This paper presents a valuable contribution to wildfire science by integrating fireline observations to enhance the understanding of fire plume behavior during pyroconvective extreme wildfire events. The authors effectively highlight the importance of detailed, real-time observational data in characterizing complex fire-induced phenomena, which has significant implications for improving plume modeling accuracy. The study's focus on firefighter safety underscores the practical relevance of accurately predicting plume dynamics to inform operational decision-making. Overall, the work advances both the scientific understanding of extreme wildfire behavior and its application to emergency response and safety management, offering meaningful insights for researchers, practitioners, and policymakers involved in wildfire mitigation and response efforts.

Having atmospheric profile data in the environment and inside the convective plume is of undeniable value, especially since it is emphasized that the indices proposed in recent years to classify pyroconvective activity do not seem entirely satisfactory. It is also important to highlight the significant contribution of integrating numerical weather prediction model data, as these can help to underscore the models' own limitations. Would it be interesting to incorporate atmospheric profiles from models with higher vertical and/or horizontal resolution, such as AROME? On the other hand, meteorological radar measurements also hold great relevance, as they allow for validation the estimates of plume tops. In summary, this is a substantial work that sheds light on research in such a critical field, given the key role that pyroconvective activity plays in the escalation of megafires.

Thanks for the comments.

We evaluated the uncertainty of various numerical weather prediction models. In our analysis, we use the ICON model (13 km spatial horizontal resolution) because it offers (1) improved resolution compared to the GFS model (28 km spatial resolution), (2) better representation of the topography and land use, and (3) can partially resolve deep convection. In addition, it remains a freely accessible global model available to all fire and rescue services. This choice was significant, as we had already applied our methodology to analyze fires in Europe and Chile.

We also tested the AROME model, which features a higher spatial resolution of 2.5 km with the advantages mentioned above, resulting in reduced uncertainty in our predictions of the fire-weather interactions.

The increase in horizontal resolution among the GFS, ICON, and AROME models results in a reduction of uncertainty (Figure S8) in the vertical profile (75th percentile). The GFS model is underestimating the potential temperature in the lower part of the Atmospheric Boundary Layer (ABL) by 3 K, while ICON underestimates it by 2 K, and AROME underestimates it by an average of 1 K. The uncertainty for RH decreases from 30% for the GFS model, to 20% for the ICON model, and finally to 10% for the AROME model.

Evaluating numerical model uncertainties concerning in-situ ambient measurements supports our method of using paired ambient and in-plume radiosoundings to analyze pyroconvection during fires. This provides essential information for safety and strategies during wildfires.

Following the advice of the reviewer, and to show the comparison of the in-situ observations with numerical models at different resolutions, we will add a new Figure in the supplementary materials section to address this review concern:

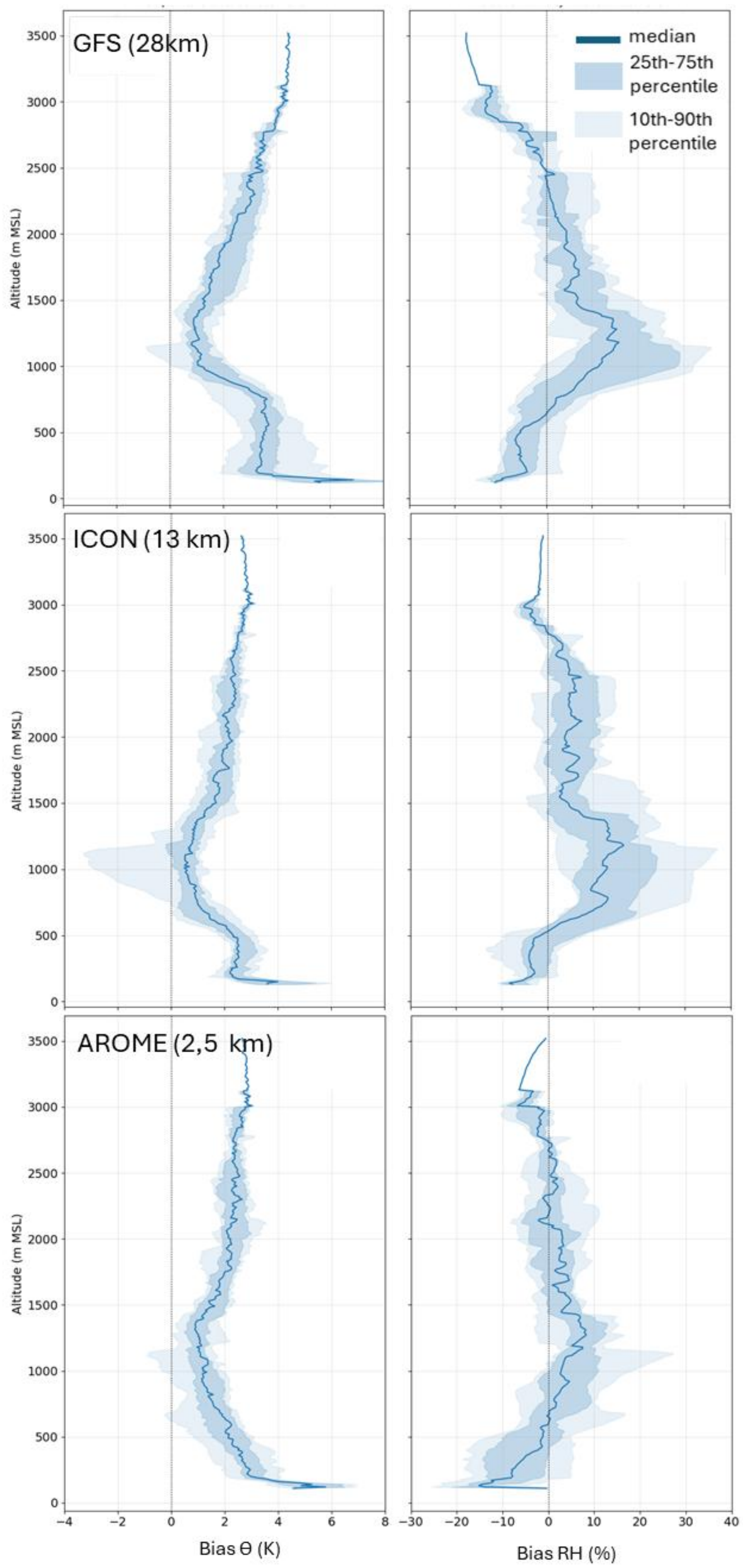

Figure S8.- Evaluation of the representativeness of numerical models compared with in-situ soundings of potential temperature and relative humidity. The assessment is based on the bias of the vertical profiles for both potential temperature and relative humidity. This bias is calculated by comparing the observed profiles with the predictions from numerical models. To quantify the uncertainties, the distribution of differences is analyzed and represented in the plot as mean values and percentiles of the differences between the sonde measurements and the model's numerical vertical profile data. To ensure comparability, both the observational and modeling data are interpolated to a vertical resolution of 10 meters. The models evaluated include: a) GFS with a spatial resolution of 28 km, b) ICON with a spatial resolution of 13 km, and c) AAROME with a spatial resolution of 2.5 km.