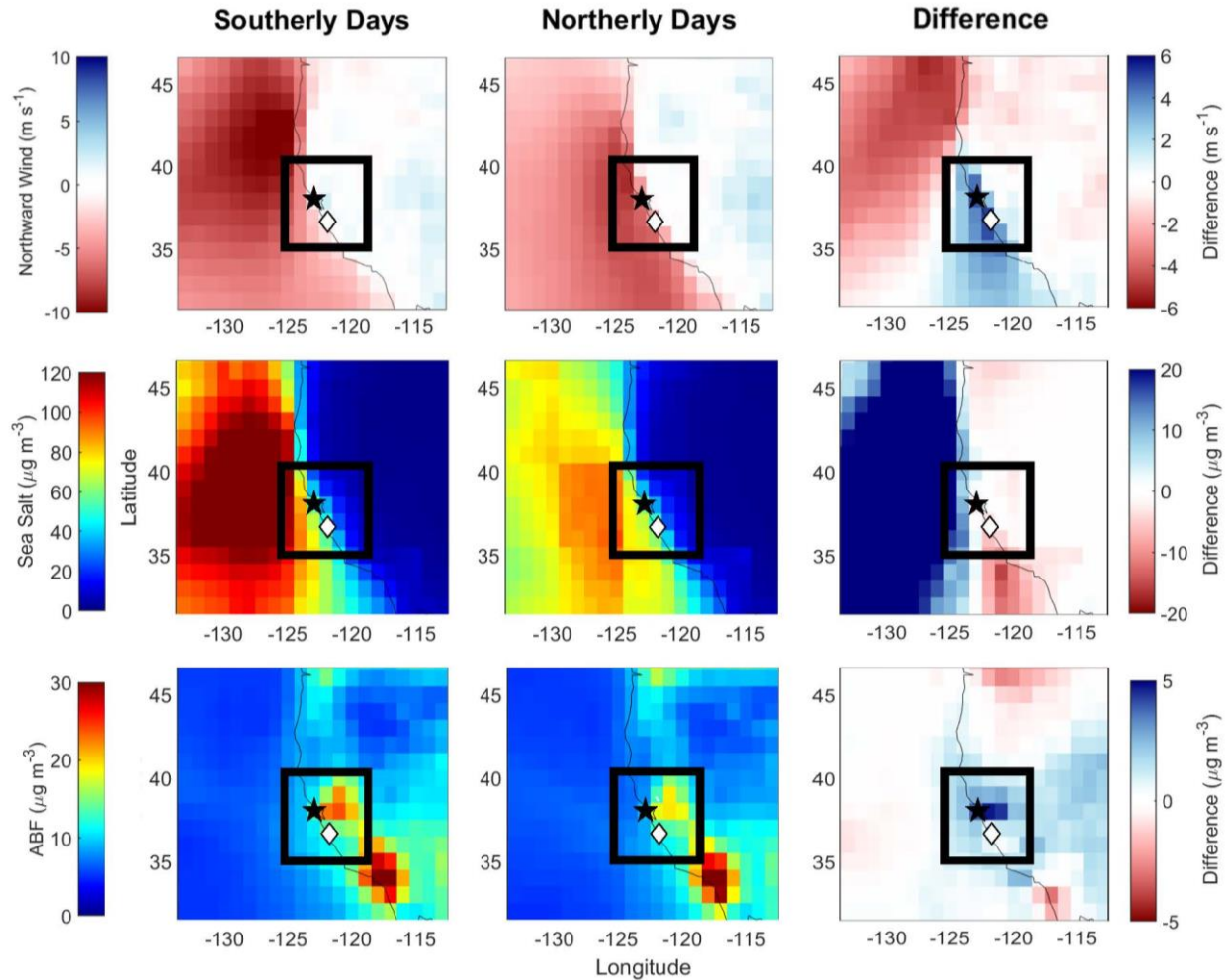


Figure 2: Average northward wind speed (v_{wind} ; m s^{-1}), total sea salt mass concentration ($\mu\text{g m}^{-3}$), and total ABF mass concentration ($\mu\text{g m}^{-3}$) of campaign months at 1800 UTC for 1st through 5th NAAPS levels (up to ~ 668 m above sea level) for southerly and northerly flow wind days. The right-most panel illustrates the difference between southerly and northerly flow days. The airbase in Marina, CA is denoted by a white diamond, Pt. Reyes is indicated with a black star, and the black box indicates the region of focus in this study.

