Amendments to the Reply to Reviewer 2 Comments

Manuscript: CONFEX: A Database for CONUS Fire EXtent (essd-2026-116)

*Reviewer comments are in red, author responses are in blue, and revised manuscript sections are in black.

Reviewer comment: **"The manuscript "CONFEX: A Database for CONUS Fire EXtent" presents an ambitious and valuable effort to build a wildfire perimeter dataset for CONUS and Alaska using VIIRS 375 m active fire detections. Providing a spatially comprehensive and temporally dynamic dataset is critical for fire management and ecological modeling. However, after a review of both the manuscript and the released geospatial data, I found that the current version suffers from important methodological limitations, severe geospatial inaccuracies, and a lack of robust uncertainty quantification. While the conceptual pipeline is promising, its execution introduces artifacts and biases that compromise the dataset's scientific reliability. Furthermore, the manuscript frequently substitutes rigorous quantitative validation with speculative language. In its current state, the dataset and the accompanying manuscript do not meet the rigorous "high-quality data" standards expected for publication in ESSD. I therefore recommend a major revision, and I detail my concerns below."**

General Response: We thank Reviewer 2 for the detailed and constructive evaluation. The manuscript and released workflow have been substantially revised. The revised version now (i) specifies the software environment; (ii) applies corrected CONUS and Alaska spatial-domain filtering; (iii) uses EPSG:5070 for CONUS and EPSG:3338 for Alaska; (iv) replaces the earlier single California tuning with regional threshold tuning; (v) excludes 1- and 2-detection clusters from the cleaned release; (vi) adds geometry and attribute quality control, managed-fire candidate attribution for CONUS, volcanic-source diagnostic flags, remaining spatiotemporal-overlap diagnostic flags, and boundary screening; and (vii) expands validation using MTBS, FRAP, GeoMAC, and WFIGS with complementary area-based, object-level, unmatched-object, merge/split, overlap, and clean one-to-one diagnostics. We also revised the Introduction and Data and Methods sections to reduce speculative language, better distinguish CONFEX from burned-area products, and clarify that CONFEX should be interpreted as a spatially consistent, detection-derived fire-event inventory rather than an exact high-resolution burned-area boundary product.

General Comment 2: Spatial-domain filtering

Reviewer comment: **"A serious spatial-domain issue must be addressed. Although the manuscript repeatedly describes CONFEX as a dataset for CONUS and Alaska, the**

released product appears to contain fire-event polygons outside that stated domain. For example, I identified a polygon with year = 2023 and cluster_final = 85586 (centroid: 44.9835°N, 66.9877°W) that lies entirely in Canada, and another with year = 2013 and cluster_final = 41847 (centroid: 27.1205°N, 99.4487°W) that lies entirely in Mexico. In addition, the dataset appears to contain nearly 1,000 Hawaii polygons. These records suggest that the spatial filtering, study-area clipping, or release-version control is not fully consistent with the manuscript's stated domain and must be corrected or clarified."

Response: We thank the reviewer for identifying this important release-quality issue. We corrected the final release workflow by applying boundary screening after volcanic-source screening and overlap-resolution quality-control steps. The final release retains only fire-event objects whose ignition points fall within the corresponding CONUS or Alaska study-area boundary. This removes exterior records while avoiding inappropriate removal of events that legitimately ignited inside the study domain but whose perimeter may touch a boundary.

Exact revised manuscript text in the "Post-processing and Quality Control" subsection of "Data and Methods": "Boundary screening was then applied to retain only objects whose ignition points fell within the corresponding CONUS or Alaska study-area boundary."

General Comment 3: Parameter tuning from one region/year

Reviewer comment: **"A major methodological concern is the apparent reliance on parameter tuning from a single region and year. The key DBSCAN thresholds used in CONFEX (2000 m in space and 48 h in time) were tuned using only the 2020 California FRAP dataset, yet these same settings were applied across all of CONUS and Alaska. Given the drastic differences in fire regimes, fuels, climate, and fire behavior across the full study domain, it is unclear why a California-based calibration should generalize well. The authors must justify this transferability explicitly or provide sensitivity tests showing that the selected parameters remain appropriate outside California."**

Response: We thank the reviewer for this important insight. We agree that the earlier California-only tuning was not adequate for the full CONUS and Alaska product. The revised workflow replaces that approach with region-specific tuning across broad CONUS regions and Alaska. Final thresholds were selected regionally from a larger tuning space using a diagnostic framework that considers object agreement, area agreement, merge/split behavior, unmatched objects, and candidate-count behavior rather than applying a single national parameter set.

