Amendment to Reply to Reviewer 3 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.

General Comment: **This manuscript presents the CONUS Fire EXtent (CONFEX) dataset, a VIIRS-based wildfire event product (2012–2024) that derives fire perimeters, ignition locations, and temporal attributes using a spatio-temporal clustering framework. The dataset addresses an important gap between hotspot-based detections and perimeter-based inventories, offering higher temporal resolution and event-level characterization. The methodology is generally well described and technically sound, and the dataset has clear potential value for fire regime analysis, ignition modeling, and risk assessment. However, several issues related to spatial interpretability, validation, and uncertainty need to be addressed before publication. Hence, the reviewer recommended a major revision with comments attached:**

General Response: We thank Reviewer 3 for the thoughtful and constructive feedback. We appreciate the recognition that CONFEX addresses an important gap between hotspot-based detections and perimeter-based inventories. In response, we revised the manuscript to improve spatial interpretability, strengthen validation, and better describe uncertainty, regional performance differences, and methodological assumptions. The revised version now includes region-specific tuning, expanded validation using MTBS, FRAP, GeoMAC, and WFIGS, clearer discussion of active-fire-derived perimeters versus burned-area products, additional quality-control and overlap diagnostics, and a more explicit description of dataset limitations.

MAJOR COMMENTS

Reviewer comment: **"1. All figures throughout the manuscript lack latitude/longitude grids or coordinate ticks, making it difficult to identify the geographic location of the presented results. For a geospatial data paper, this significantly limits its interpretability, reproducibility, and usability by the community."**

Response: We thank the reviewer for this advice. We agree that this is an important issue for a geospatial data paper. The revised map figures now include coordinate grids or coordinate tick labels where applicable.

Example revised figure:

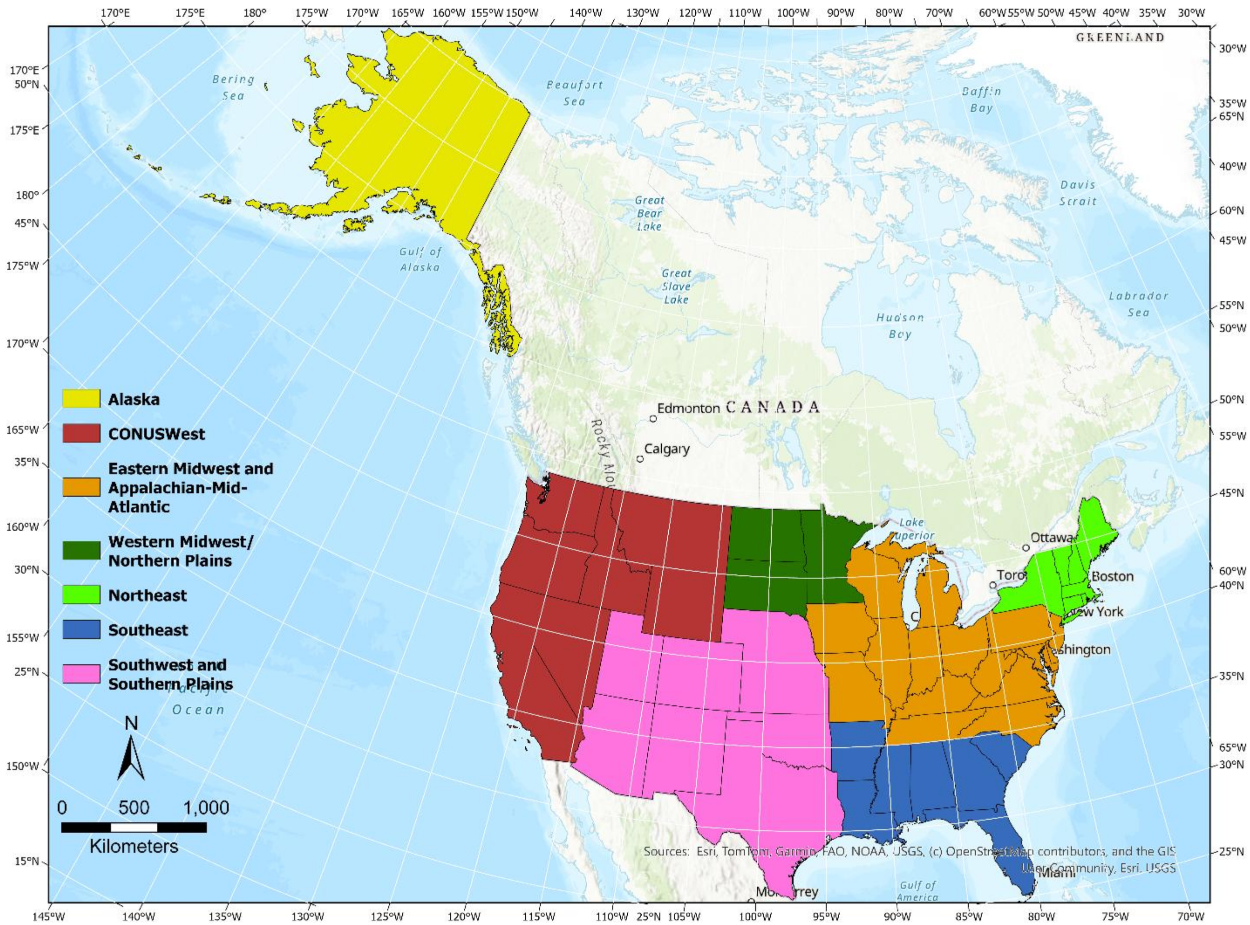

Figure 1. Broad state-based CONFEX tuning regions for CONUS and Alaska. Regional boundaries were constructed from U.S. Census Bureau cartographic boundary shapefiles and projected for display using North America Albers Equal Area Conic. Basemap/imagery credit: Sources: VCGI, Esri, TomTom, Garmin, FAO, NOAA, © OpenStreetMap contributors and the GIS community | Powered by Esri.

Reviewer comment: "3. The dataset derives fire perimeters from clustered VIIRS detections, but there is no quantitative assessment of positional uncertainty of perimeters, centroid accuracy, and sensitivity of geometry to clustering parameters. Validation is primarily based on F1 scores, which do not fully capture spatial errors."

Response: We thank the reviewer for this important suggestion. We agree that F1 scores alone do not fully describe spatial uncertainty or perimeter-geometry error. In the revised manuscript, we added text in the Dataset Limitations section clarifying that CONFEX perimeters, centroids, and ignition attributes have uncertainty arising from VIIRS spatial resolution and geolocation uncertainty, hotspot density and arrangement, missed detections due to cloud, smoke, low-intensity combustion, and sensitivity to clustering and alpha-shape parameters. We also expanded the validation interpretation beyond strict object-level F1 scores by adding area-based agreement, object-level agreement, unmatched-object, merge/split, overlap, and clean one-to-one diagnostics. These additions do not eliminate the need for future independent positional-uncertainty assessment, but they provide a more complete spatial interpretation of where CONFEX perimeters agree with reference perimeters and where disagreement arises from fragmentation, merging, overlap, or unmatched detections.

Revised manuscript addition (Dataset Limitations/Discussion): "There is inherent uncertainty in CONFEX perimeter geometry, centroid location, and ignition timing and location because the product is derived from clustered VIIRS active-fire detections rather than direct field observations. This uncertainty is influenced by VIIRS pixel-size variation from 375 m at nadir to approximately 1 km at swath edges (Schroeder et al., 2014), geolocation uncertainty, hotspot density and arrangement, missed detections due to cloud, smoke, low-intensity combustion, and quality-control filtering, as well as sensitivity to clustering and alpha-shape parameters. Therefore, ignition attributes should be interpreted as first-detection proxies, centroids as detection-derived geometric summaries, and perimeters as VIIRS-derived event envelopes rather than exact burned-area boundaries."

Reviewer comment: "4. The manuscript reports low performance in the Eastern CONUS, attributed mainly to false positives. However, the discussion does not sufficiently explore underlying causes, such as 1) prevalence of prescribed burns, 2) smaller and fragmented fires, 3) lower fire intensity affecting VIIRS detectability. Please expand discussion linking algorithm assumptions to regional fire regimes"

Response: We thank the reviewer for this important comment. We agree that lower validation agreement in the Eastern CONUS requires clearer interpretation and should not be attributed simply to false positives. In the revised manuscript, we expanded the Results and Discussion to link regional performance differences to reference-data coverage, regional fire-regime characteristics, and event-delineation differences. We now clarify that lower area scores in the Midwest, Appalachian-Mid-

Atlantic, and southeastern CONUS regions reflect the difficulty of comparing a VIIRS detection-derived object inventory with reference perimeter datasets that preferentially represent larger fires or operationally mapped events. Northeast validation is interpreted primarily using WFIGS because MTBS contained too few VIIRS-era reference fires in that region for stable regional validation.

Exact revised manuscript text in "Validation 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."