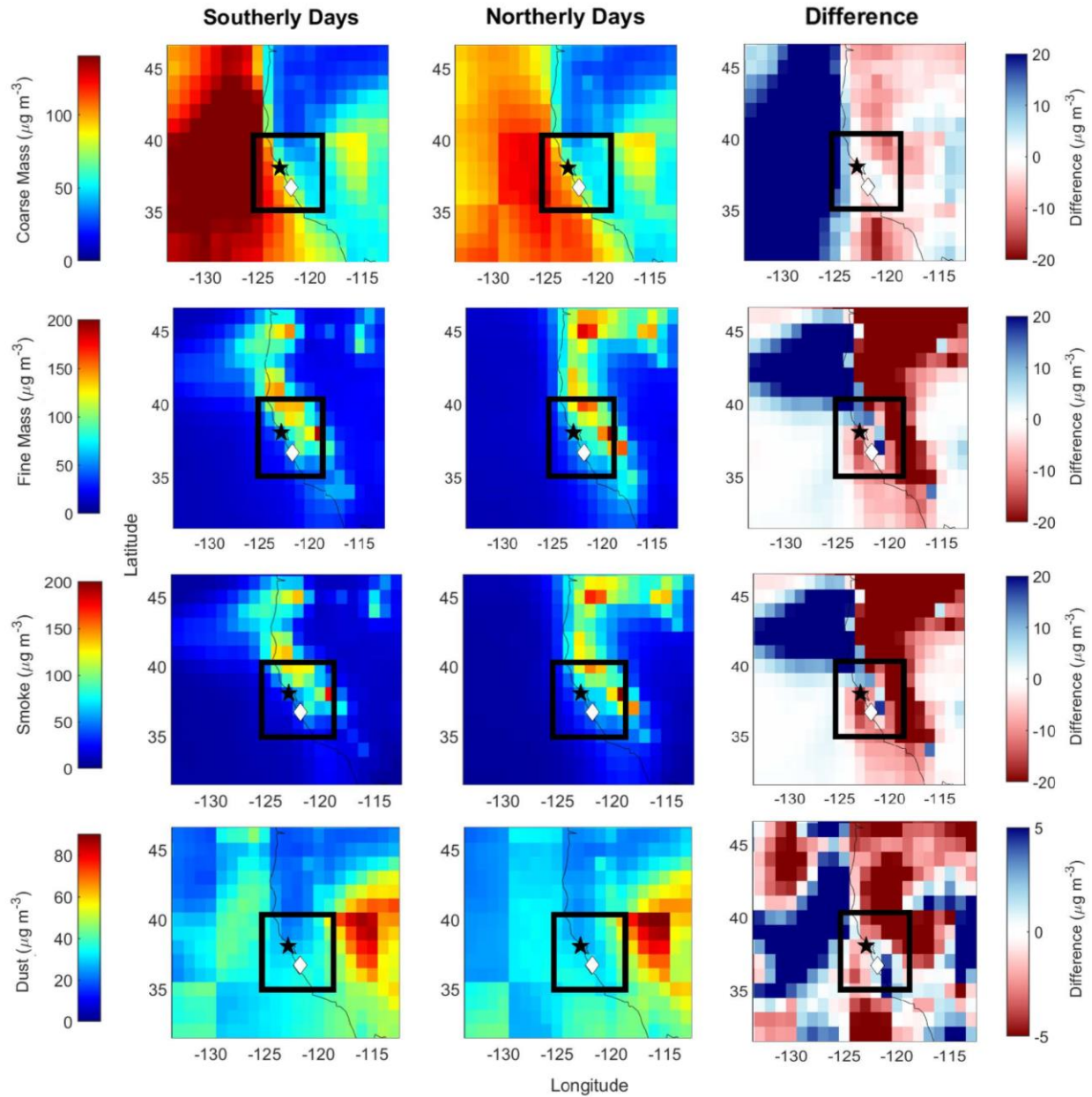


Figure S2: Total fine mass, coarse mass, smoke, and dust concentrations ($\mu\text{g m}^{-3}$) of campaign months at 1800 UTC for 1st through 5th NAAPS levels (up to ~ 668 m above sea level) for southerly and northerly wind days. The right-most panel illustrates the difference between southerly and northerly wind days. The airport in Marina, CA is denoted by a white diamond, Pt. Reyes is indicated with a black star, and the black box indicates the region of focus in this study.

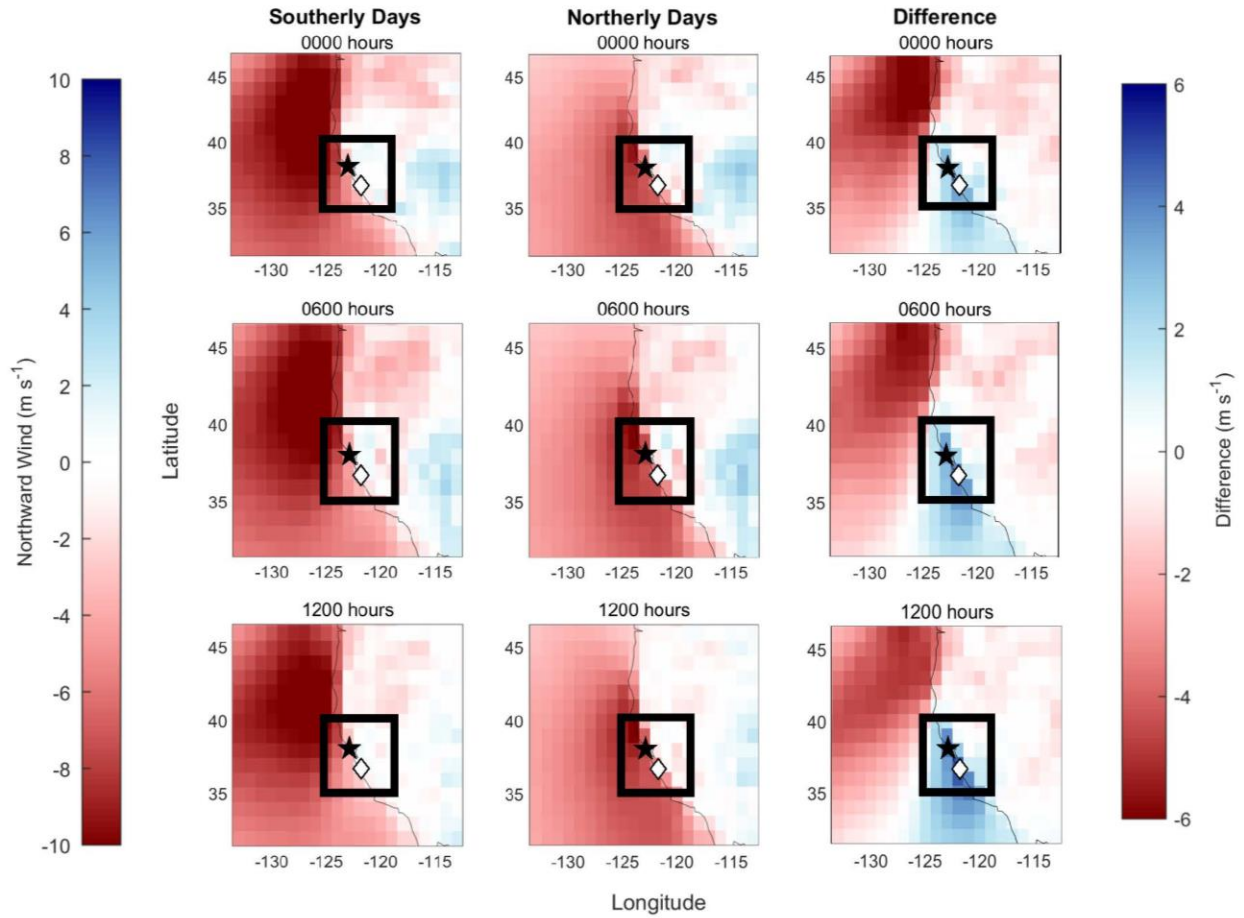


Figure S4: Average northward wind speed (v_{wind} : m s^{-1}) of campaign months (see Table 1) at 0000, 0600, and 1200 UTC for 1st through 5th NAAPS levels (up to ~ 668 m above sea level) for days identified as having southerly and northerly wind based on datasets described in Section 2.2. The color bar for the left two columns of panels can be interpreted as red values being for northerly flow and blue as southerly flow. The right-most panel illustrates the difference between southerly and northerly wind days. The airport in Marina, California is denoted by a white diamond, Pt. Reyes is indicated with a black star, and the black box outlines the region of focus in this study.