Exact revised manuscript text in the "Threshold Tuning" subsection of "Data and Methods":

"More detailed regionalization using pyromes or EPA Level III ecoregions was considered but not adopted for parameter tuning because these units are much more finely resolved than the intended operational regions, many fire perimeters cross pyrome or ecoregion boundaries, and small unit-level reference samples would complicate national-scale perimeter generation and validation (Graham et al., 2026; U.S. EPA, 2015; Short et al., 2020). Instead, states were grouped into broad contiguous regions that preserve dominant MTBS fire-regime contrasts while remaining practical for regional threshold selection. Some low-fire-count states were grouped with neighboring regions because their event samples were too sparse for reliable independent tuning; this favors stable regional thresholds over state-specific thresholds dominated by only a few fires (Supplementary Text S3; Table S9). Alaska was treated separately because of its distinct equal-area projection, high-latitude detection environment, fire size distribution, and hotspot-density structure."

"For each tuning experiment, VIIRS S-NPP 375 m detections were clipped to the regional mask, which was constructed from U.S. Census Bureau cartographic boundary shapefiles (U.S. Census Bureau, n.d.) and projected to the appropriate equal-area coordinate system: EPSG:3338 for Alaska and EPSG:5070 for CONUS regions. Detections were clustered using the normalized DBSCAN framework described in the main algorithm section, with x and y coordinates divided by the candidate spatial threshold and acquisition time divided by the candidate temporal threshold. DBSCAN was run with the Chebyshev metric and $\varepsilon = 1$."

"Across the regional tuning experiments, tested spatial thresholds covered 750–6000 m at 250 m intervals, temporal thresholds covered 48–504 h at 24 h intervals, and alpha values were 0.0001, 0.0005, and 0.001. Larger alpha values were avoided because, under the retained-triangle criterion circumradius < 1/alpha, they impose unrealistically small circumradius thresholds relative to the 375 m VIIRS pixel spacing and would eliminate most Delaunay triangles. Final thresholds were selected regionally from this tuning space using the same diagnostic framework, rather than applying a single national parameter set."

General Comment 6: Non-exclusive overlapping fire objects

Reviewer comment: **"The dataset appears to contain at least some non-exclusive fire-event objects. For example, in "VIIRS_final_perims_ALL_YEARS.gpkg", cluster_final IDs 52266 (2022/06/19–2022/07/01) and 52424 (2022/06/20–2022/06/26) overlap both temporally and spatially, with approximately 27 km^2 of shared area. This overlap contradicts the premise of each cluster representing a distinct fire event and suggests that additional topological quality control is needed."**

Response: We thank the reviewer for highlighting this case. We agree that spatiotemporal overlap between fire-event objects should be explicitly addressed. In the revised workflow, we added a final spatiotemporal-overlap resolution step after geometry and attribute quality control. For each pair of objects with spatial and temporal overlap, smaller objects are merged into larger objects when they are nested within the larger perimeter, when the smaller object ignition point falls inside the larger perimeter, or when more than 10 % of the smaller perimeter overlaps the larger perimeter. Object pairs that meet the spatial and temporal overlap criteria but do not satisfy these merge rules are retained as separate fire-event objects and carried forward as remaining spatiotemporal-overlap diagnostic flags. This approach reduces clear duplicate or nested overlap cases while preserving potentially distinct nearby fire events when automatic merging would be ambiguous.

Exact revised manuscript text in the "Post-processing and Quality Control" subsection of "Data and Methods":

"A final spatiotemporal-overlap resolution step was then applied to the cleaned CONFEX objects. For each pair of objects with spatial and temporal overlap, the smaller and larger objects were identified by mapped area. Smaller objects were merged into larger objects when the smaller object was nested within the larger perimeter, when the smaller object ignition point fell inside the larger perimeter, or when more than 10 % of the smaller perimeter overlapped the larger perimeter. Object pairs that met the spatial and temporal overlap criteria but did not satisfy any of these merge rules were retained as separate fire-event objects and carried forward as remaining spatiotemporal-overlap diagnostic flags."

