Comments made by Anonymous Referee 1 are provided in black text.
Author responses are provided in blue text.

Anonymous Referee #1
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This manuscript describes the meteorological conditions and climatological reference
points (e.g., return period estimates) of the heavy rainfall that drove catastrophic debris flows following the 2017-2018 southern California wildfires. This is admittedly my first review of a "Brief Communication" submission, and in all honesty as I read it, I struggled to find novel aspects that were obviously worthy of publication. The event itself is interesting and high-impact, the data summary and meteorological analysis is sound, and the writing and communication is clear. Thus, the main issues that I have are more to do with what seems to be lacking, rather than problems with the material in the manuscript. However, suspecting that the problem may be with my own expectations of a full-length publication relative to the present manuscript type, I offer below only a few minor comments/suggestions that the editor and authors can consider as they deem appropriate.

The reviewer is correct, it was not our goal here to answer a question or test a hypothesis, but rather to document the incident in a way that hopefully provides insight to future research. Following the event, the authors saw misinterpretation of the meteorological characteristics of the event in the media and discussions with colleagues. We read and heard references to the event being a tropical storm, or being caused by orographic effects alone. We were concerned these misinterpretations may be damaging to the progression of research on the topics of short duration, high intensity rainfall in this region and post-fire debris flows. Many scientific publications related to this event are anticipated over the next few years. A peer-reviewed statement on the meteorological drivers of this event provides researchers in a variety of fields a reference to support their work, without having meteorology expertise. A brief communication, rather than a full-length article seemed the appropriate place to make a statement on the event.

General comment: 1.
If part of the purpose of this manuscript is to " support investigations on this and other PFDFs in a range of fields...," then I suggest adding at least some discussion of/references to relevant post-fire hydrologic or geologic concepts that might be of interest in future research, e.g.,
a..Neary et al. 2003: https://www.researchgate.net/publication/228510172_Post-wildfire_watershed_flood_responses
b.'Havel et al. 2018: https://doi.org/10.5194/hess-22-2527-2018
c. Brogan et al. 2017 https://onlinelibrary.wiley.com/doi/full/10.1002/esp.4194

Our intent is to focus on the meteorological triggers of the debris flow, rather than the geomorphic processes. Additionally, we are limited to 20 references and

~2500 words (NHESS author guidelines for Brief Communications can be found here: https://www.natural-hazards-and-earth-system-sciences.net/about/manuscript_types.html), so we chose to spend these on meteorological references and references specific to the event. To provide clarification, we have adjusted the paragraph at page 2, line 10 to explain that we are supporting the understanding of the meteorological triggers of PFDFs, which has been shown to be a knowledge gap in management communities (e.g. Garfin et al. 2016). This provides differentiation from the initial statement that could have been interpreted as if we were attempting to educate on post-fire debris flow processes in general.

As the reviewer alludes to, there is a large body of work on post-fire debris flow geomorphic processes, and here we choose to focus on the meteorological triggering process for this event and relate it to past events and climatology.

Specific comments: Lines 25 – 26: I'm not familiar with the language/terminology "having high debris flow hazard"...do you mean risk? Can you re-phrase/explain for a general audience?

The USGS model is a hazard model because it does not intersect the debris flow hazard with values exposed to and vulnerable to the hazard. Therefore in this case, it is correct to say that the USGS model provides information about debris flow hazards rather than risk.

Figs. 3a, b are highly suggestive of possible line echo wave pattern ("LEWP") dynamics. Again, in the interest of supporting/inspiring future investigations, perhaps a reference to this idea/possibility be added?

Line echo wave patterns are a type of squall line (Markowski and Richardson, 2010). NCFRs can be differentiated from squall lines based on their low-level cold pool maintenance by cold-air advection (CAA) rather than evaporational cooling in shallow rear-to-front flow (Geerts and Hobbs 1995). We see evidence of CAA in backing winds in vertical wind profile observed at Santa Barbara Airport following the frontal passage (Fig. S8).

LEWPs are most commonly described as a phenomenon impacting areas east of the Rockies during the spring and summer seasons (e.g. Johns 1993; Weisman 1993; Pryzybylinski 1995; Corfidi et al. 2018). LEWPs are typically associated with extreme convective instability owing to high amounts low-level moisture (Pryzybylinski 1995). Johns et al. (1990) found that long-lived derechos had an average of 2400 J/kg of CAPE in the initiation environment. It is much less likely for LEWPs to develop in low-instability environments such as the one observed here.

Additionally, LEWPs are commonly associated with straight-line strong wind events known as derechos (Pryzybylinski 1995 and references therein). The

NWS criteria for derechos requires wind gusts >57 mph at most points along the storm path (Corfidi et al. 2018). At stations near sea level in this event, we see gusts typically <=40 mph (37.8 mph at KSBA, 24 mph at Montecito #2 RAWS, 40 mph at Santa Barbara Botanic Garden RAWS, and 28 mph at Casitas RAWS; https://raws.dri.edu/). At higher elevation stations like San Marcos Pass RAWS (457 m), wind speed was slightly higher, with a maximum of 48 mph. For all these cases, maximum gusts were out of the S/SE. The increase in wind speed with elevation is consistent with the presence of a strong low-level jet (Neiman et al. 2004). The LLJ also displays well in the vertical wind profile from KSBA (Figure S8) and a burst of wind at the surface consistent with a derecho event is not present in the profiler data. The lack of strong "downburst"-type winds weakens the case for the consideration of this event as a LEWP.

References:

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