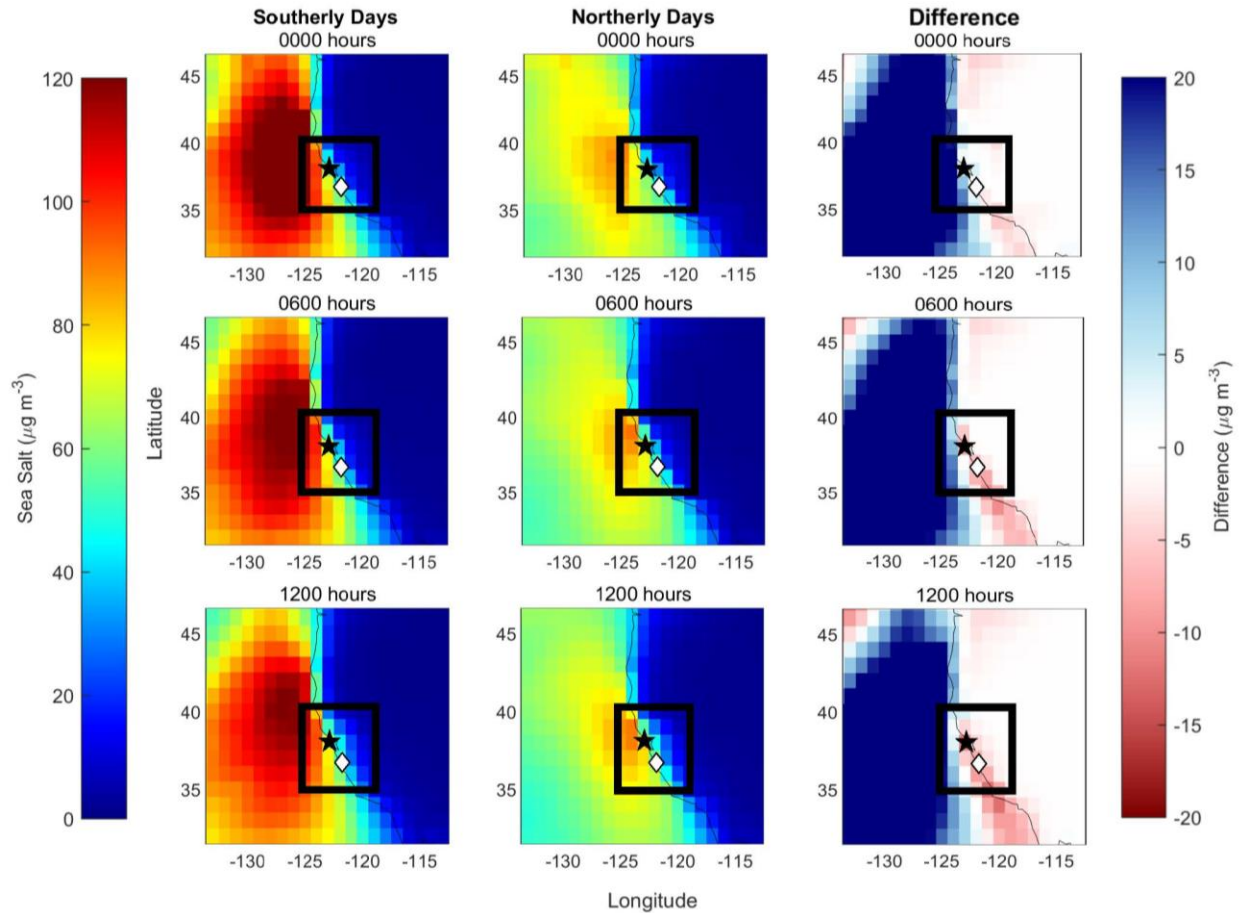


Figure S5: Total sea salt mass concentration ($\mu\text{g m}^{-3}$) of campaign months at 0000, 0600, and 1200 UTC 1st through 5th NAAPS levels (up to ~ 668 m above sea level) for days identified as having southerly and northerly wind based on datasets described in Section 2.2. The right-most panel illustrates the difference between southerly and northerly wind days. The airport in Marina, California is denoted by a white diamond, Pt. Reyes is indicated with a black star, and the black box indicates the region of focus in this study.