General Comment 7: Eastern CONUS interpretation and Soberanes example

Reviewer comment: **"L298-305: The paragraph discussing the poor performance in the Eastern CONUS suffers from severe analytical spin and a notable geographic error. By reporting 9,084 false positives (FP) and 1,916 true positives (TP), the algorithm yields a precision of merely 17.4%, while 2,703 false negatives (FN) equate to a recall of 41.5%. It represents a fundamental algorithm limitation in the Eastern CONUS, not a "complementary" relationship, and claiming that more than 9,000 FPs simply identify "substantially more fire activity" without robust ground validation is scientifically unsound. Additionally, framing the splitting of a single MTBS fire into multiple fires as a "feature" ignores the artificial fragmentation likely caused by the rigid 48-hour temporal threshold. Compounding these analytical issues is a stark geographic mismatch: the authors use the Soberanes Fire—which occurred in California (Western CONUS)—to justify algorithm behavior in an Eastern CONUS error analysis. I recommend that the authors objectively state that the current clustering pipeline performs poorly in**

the East rather than spinning a 17% precision score as a strength, and completely remove the logically disconnected Soberanes fire example from this Eastern CONUS discussion."

Response: We thank the reviewer for this important insight. The revised manuscript removes the disconnected Soberanes example from the eastern CONUS interpretation and avoids presenting high unmatched counts as a strength. The revised validation framework now reports regional performance using complementary area-based, object-level, merge/split, unmatched-object, and overlap diagnostics, and we interpret lower scores in the Midwest, Appalachian-Mid-Atlantic, and southeastern CONUS regions in relation to fire regime, managed burning, small-fire prevalence, and reference-dataset coverage, while Northeast validation is interpreted primarily using WFIGS because MTBS contains too few VIIRS-era reference fires for stable regional validation. We also clarify that unmatched CONFEX objects should not be interpreted as confirmed omitted fires or as direct false positives without additional evidence.

Exact revised manuscript text in the "Validation Discussion" subsection of "Results and Discussion":

"Lower area scores in the Midwest, Appalachian-Mid-Atlantic, and southeastern CONUS regions should be interpreted in relation to fire regime and reference-dataset coverage. These regions contain many smaller fires, managed burns, and fire activity that may fall below MTBS reporting thresholds or outside operational perimeter reporting. Consequently, lower object precision or lower unrestricted area precision does not necessarily indicate that all additional CONFEX objects are errors. Rather, it reflects the difficulty of comparing a detection-derived object inventory with perimeter datasets that preferentially represent larger fires or operationally mapped events. Northeast results were interpreted primarily using WFIGS because MTBS contained too few VIIRS-era reference fires in that region for stable regional validation."

"Finally, CONFEX-only candidate fire-event objects should be interpreted cautiously. Lack of overlap with MTBS, GeoMAC, or WFIGS does not prove that a CONFEX object is a true omitted fire, nor does it prove that the object is erroneous. These objects are best treated as a candidate population for downstream inspection, comparison with ancillary datasets, and future validation. This interpretation is especially important for CONUS, where available perimeter inventories do not comprehensively represent the full population of smaller VIIRS-detected fire objects."

Specific comments

Specific Comment: FIRED description

Reviewer comment: **"L74: The manuscript incorrectly characterizes FIRED as a strictly "regionally focused effort" for CONUS, overlooking that it has already been expanded into a global fire perimeter dataset via the FIREDpy algorithm (Mahood et al., 2022, Scientific Data). Please update this statement and citation"**

Response: We revised the Introduction to state that FIRED began as a CONUS inventory and was later expanded into a global dataset, with the appropriate Mahood et al. (2022) citation.

Exact revised manuscript text in the "Introduction" section: "Similarly, the FIRED (Fire Events Delineation) database (Balch et al., 2020) provides a comprehensive inventory for the CONUS and was later expanded into a global dataset (Mahood et al., 2022)."

Specific Comment: Background section too long

Reviewer comment: **"L100-152: The background section would be more effective if the discussion of the historical development of fire remote sensing were shortened and made more concise. At present, a substantial portion of the introduction reviews earlier satellite fire products and monitoring approaches, which is useful context but somewhat longer than necessary for a data description paper focused on presenting CONFEX. I suggest condensing this narrative and instead adding a summary table that compares the main existing datasets with CONFEX in terms of spatial coverage, temporal coverage, spatial resolution, event definition, and major strengths and limitations."**

Response: We thank the reviewer for this helpful suggestion. The historical discussion of satellite fire remote sensing was condensed and moved to Supplementary Note S1, while the revised Introduction now focuses on the distinction between active-fire detections, burned-area products, and event-level perimeter datasets. We also added Table 1 to compare existing fire-event, burned-area, operational perimeter, and fire-occurrence datasets with CONFEX in terms of spatial coverage, temporal coverage, spatial resolution, event definition, major strengths, and major limitations.

