Amendments to the Reply to Reviewer 1 Comments

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

Reviewer comment: **"While high-resolution and high-spatial-accuracy fire perimeter datasets are crucial for studying fire regimes, this manuscript does not demonstrate good writing quality. There are several structural and methodological issues that need to be addressed to improve clarity, rigor, and scientific contribution."**

**Reviewers comments are in red, authors response and sections removed are in blue, and the revised manuscript sections are in black.*

General response.

We thank Reviewer 1 for the constructive feedback. The manuscript has been revised to align with ESSD expectations by clarifying the manuscript structure, tightening the Introduction, expanding the preprocessing and geospatial-method description, strengthening the validation interpretation and discussion of limitations, and moving detailed satellite active-fire background to the supplementary material. The former spectral-channel figure was converted into a table and is now presented in the supplementary document as Table S1.

Major Comment 1: Manuscript Structure

Reviewer comment: **"Manuscript Structure: The current organization of the manuscript is not well structured, which makes it difficult to follow. I recommend adopting a more conventional scientific structure to improve clarity and readability, such as: Introduction – Data and Methods – Results – Discussion – Conclusion."**

Response: We thank the reviewer for this excellent suggestion. We adopted the suggested structure with one modification. The revised manuscript now separates the framing of the problem in the Introduction, the workflow and implementation details in the Data and Methods section, and the findings, interpretation, and limitations in a combined Results and Discussion section. This is followed by the Conclusion and Data Availability sections. In addition, the former standalone Motivation subsection was removed from Methods, and its rationale was relocated to the Introduction.

Major Comment 2: Introduction

Reviewer comment: **"The Introduction is overly broad and somewhat verbose. It includes substantial discussion of topics (e.g., manual methods and various fire products) that are not directly relevant to this study."**

Response: We thank the reviewer for this important suggestion. The Introduction was streamlined by reducing broad historical context and by removing long descriptive passages on manual methods and early satellite-fire surveillance that were not essential to motivating CONFEX. In the revised manuscript, the Introduction now focuses more directly on the distinction between manual records, active-fire detections, burned-area products, and event-level perimeter datasets. We also added a comparative table of existing fire datasets and relevant foundational approaches, clarified the specific gap addressed by CONFEX, and moved the historical satellite active-fire background to Supplementary Note S1.

The revised "Introduction" now reads:

Wildfire is a fundamental ecological process and a crucial component of the global carbon cycle (Santín et al., 2015). However, the implementation of fire suppression policies, curtailment of indigenous fire stewardship, historical land-use change, increased inhabitation of wildlands, and the influence of climate change have contributed to the current intensifying fire regime (Greenler et al., 2024; Martinez et al., 2023; Copes-Gerbitz et al., 2024). Wildfire activity in the western fire regime of the continental United States has intensified significantly over the past two decades, and this increasing trend in frequency and severity is expected to continue (Westerling, 2016; Harvey, 2016; Westerling et al., 2006; Iglesias et al., 2022; Holden et al., 2018; Brown et al., 2004). Wildfire research and operational applications need accurate, detailed and spatially consistent datasets which can be utilized to study not only the spatial distribution of these fires, but also the temporal and spatial evolution of such fires, given the topographic expanse.

Wildfire-related data is traditionally acquired through manual or remote sensing methods. Manual data provides indispensable knowledge; however, this data is most accurate at urban or urban wildland interfaces, since these areas have been the priority for centuries. Remote sensing methods, utilizing satellite and low elevation airborne instruments, have emerged as a primary alternative. They typically use two distinct detection methods: active fire (AF) detections and burned area (BA) products. AF products identify instantaneous thermal anomalies at the time of satellite overpass by using the near infrared and mid-infrared spectral ranges (Schroeder et al., 2014). In contrast, BA products are based on detection of land-cover and moisture changes after a fire has already passed (Giglio et al., 2018). While BA products are valuable for mapping the final fire footprints, they are less suitable for rapid assessment because their algorithms require a sustained interval of post-fire observations to confirm surface changes (Chen et al., 2022). Seminal work by Giglio et al. (2006) established the foundational methodology for using AF pixel counts as a statistical proxy for burned area, at a coarse 1° resolution. Perimeter-based datasets generated from active fire detections are better for event-level analysis, as they synthesize these scattered detections into coherent fire objects that provide ignition and event duration information. Even in the absence of complex daily progression tracking, the provision of an ignition location, geometric centroid, and a precise temporal duration offers a level of operational detail that neither individual hotspots nor cumulative burned area grids can provide.