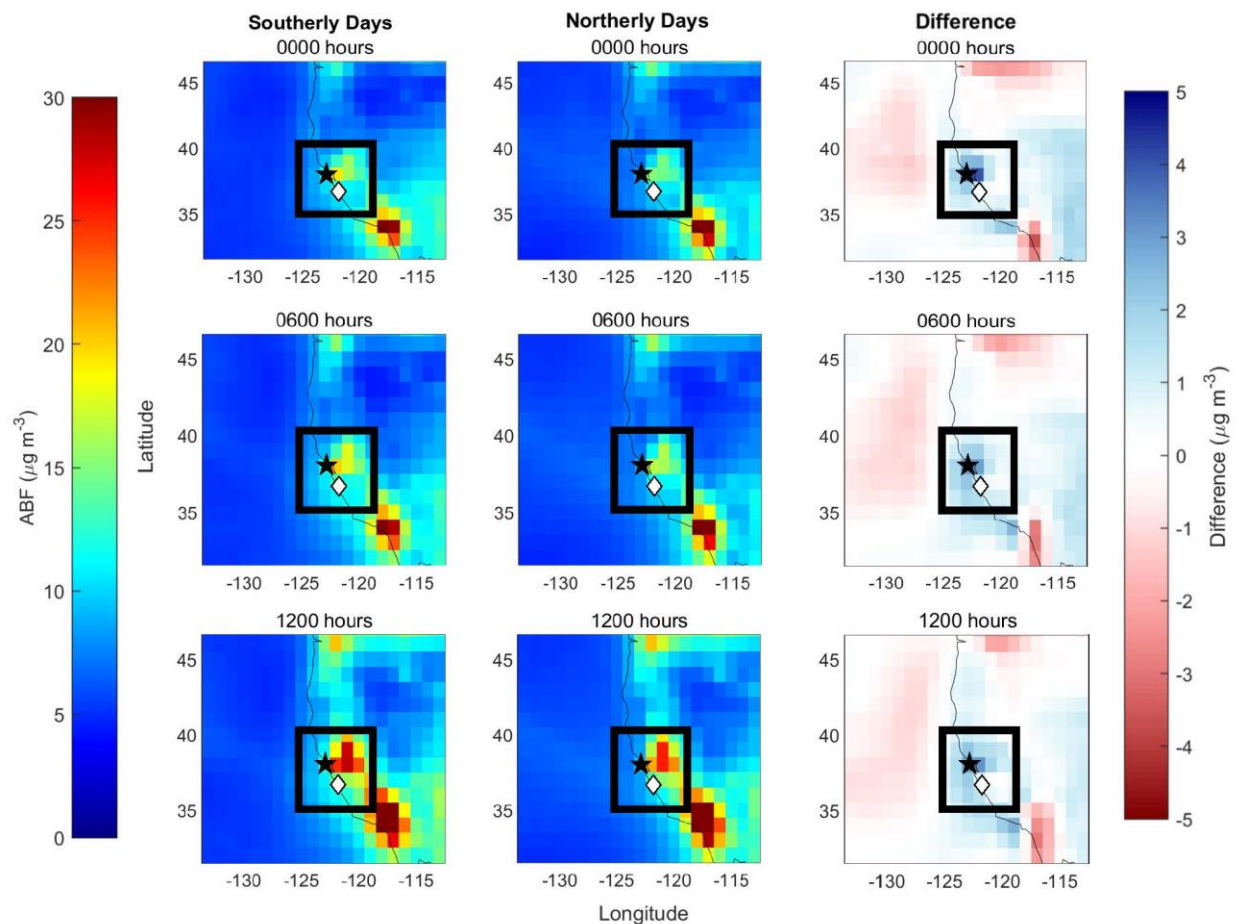


Figure S6: Total anthropogenic and biogenic fine (ABF) aerosol mass concentration ($\mu\text{g m}^{-3}$) of campaign months at 0000, 0600, and 1200 UTC 1st through 5th NAAPS levels (up to ~668 m above sea level) for days identified as having southerly and northerly wind based on datasets described in Section 2.2. The right-most panel illustrates the difference between southerly and northerly wind days. The airport in Marina, California is denoted by a white diamond, Pt. Reyes is indicated with a black star, and the black box indicates the region of focus in this study.

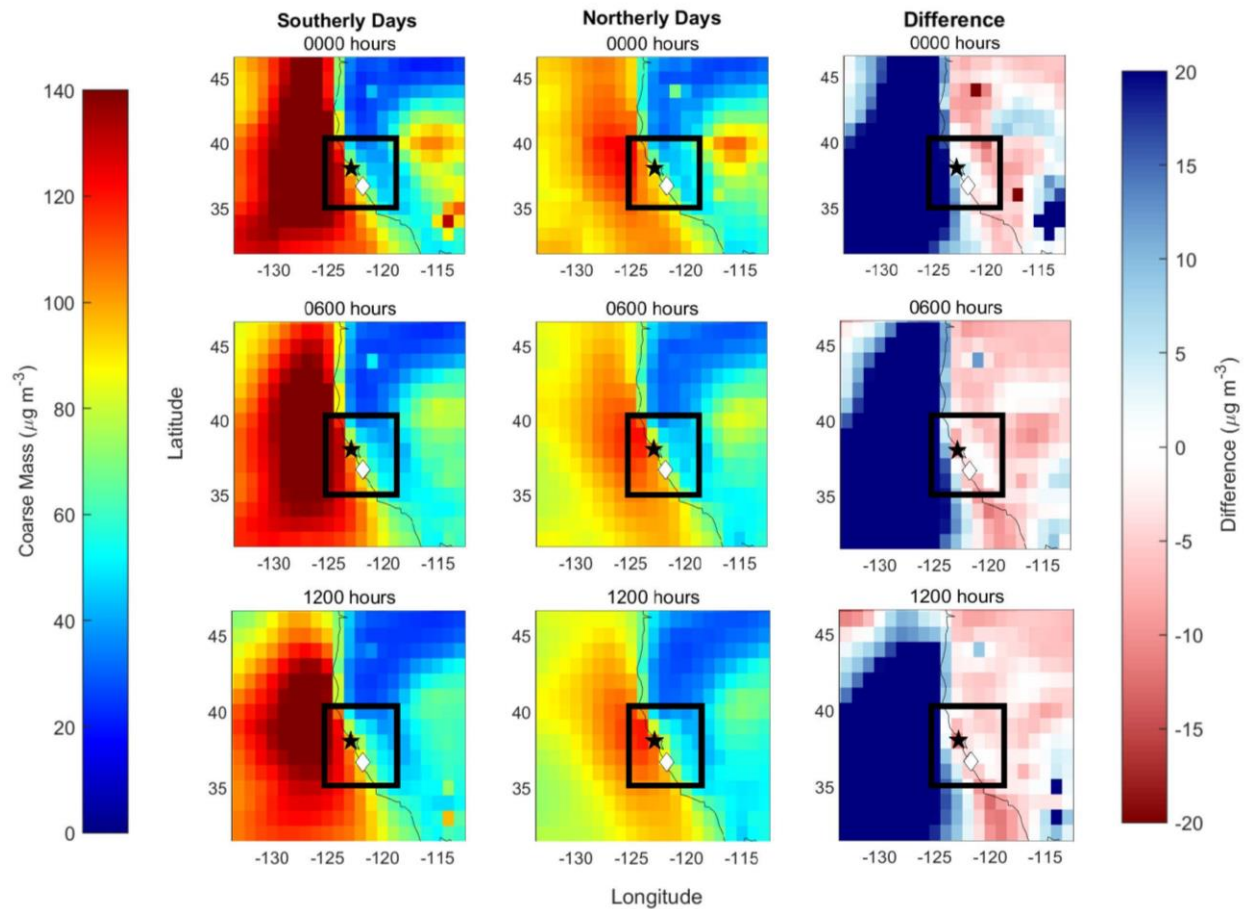


Figure S7: Total coarse mass concentration ($\mu\text{g m}^{-3}$) of campaign months at 0000, 0600, and 1200 UTC 1st through 5th NAAPS levels (up to ~ 668 m above sea level) for days identified as having southerly and northerly wind based on datasets described in Section 2.2. The right-most panel illustrates the difference between southerly and northerly wind days. The airport in Marina, California is denoted by a white diamond, Pt. Reyes is indicated with a black star, and the black box indicates the region of focus in this study.