Exact revised manuscript text in the "Introduction" section:

"Over the past two decades, several fire event datasets have been developed to transition from pixel-level detections to object-based tracking. Global products like the Global Fire Atlas (Andela et al., 2019) and GlobFire (Artés et al., 2019) reconstruct fire events from the 500 m MODIS (Moderate Resolution Imaging Spectroradiometer) burned area product. Similarly, the FIRED (Fire Events Delineation) database (Balch et al., 2020) provides a comprehensive inventory for the CONUS and was later expanded into a global dataset (Mahood et al., 2022). Conversely, high-resolution datasets like FEDS (Fire Events Data Suite) (Chen et al., 2022) and Firelytics (McClure et al., 2023) leverage the 375 m Visible Infrared Imaging Radiometer Suite (VIIRS) active fire product but are geographically restricted to California. National products like MTBS (Monitoring Trends in Burn Severity) (Finco et al., 2012) offer 30 m resolution but are also limited by large fire area thresholds and omit the smaller events that comprise a significant portion of total fire counts. Table 1 summarizes existing fire-event, burned-area, operational perimeter, and fire-occurrence datasets relevant to the development and validation context of the CONUS Fire Extent (CONFEX) database."

"Table 1. Summary of existing fire-event, burned-area, operational perimeter, and fire-occurrence datasets relevant to CONFEX."

Specific Comment: NLCD baseline year

Reviewer comment: **"L209-211: Applying a static 2016 NLCD layer uniformly to classify fires from 2012–2024 could introduce classification inconsistencies due to land cover change. The authors should consider using time-matched land cover epochs or discuss the uncertainty introduced by a single baseline year."**

Response: We thank the reviewer for this important suggestion. We revised the manuscript to clarify the NLCD land-cover treatment. For CONUS, NLCD land-cover data were sampled using year-matched NLCD epochs during 2012–2024. For Alaska, NLCD 2016 was used because it is the only Alaska NLCD product available during the study period. We also now note that the use of a single Alaska baseline may introduce uncertainty where land cover changed after the baseline year.

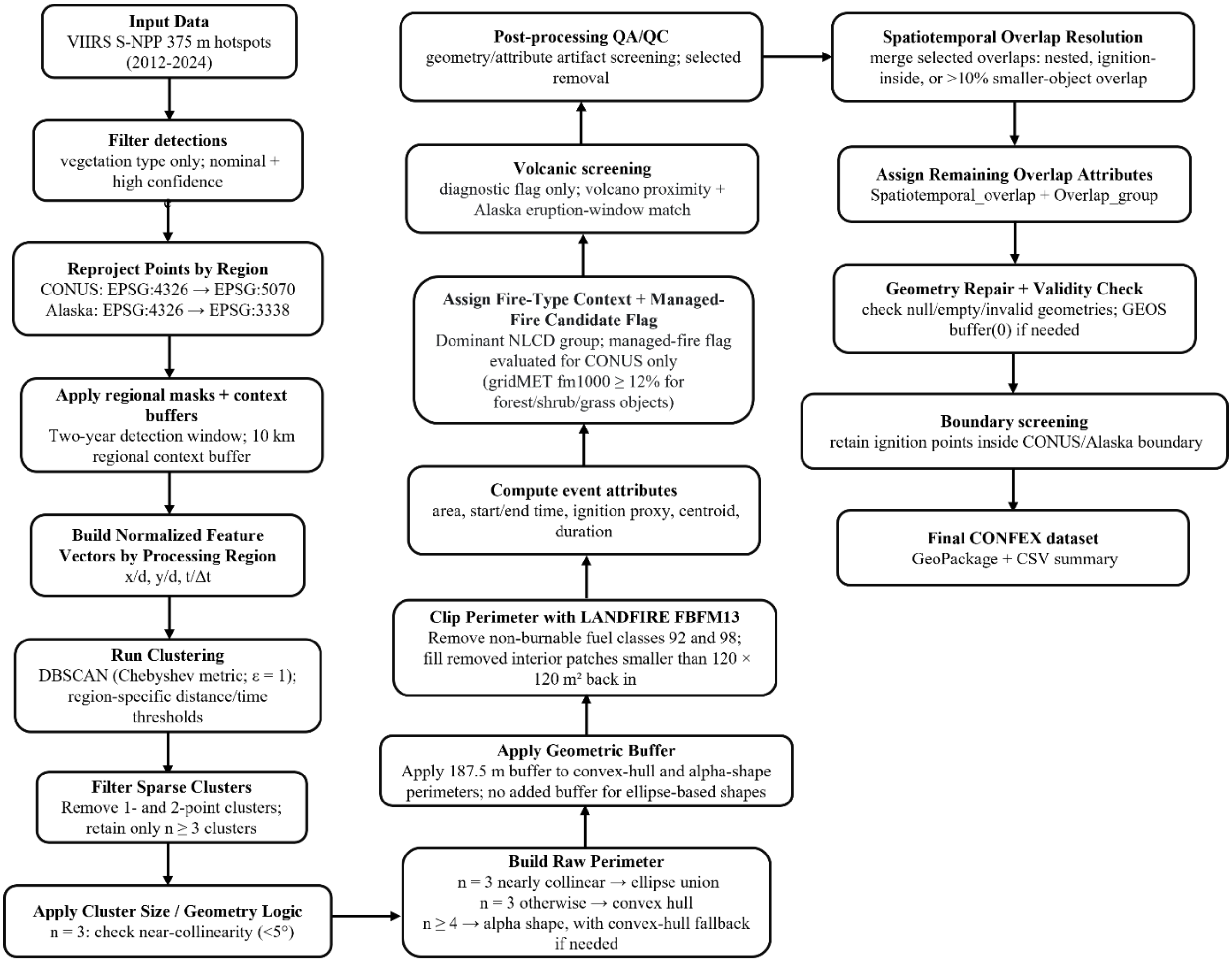
Exact revised manuscript text in the "Spatiotemporal Clustering Algorithm" subsection of "Data and Methods": "For CONUS, NLCD land-cover data were sampled using year-matched NLCD epochs during 2012–2024, whereas Alaska objects were assigned land-cover context using NLCD 2016 because it is the only Alaska NLCD product available during the study period; this may introduce uncertainty where land cover changed after the baseline year."