Exact revised manuscript text in Section 3.4.2, "Validation Discussion":

"The GeoMAC and WFIGS results do not resolve the lower eastern validation scores, but they help explain them. In the Southeast, both operational datasets show some reference-area recovery, especially GeoMAC recall, but very low precision because CONFEX contains many more detection-derived objects than the operational perimeter inventories. This is consistent with dense small-fire activity and prescribed burning; many such events may be detected by VIIRS but not represented as mapped perimeters in operational datasets."

Reviewer comment: "5. The clustering parameters (distance, time, alpha) are tuned using California 2020 only. This raises concerns about applicability to Eastern CONUS or Alaska. Please discuss parameter transferability and potential regional sensitivity."

Response: We thank the reviewer for this important comment. We agree that California-only tuning would not be sufficient for applying the workflow across CONUS and Alaska. In the revised manuscript, the tuning framework was expanded to region-specific calibration across seven broad regions: Alaska, CONUS West, Southwest and Southern Plains, Southeast, Northeast, Eastern Midwest/Appalachian-Mid-Atlantic, and Western Midwest/Northern Plains. This revision addresses parameter transferability by selecting clustering distance, temporal, and alpha-shape thresholds separately for broad regional groups rather than assuming that a single California-derived parameter set applies everywhere.

Exact revised manuscript text in "Threshold Tuning": "The parameter-tuning validation was organized across seven broad state-based regions: Alaska, CONUS West, Southwest and Southern Plains, Southeast, Eastern Midwest/Appalachian-Mid-Atlantic, Western Midwest/Northern Plains, and Northeast (Figure 1). This regionalization was informed primarily by MTBS state-level fire-count and burned-area summaries from 1984-2024 and VIIRS-era summaries from 2012-2024. These summaries showed a strong west-to-east contrast: CONUS West had the largest total burned area and largest mean fire size, while the Southeast had the highest number of MTBS fires but substantially smaller average fire sizes (Supplementary Text S2; Table S3). The Southwest and Southern Plains formed an intermediate large-fire/high-activity region, while the Midwest, Northern Plains, Appalachian-Mid-Atlantic, and Northeast states had lower MTBS fire densities."

MINOR COMMENTS

Reviewer comment: "Introduction is way too long as a data paper, could be truncated."

Response: We thank the reviewer for this suggestion. The Introduction has been shortened and refocused to better fit a data description paper. Broad historical discussion and less directly relevant background material were removed, condensed, or moved to the supplementary document, while the revised Introduction now focuses on the need for CONFEX, the distinction between active-fire, burned-area, and perimeter products, and the specific gap addressed by the dataset.

Reviewer comment: "Figure 1 is essentially a table."

Response: We thank the reviewer for pointing this out. The former Figure 1 has been converted into a table describing the VIIRS channels used in the 375 m active-fire detection algorithm. Because the detailed satellite active-fire background was moved to the supplementary material, this channel summary is now provided as Supplementary Table S1.

Revised supplementary text: "Table S1. Channels used in the 375 m active-fire detection algorithm, adapted from Schroeder and Giglio (2016)."

Reviewer comment: "Clarify distinctions between 'event,' 'cluster,' and 'fire perimeter.'"

Response: We thank the reviewer for this important clarification request. The revised Methods section now clarifies that a cluster is the group of VIIRS hotspot detections identified by DBSCAN, a fire event is the retained geospatial object represented by that cluster after filtering and attribution, and a fire perimeter is the polygon geometry generated from the cluster detections. The revised text also clarifies that the final dataset consists of retained or overlap-merged fire-event objects with mapped area and centroid attributes.

Revised manuscript text: "Each cluster is taken as a candidate fire event object. In this study, a cluster refers to the group of VIIRS hotspot detections identified by DBSCAN, a fire event refers to the retained geospatial object represented by that cluster after filtering and attribution, and the fire perimeter refers to the polygon geometry generated from the cluster detections."

Reviewer comment: **"Clearly describe dataset structure and availability."**

Response: We thank the reviewer for this suggestion. The revised manuscript now describes the structure of the final dataset more clearly, including the geospatial fire-event objects and the accompanying CSV summary table. The Data Availability section has also been updated to describe the released dataset files more clearly.

Revised manuscript text: "The final dataset consists of geospatial fire-event objects, each corresponding to a retained or overlap-merged fire object. Attributes include event identifiers, start and end time, duration, number of VIIRS detections, mapped area, ignition-proxy coordinates, centroid coordinates of the final event perimeter, fire-type context, managed-fire candidate status for CONUS, possible volcanic or eruption-source diagnostic flags, and remaining spatiotemporal-overlap diagnostic attributes. The workflow also generates a CSV file in which each row corresponds to a summary of the most important attributes of each fire-event object."