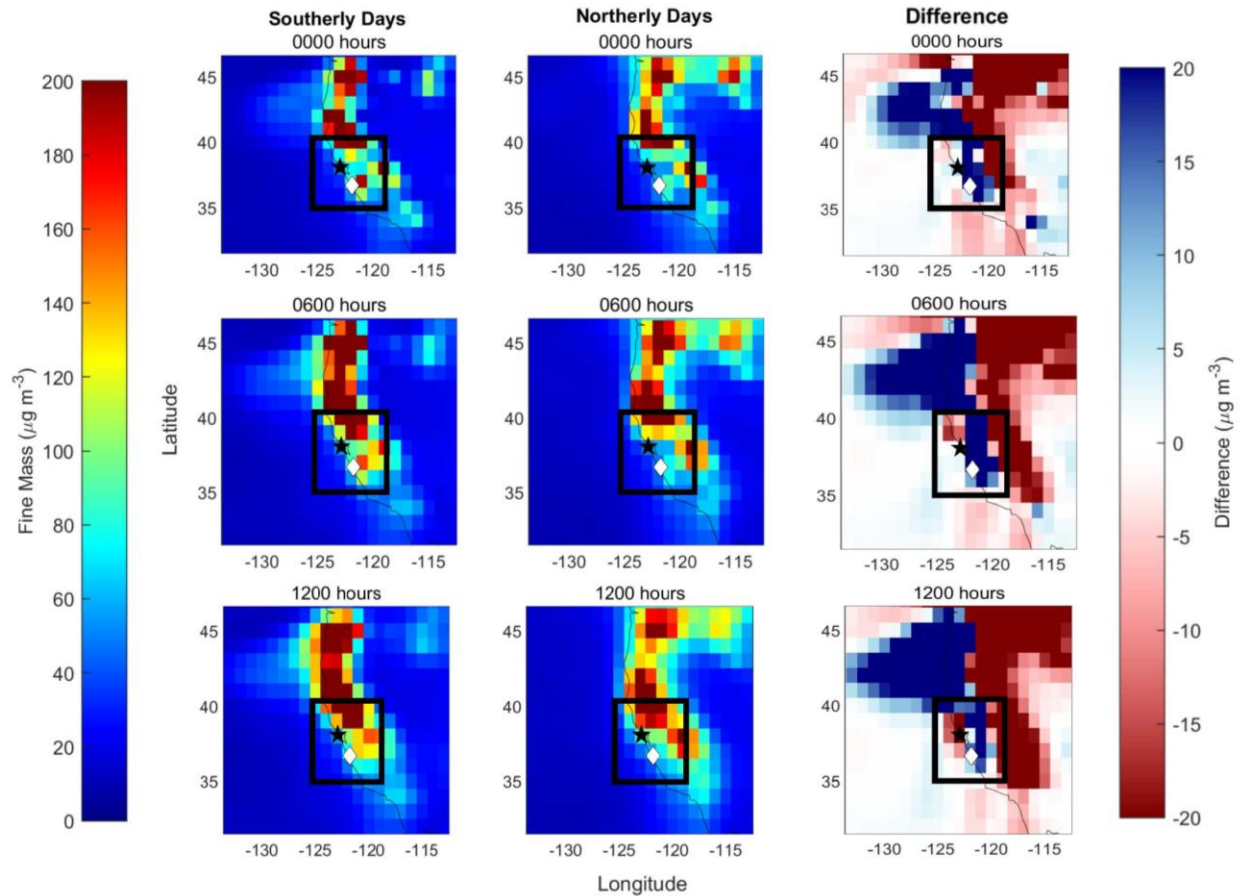


Figure S8: Total fine mass concentration ($\mu\text{g m}^{-3}$) of campaign months at 0000, 0600, and 1200 UTC 1st through 5th NAAPS levels (up to ~ 668 m above sea level) for days identified as having southerly and northerly wind based on datasets described in Section 2.2. The right-most panel illustrates the difference between southerly and northerly wind days. The airport in Marina, California is denoted by a white diamond, Pt. Reyes is indicated with a black star, and the black box indicates the region of focus in this study.