Specific Comment: Workflow figure branching logic

Reviewer comment: **"Figure 3 is oversimplified in several important respects. The diagram does not clearly show the branching logic for 1–2 point, 3-point, and ≥4-point clusters, even though these cases are handled differently in the algorithm."**

Response: We thank the reviewer for this suggestion. The workflow figure was revised to make the perimeter-reconstruction branching logic explicit. In the revised workflow, 1–2 point clusters are excluded from the final released product, 3-point clusters are handled using collinearity-dependent logic, and clusters with ≥4 hotspots are reconstructed using alpha shapes with convex-hull fallback. The revised workflow also shows the post-processing pathway leading to final fire-event objects.

Exact revised figure in the "Spatiotemporal Clustering Algorithm" subsection:



"Figure 2. CONFEX workflow for converting VIIRS S-NPP 375 m active-fire detections into final fire-event objects, including regional clustering, perimeter construction, diagnostic attribution, post-processing quality control, and final screening steps."

Specific Comment: Alpha-shape parameter grid

Reviewer comment: **"L247: In the Parameter Tuning Section, the alpha-shape parameter of 1, 0.01, and 0.001 was checked, but there appears to be a geometric mismatch between these values and the 375 m nominal spatial resolution of the VIIRS detections. Based on the formulation where retained triangles must have a circumradius < 1/alpha, testing alpha = 1 and**

alpha = 0.01 translates to thresholds of 1 m and 100 m, respectively, which are geometrically highly restrictive given the 375 m pixel spacing and would likely reject almost all triangles. Consequently, the selection of alpha = 0.001 (a 1000 m threshold) might appear optimal primarily because the other two values fall well below the spatial limit of the sensor, rather than representing a comprehensive tuning of the algorithm's behavior."

Response: We thank the reviewer for this helpful observation. We revised the regional tuning experiments to use a more appropriate alpha-shape parameter grid of 0.0001, 0.0005, and 0.001, which better matches the spatial scale of VIIRS 375 m detections. We also clarified that larger alpha values were avoided because, under the retained-triangle criterion circumradius < 1/alpha, they impose unrealistically small circumradius thresholds relative to the VIIRS pixel spacing and would eliminate most Delaunay triangles.

Exact revised manuscript text in the "Threshold Tuning" subsection of "Data and Methods": "Across the regional tuning experiments, tested spatial thresholds covered 750-6000 m at 250 m intervals, temporal thresholds covered 48-504 h at 24 h intervals, and alpha values were 0.0001, 0.0005, and 0.001. Larger alpha values were avoided because, under the retained-triangle criterion circumradius < 1/alpha, they impose unrealistically small circumradius thresholds relative to the 375 m VIIRS pixel spacing and would eliminate most Delaunay triangles. Final thresholds were selected regionally from this tuning space using the same diagnostic framework, rather than applying a single national parameter set."

