We appreciate Referee #2's thorough review and insightful suggestions. We truly believe that the recommended changes will improve the manuscript. Below are detailed replies addressing each specific comment:

Comments to the Author:

The main objectives of this study were to calibrate KINERO2 (K2) hydrological model and to use the hydrological parameters obtained to simulate discharges under present and future climate conditions. The study uses observed rainfall and runoff data collected in a watershed located in Arizona and burned in 2020. Model predictions under different climate scenarios are relevant to stakeholders whose knowledge of potential runoff is crucial for this area, which is subject to short-duration, high-intensity rainfall events. The text is clear and easy to read. After revision, the paper is ready to be published in Natural Hazards and Earth System Sciences journal.

R: We appreciate the reviewer's positive feedback and helpful suggestions.

Specific Comments:

Line 149 – Explain how the runoff and baseflow were separated from the discharge. If this was not done, explain the approach used.

R: We did not perform baseflow separation in this study. All observed flows were treated as event-driven runoff.

Line 153 – Why were Pre-4 and Pre-10 events selected?

R: Events Pre-4 and Pre-10, with no measurable streamflow, were specifically chosen to establish minimum model parameter values. As described in lines 191–195:

> "For events Pre-4 and Pre-10 where there was no measurable streamflow observed, simulations that produced peak discharge rates between 0.5 m^3/s and 1.5 m^3/s were used to infer minimum effective values for parameters. We were able to use this approach to determine minimum values for model parameters since modeled peak discharge increases with a decrease in any of the calibrated parameters. For example, the minimum Ksp can be estimated based on the lowest value of Ksp that results in a simulated peak discharge of less than 1.5 m^3/s."

Line 176 – I assume SBS stands for soil burn severity, but it is never mentioned in the text. It will be easier for the reader if you spell it down.

R: We clarified the abbreviation SBS by spelling it out clearly as "Soil Burn Severity" at its first appearance in line 107.

Line 177 – 179 – From what I understand the defaults in the AGWA tables are lower than those calibrated for burned areas. Isn't this interesting? Why does this happen?

R: The default values in the AGWA tables come from standard soil databases and land use/land cover datasets. You are correct that these default AGWA values lead to a lower soil infiltration capacity than what was inferred for burned conditions in postfire years 2 and 3. We do not want to over-interpret this observation since we view the default values from the AGWA tables as being a starting point for modeling that is best refined through additional, local calibration whenever possible. In general, however, we notice that the value calibrated (e.g., for Ks) in areas burned at moderate to high severity is lower than the default AGWA value (associated with unburned conditions) and that the calibrated value increases in postfire years 2 and 3 to be above the AGWA default value. This trend of increasing soil infiltration capacity with time since fire is consistent with the conceptual model that fire effects on infiltration capacity are greatest immediately after fire and decrease over time.

Line 241 – What is ARI? Can you describe it?

R: ARI stands for "annual recurrence interval," as defined in line 236. It refers to the average interval (in years) between rainfall events of a particular magnitude.

Line 285 – The model reproduced the observed runoff response reasonably well. How did you state that for pre-4 and pre-10 if you don't have the KGE values (Figure 4)?

R: Pre-4 and Pre-10 were specifically selected to infer minimum parameter values because no measurable streamflow was recorded. As detailed previously in lines 191–195, these events allowed estimation of lower-bound parameters based on simulations generating minimal peak discharge. For Pre-4 and Pre-10, we say that the runoff response was reproduced reasonably well because both the model and observation are the same (i.e., no runoff in either case).

Line 303 – 307 – shouldn't this part go in the methods?

R: We positioned this text in the current location to enhance narrative flow and readability by keeping the context and results closely linked.

Line 395 – It is clear from the results that KINEROS2 model better simulates infiltration-excess runoff but it is unable to simulate other runoff-generation mechanisms. You mentioned ParFlow model. Why did you choose the KINEROS2 model and not in a model able to simulate a mixture of flow dynamics? It is because the goal was to simulate infiltration-excess conditions and, in this way, reduce the range of hydrological parameters values, thus improving predictions? Maybe stress out between line 445-458 that similar simulations settings will be for events driven by infiltration excess runoff.

R: Infiltration-excess runoff typically dominates post-fire hydrological responses in our study area, and KINEROS2 effectively captures this process. Numerous postfire hydrology studies successfully use similar infiltration-excess frameworks. However, we acknowledge that complex runoff dynamics (saturation-excess or mixed processes) in some events (Events 6–10) underscore the need for future investigations using more comprehensive hydrological models like ParFlow, capable of simulating diverse hydrological processes.

Line 409 – Do you have KGE values for pre-4 and pre-10 events? I would show them because otherwise how can you infer that the Ksp is greater than 60 mm/hour in the third post-fire year based on a single event?

R: No KGE values are available for Pre-4 and Pre-10 events due to the absence of measurable streamflow. The model produces no runoff, which matches the observation. These events were utilized to determine minimum parameter values, as previously detailed (lines 191–195).

Line 445-448 - Perhaps you could point out that similar simulations will be set up for events driven by infiltration-excess runoff.

R: We appreciate this suggestion. We clarified our discussion by emphasizing:

> "These findings provide valuable guidance for applying hydrologic models to simulate postfire runoff and related hydrologic hazards in similar infiltration-excess dominated settings."

Figure 7 - Why did you not show the ARI = 10 years?

R: Figure 7 primarily demonstrates how peak discharges are amplified by different climate conditions for selected ARIs (1, 2, and 5 years) across the first three postfire years. Results for the 10-year ARI were included separately in Figure 8 to clearly depict the full range of responses.