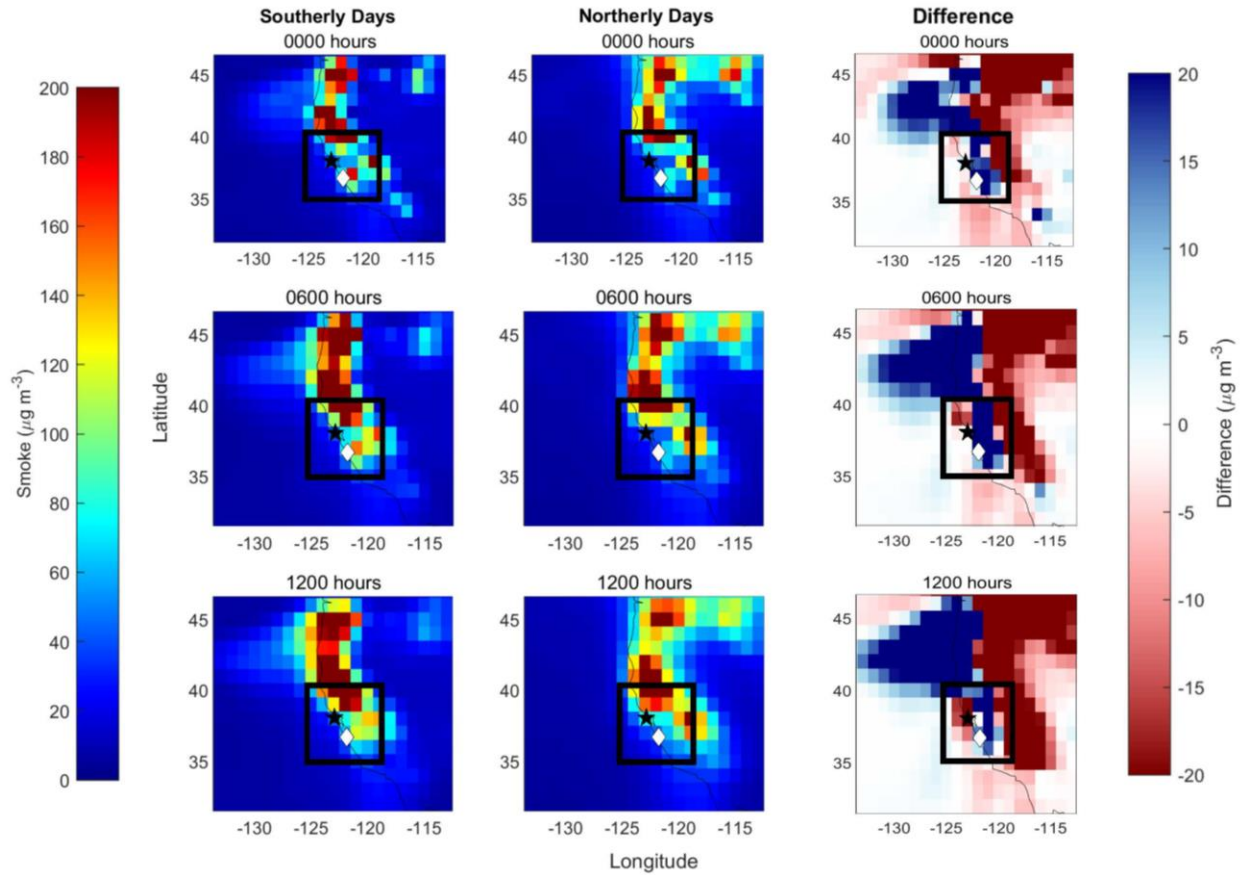


Figure S9: Total smoke mass concentration ($\mu\text{g m}^{-3}$) of campaign months at 0000, 0600, and 1200 UTC 1st through 5th NAAPS levels (up to ~ 668 m above sea level) for days identified as having southerly and northerly wind based on datasets described in Section 2.2. The right-most panel illustrates the difference between southerly and northerly wind days. The airport in Marina, California is denoted by a white diamond, Pt. Reyes is indicated with a black star, and the black box indicates the region of focus in this study.

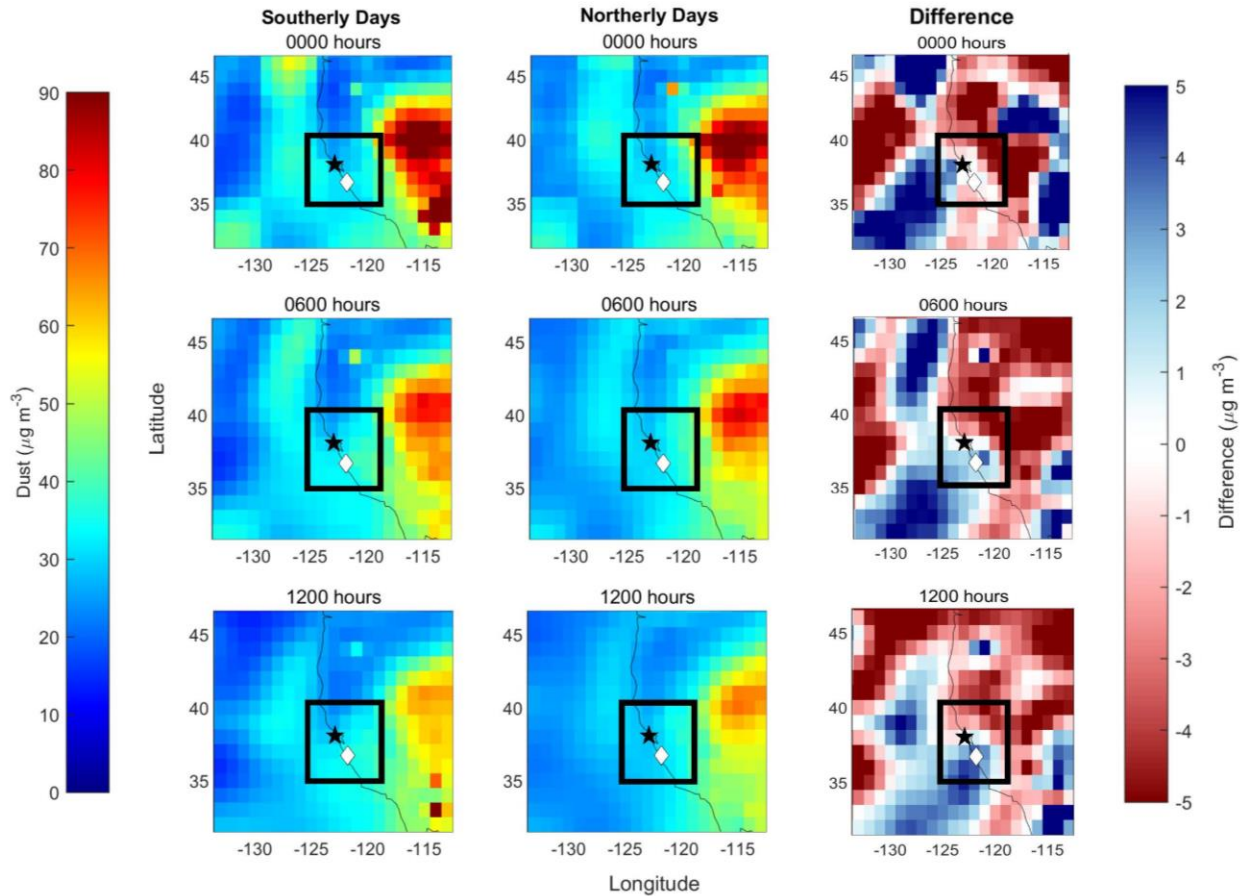


Figure S10: Total dust mass concentration ($\mu\text{g m}^{-3}$) of campaign months at 0000, 0600, and 1200 UTC 1st through 5th NAAPS levels (up to ~ 668 m above sea level) for days identified as having southerly and northerly wind based on datasets described in Section 2.2. The right-most panel illustrates the difference between southerly and northerly wind days. The airport in Marina, California is denoted by a white diamond, Pt. Reyes is indicated with a black star, and the black box indicates the region of focus in this study.