Specific Comment: Overlap verification and fragmentation

Reviewer comment: **"L273: The statement "it is also possible that these two groups overlap" is too tentative in this context. It would be preferable to verify this directly with a spatial analysis and report the result explicitly, rather than leaving the relationship between the two groups uncertain. Clarifying this point would make the validation discussion more precise and easier to follow."**

Response: We thank the reviewer for this suggestion. We replaced speculative language with explicit spatial diagnostics. The revised validation framework now evaluates object-level correspondence, area agreement, split and merge diagnostics, unmatched CONFEX objects, clean one-to-one correspondences, and spatiotemporal-overlap diagnostics. These diagnostics allow overlap and fragmentation behavior to be reported directly rather than described speculatively.

Exact revised manuscript text in the "Tuning Diagnostics" subsection of "Data and Methods": "Parameter performance was evaluated using a multi-objective set of diagnostics capturing area agreement, object-level correspondence, split, merging, and unmatched candidate behavior. Area precision, area recall, and area F1 were computed from unioned CONFEX and reference geometries within the target year. Area precision and merge diagnostics were used to avoid selecting overly permissive thresholds that increased apparent area recall by producing inflated or unrealistically merged perimeters."

"Object-level precision, object-level recall, and object-level F1 were computed using greedy one-to-one matching between CONFEX and reference objects under any positive spatial overlap, with overlapping candidate pairs ordered by intersection over union (IoU). IoU was used only to rank overlapping candidate pairs during greedy matching. Split, merge, candidate-count, unmatched-object, and clean one-to-one diagnostics were then used to avoid selecting thresholds that produced excessive split, unsupported candidate fire-event objects, or unrealistically merged perimeters."

Exact revised manuscript text in the "Validation Discussion" subsection of "Results and Discussion":
"The merge, split, and clean one-to-one diagnostics show that broad spatial agreement and exact event partitioning should be interpreted separately. CONFEX can reproduce major burned-area patterns while still representing that area as multiple detection-derived objects or linking nearby reference perimeters differently than incident-based datasets. This behavior was most apparent in the Southeast, Eastern Midwest/Appalachian-Mid-Atlantic, and Southwest and Southern Plains. The relatively low spatiotemporal-overlap percentages indicate that direct overlap among retained CONFEX objects was not the dominant structural issue; rather, many differences appear as one-to-many or many-to-one relationships with reference perimeters."

Specific Comment: Role of FRAP

Reviewer comment: **"L280-282: The discussion of FRAP durations is helpful, but I think the role of FRAP in the validation framework should be clarified. If the authors conclude that FRAP durations are not representative of actual fire spread or acreage, it becomes somewhat unclear how this dataset can still serve as a benchmark for evaluating the temporal performance of CONFEX. I suggest that the authors explain more explicitly which aspects of FRAP remain suitable for comparison and which should be treated with caution."**

Response: We thank the reviewer for this suggestion. We clarified the role of FRAP and the other reference datasets in the validation framework. FRAP is used as an independent California operational-perimeter comparison dataset, separate from MTBS, to evaluate spatial agreement with state-level mapped fire perimeters. We also clarified that MTBS, FRAP, GeoMAC, and WFIGS derive from different burned-area, operational, and agency reporting workflows and do not provide a uniform temporal definition of fire start, containment, or end date. Therefore, these datasets are used primarily for spatial-consistency assessment rather than as direct benchmarks for temporal-duration validation.

Exact revised manuscript text in the "Validation" subsection of "Data and Methods":

"FRAP provided an additional California operational-perimeter comparison dataset compiled from state and cooperating-agency records (CAL FIRE, 2025)."

"Because these reference datasets derive from different burned-area, operational, and agency reporting workflows and do not provide a uniform temporal definition of fire start, containment, or end date, they were used primarily for spatial-consistency assessment rather than as direct benchmarks for temporal-duration validation."

Specific Comment: 2024 validation data

Reviewer comment: **"L287, 310-311: Please explain why the 2024 data for both MTBS and FRAP were excluded from the validation analyses, given that both are currently available and the CONFEX dataset extends to 2024."**

Response: We thank the reviewer for this comment. The validation analysis has been updated to include the full 2012-2024 CONFEX period where reference data are available. MTBS is now used for 2012-2024, FRAP is used as the California reference perimeter dataset, GeoMAC is used for 2012-2018, and WFIGS is used for 2021-2024. The revised validation is therefore no longer limited by the earlier exclusion of 2024 MTBS or FRAP data.

Exact revised manuscript text in the "Validation" section: "Final post-processed CONFEX perimeters were validated regionally against multiple complementary reference datasets: MTBS perimeters for 2012–2024 (MTBS, 2024), FRAP fire perimeters for California (CAL FIRE, 2025), GeoMAC historical perimeters for 2012–2018 (Walters et al., 2011), and WFIGS operational perimeters for 2021–2024 (NIFC, 2026). For each validation comparison, CONFEX and reference perimeters were projected to the appropriate regional coordinate reference system, clipped to regional masks, and evaluated within matching calendar years.”

Specific Comment: Wildfire versus broader fire events

Reviewer comment: **“L337-338: The manuscript describes CONFEX as a wildfire database, but some of the detected large fire events in regions such as Florida may include prescribed burns. Because prescribed fires and wildfires can differ in their drivers and behavior, it would be helpful for the authors to clarify whether the current product represents wildfire only or a broader fire-event database.”**

Response: We thank the reviewer for highlighting this important distinction. We clarified that CONFEX was developed for wildfire applications, but because it is derived from VIIRS active-fire detections, it is not a strictly wildfire-only database. The product may include prescribed burns, other vegetation fires, and potential volcanic thermal detections. To support interpretation, the revised manuscript retains managed-fire candidate and volcanic-source diagnostic attributes rather than using them as automatic exclusion criteria.

Exact revised manuscript text in “Dataset Limitations”: “CONFEX was developed for wildfire applications, but because it is derived from VIIRS active-fire detections, it unavoidably includes prescribed burns, other vegetation fires, and potential volcanic thermal detections. Managed-fire candidate and volcanic-source attributes are retained as diagnostic flags rather than used as automatic removal criteria; therefore, CONFEX should be interpreted as a broader fire-event database rather than as a strictly wildfire-only database.”

Specific Comment: Alaska ecoregion terminology

Reviewer comment: **“L359-360: The sentence stating that Alaskan fires are "spread across two different ecoregions of boreal and tundra forests" contains two errors. The term "tundra forests" is ecologically incorrect. By definition, the tundra biome is characterized by the absence of trees. Alaska comprises more than two Level I ecoregions. According to the standard Commission for Environmental Cooperation (CEC) framework, Alaska also includes Marine West Coast Forests, and Northwestern Forested Mountains. Please rephrase to use accurate ecological terminology.”**

Response: We thank the reviewer for identifying this ecological inaccuracy. We revised the Alaska discussion to remove the phrase “tundra forests” and to avoid implying that Alaska contains only two ecoregions. The revised text now describes fire occurrence across boreal forest, tundra, and other ecoregions, with citations to Alaska fire-regime and ecoregion references.

Exact revised manuscript text in "Alaska Fire Dynamics":

"Understanding the fire regime of Alaska presents unique challenges, as fire occurrences are sparse and spread across boreal forest, tundra, and other ecoregions (Kasischke and Turetsky, 2006; Mack et al., 2011; U.S. EPA, 2015). The boreal fire regime is well documented through manual datasets; however, manual data are less complete for tundra and remote areas owing to sparse population and limited reporting coverage (Jenkins et al., 2014)."

Specific Comment: Strict 48-hour threshold in Alaska

Reviewer comment: **"L378-379: Applying a strict 48-hour "hard threshold" makes the algorithm highly vulnerable in regions known for prolonged cloudiness, such as Alaska. If a fire smolders under cloud cover for three days without a satellite pass, the rigid cutoff will artificially split one continuous fire into multiple separate events. I suggest exploring or discussing the feasibility of a dynamically adjusted temporal threshold to enhance robustness against missing data."**

Response: We thank the reviewer for this important suggestion. The revised workflow no longer applies a uniform 48-hour temporal threshold to Alaska. Instead, temporal thresholds were selected regionally through the tuning framework. Alaska now uses a longer 384-hour temporal window, which was selected to better accommodate sparse detections and long-duration northern fire events while avoiding excessive temporal permissiveness.