Boundary layer flow figures (S13-15): These are a great addition. I have a suggestion based on my own experience making these kind of plots – instead of having the quivers show wind speed and direction, use line contours for wind speed and use the arrows to show only the wind direction. You can use the same plotting function to show wind direction, just normalize by vector magnitude so all the arrows are the same length. This is helpful because the southerly flow is often rather weak, so the tiny arrows force the reader to zoom to something crazy like 300% to be able to confirm that, yes, there is indeed a slight southerly component by the coast.

Response: This is a great suggestion. We have adjusted Figures S13-15 accordingly:

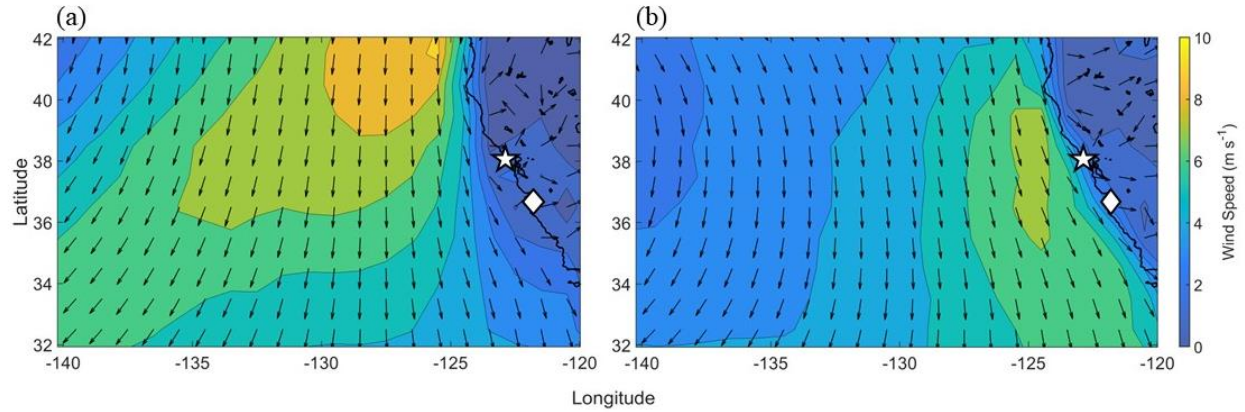


Figure S13: NAVGEM boundary layer flow patterns for (a) all southerly flow days and (b) all northerly flow days included in this study. These results are for 1800 UTC for all days of the campaign months in Table 1 as was done for Figs. S4-S10; the lowest level of the model was used representing the lowest ~50 m. The airport in Marina, California is denoted by a white diamond and Pt. Reyes is indicated with a white star.