Exact revised manuscript text from "Table 2. Final selected and working thresholds with regional interpretation": "Alaska 2500 m / 384 h / α = 0.0005 High It provides strong area agreement while maintaining conservative object-level structure. The 2500 m distance threshold and 384 h temporal window support clustering of sparse and long-duration northern fire detections, while avoiding excessive temporal permissiveness. This setting provides a practical balance among area agreement, clean one-to-one correspondence, limited split, and low merge behavior, making it appropriate for large, spatially extensive Alaska fire events."

Specific Comment: Figures S1 and S2

Reviewer comment: **"Figures S1 and S2: Please redraw with appropriate y-axis limits. The tallest CONFEX bars are visibly truncated in Figure S1, preventing full inspection of the data."**

Response: We thank the reviewer for this important observation. The supplementary comparison figures were redrawn with corrected axis limits so that the tallest CONFEX values are fully visible and the regional and state-level MTBS-thresholded comparisons can be inspected without truncation.

Specific Comment: Events with fewer than three detections

Reviewer comment: **"Supplement L67-70: The authors mention in S2 that events with < 3 detections have "associated uncertainty". This is a severe understatement. A single VIIRS 375m pixel covers approximately 35 acres. If an event has only 1 or 2 detections, its true physical footprint cannot exceed 100 acres. If such events are somehow bypassing the 500-acre or 1000-acre filters, it proves that the current algorithm is generating massive, physically impossible areas."**

Response: We agree with the reviewer. To address this concern, the final released product now excludes 1- and 2-point clusters and treats them as noise. In addition, we added geometry- and attribute-based post-processing quality control to identify and remove selected suspicious low-hotspot artifacts, including low-hotspot long-duration perimeters and low-hotspot large-area perimeters. The revised manuscript and supplementary material now clarify that these cases were treated as suspicious perimeter-shape indicators and that selected problematic geometries were removed from the cleaned release.

Exact revised manuscript text in "Spatiotemporal Clustering Algorithm": "Clusters with 1 or 2 points were excluded from the final released product and treated as noise."

Exact revised manuscript text in "Post-processing and Quality Control": "We specifically evaluated low compactness, high elongation, near-zero area, elongated low-hotspot geometries, small highly elongated geometries, long-duration outliers, large-area outliers, low-hotspot long-duration perimeters, low-hotspot large-area perimeters, and small-to-moderate long-duration perimeters with limited spatial growth or detection support as suspicious perimeter-shape indicators."

"Only the most clearly suspicious features were removed automatically from the cleaned release. These consisted of high elongation, near-zero area, elongated low-hotspot geometries, small highly elongated geometries, low-hotspot long-duration perimeters, low-hotspot large-area perimeters, and small-to-moderate long-duration perimeters with limited spatial growth or detection support."

Specific Comment: Quantify fragments

Reviewer comment: **“Supplement L98: The authors use highly speculative language to explain the data discrepancies: "many of which may be near or just above and perhaps smaller, spatially fractured burns...". The authors have the shapefiles for both CONFEX and MTBS. They should perform a simple spatial intersection to quantitatively report exactly how many extra CONFEX polygons are fragments of a single MTBS fire, and how many are genuinely new ignitions.”**

Response: We thank the reviewer for this suggestion. We replaced the speculative explanation with quantitative spatial-intersection diagnostics. The revised validation now reports split, merge, unmatched-object, and clean one-to-one diagnostics. Split metrics quantify cases where one reference perimeter is represented by two or more CONFEX objects, while merge metrics quantify cases where one CONFEX object overlaps two or more reference perimeters. CONFEX-only candidate objects are also reported separately, but we interpret these cautiously rather than classifying them automatically as new ignitions.

Exact revised manuscript text: “Parameter performance was evaluated using a multi-objective set of diagnostics capturing area agreement, object-level correspondence, split, merging, and unmatched candidate behavior.”

Exact revised supplementary text: “Split metrics indicate cases where one reference perimeter is represented by multiple CONFEX objects. Merge metrics indicate possible over-linking, where one CONFEX object spans multiple reference perimeters.”

“Unmatched CONFEX counts identify candidate objects with no reference overlap and are useful for detecting parameter choices that produce many unsupported fragments.”

Technical corrections

Reviewer comment: **“L152: "Figure 1" is a tabular representation and should be relabeled as "Table 1".”**

Response: The former channel figure was converted to a table. Because the detailed satellite active-fire background was moved to the supplementary material, the channel summary is now provided as Supplementary Table S1 rather than as a main-text figure or table.

Exact revised table caption:

“Table S1. Channels used in the 375 m active-fire detection algorithm, adapted from Schroeder and Giglio (2016).”