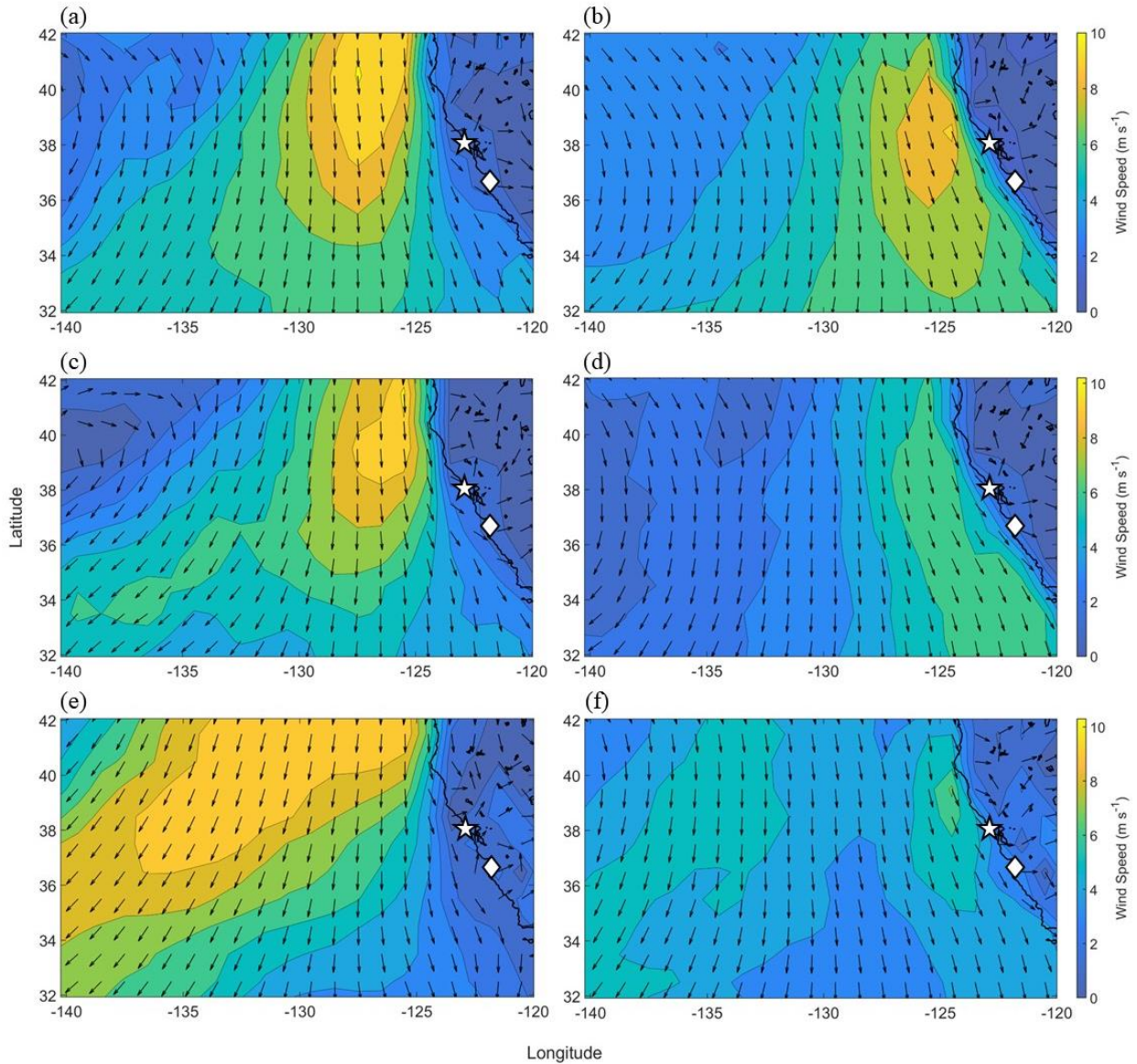


Figure S14: NAVGEM boundary layer flow patterns for (left) southerly and (right) northerly flow days during (a-b) E-PEACE, (c-d) NiCE, and (e-f) BOAS. These results are for 1800 UTC for all days of these respective campaign months in Table 1; the lowest level of the model was used representing the lowest ~50 m. The airport in Marina, California is denoted by a white diamond and Pt. Reyes is indicated with a white star.

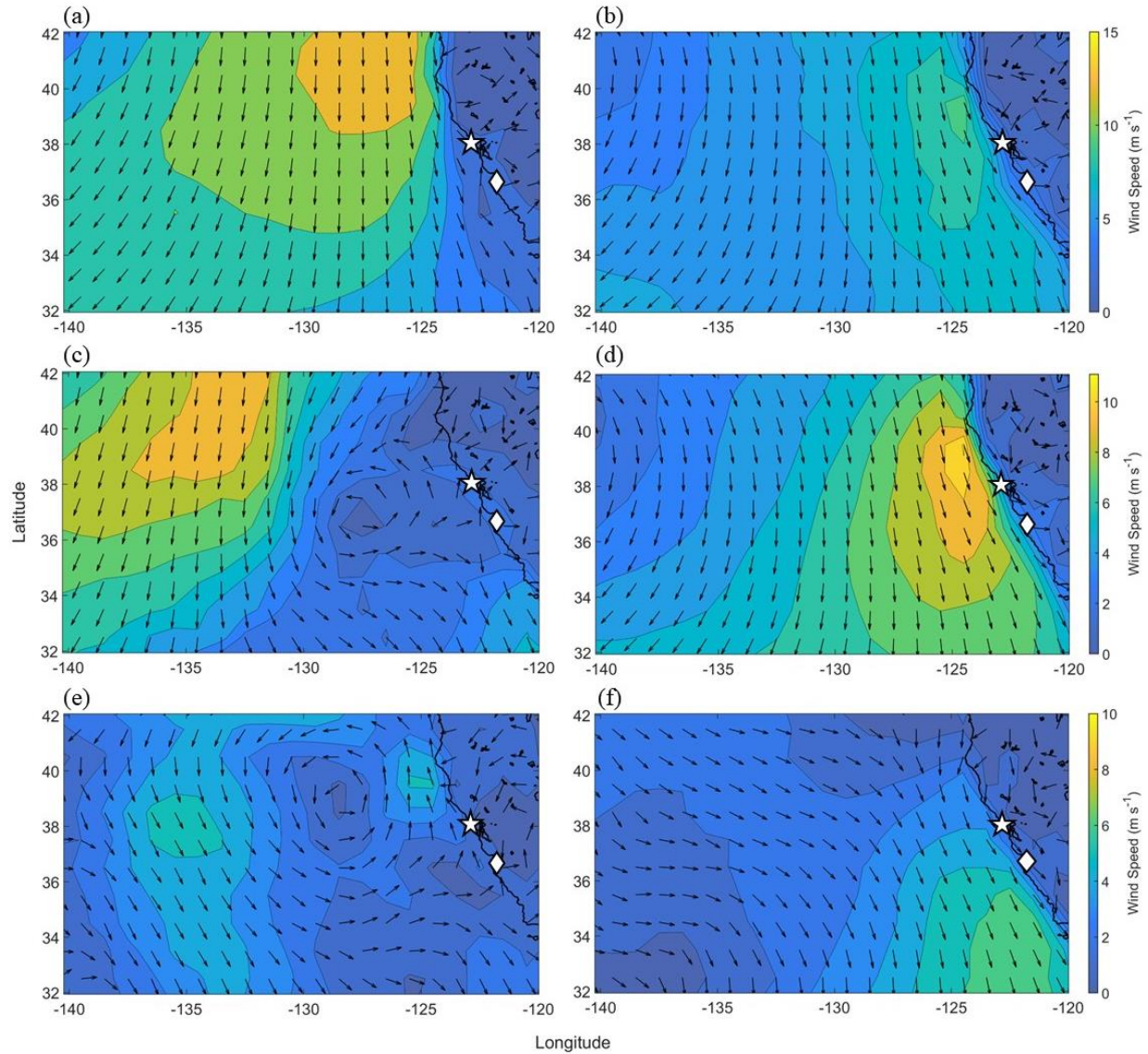


Figure S15: NAVGEM boundary layer flow patterns for (left) southerly and (right) northerly flow days during (a-b) FASE, (c-d) MACAWS, and (e-f) CSM. These results are for 1800 UTC for all days of these respective campaign months in Table 1; the lowest level of the model was used representing the lowest ~50 m. The airport in Marina, California is denoted by a white diamond and Pt. Reyes is indicated with a white star.

TYPOGRAPHICAL COMMENTS

L615-616: “there was no underlying expectation for a change in levels during southerly flow events” – unclear what you mean by “levels” here. I think you mean sea salt concentration, so maybe just change “levels” to “concentrations”

Response: Change made.

L878: “utilizing similar data sources in greater proportions” – the phrase “greater proportions” is ambiguous because “proportions” signifies a change in relative distribution. I think you’re trying to say you use more cases than Juliano did, so I suggest rewording “in greater proportions” to “across a broader range of cases.”

Response: Change made.

L879: “proven correct” is an overstatement. Suggest rewording to the following: “We find strong support for our first hypothesis that more final aerosol pollution...”

Response: Change made.

In closing, we thank Dr. Witte for these additional comments, as they enhance and improve readability of the figures in the manuscript and supplement.