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.

Citation	**Dataset**	**Spatial coverage**	**Temporal coverage**	**Spatial resolution**	**Event definition / basis**	**Major strengths**	**Major limitations**
Giglio et al. (2006)	Global burned-area estimate	Global	2000-2005	1 degree grid cells, approximately 110 km at the Equator	Monthly gridded burned-area estimates derived statistically from MODIS active-fire observations	Foundational global methodology linking active-fire counts to burned area	Coarse spatial and temporal aggregation; not an event-level perimeter product
Andela et al. (2019)	Global Fire Atlas	Global	2003-2016	500 m MODIS grid	Individual fires reconstructed from daily MODIS MCD64A1 burned-area progression, with ignition location,	Global consistency and event-scale metrics for fire dynamics and spread direction	Dependent on the MODIS burned-area product and moderate spatial resolution

					perimeter, size, duration, expansion, and spread metrics		
Laurent et al. (2018)	FRY	Global	MODIS: 2000-2017; MERIS overlap/product coverage: 2005-2011	Based on MODIS and MERIS burned-area products; not a single fixed-resolution active-fire product	Fire patches with morphology-based functional traits reconstructed from burned-area pixels using a flood-fill algorithm	Provides fire-patch morphology and functional traits from burned-area products	Based on burned-area products rather than higher-frequency active-fire detections; temporal coverage is older than recent VIIRS-era products
Artés et al. (2019)	GlobFire	Global	2001-2021	Based on MODIS MCD64A1 burned-area data	Fire-event boundaries computed from the space-time relationships among burned-area patches; each fire event has a unique ID	Harmonized global fire-event boundaries with explicit event IDs	Moderate/coarse spatial basis because it inherits the MODIS burned-area framework
Mahood et al. (2022)	FIRED / FIREDpy country products	Global country-level or regional products	2001-2021 in the Scientific Data release, with later repository updates extending further for some regions	Based on the MODIS MCD64A1 burned-area product	Fire perimeters generated with the FIREDpy spatiotemporal (ST) flooding algorithm from MODIS burned-area grids plus ancillary data	Broad, consistent global country-level inventory generated with open-source software	Moderate spatial basis because it depends on MODIS burned-area inputs; regional outputs may vary in volume and parameterization
Chen et al. (2022)	FEDS	California	2012-2020	375 m	VIIRS-based fire-event delineation with dynamic characterization	Higher spatial resolution and dynamic characterization relative to MODIS burned-area event products	Restricted geographic scope; temporal coverage ends before the full CONFEX study period
McClure et al. (2023); Sonoma	Firelytics	California	2012-2022	Not a single fixed-resolution product; based on VIIRS,	Final fire perimeters, event	Rich high-resolution fire characterizatio	Restricted to California; research

Technology, n.d.				GOES ABI, and agency records	summaries, and spatiotemporally resolved fire progression derived from satellite observations and agency-maintained fire records	n with daily, sub-daily, and hourly progression where available	dashboard product; direct comparability depends on product definition
Short (2022)	Ground-based U.S. compilation	United States	1992-2020	Ground-based compilation rather than a uniform satellite grid	Fire entries obtained from local, state, and federal organizations	Long record and useful for broad CONUS comparison	Not a spatially consistent satellite-derived event product
CAL FIRE (2025)	FRAP	California	Historical multi-year state record; official pages describe records extending back to 1878 and updated annually	Operational/agency perimeter geometry, not a fixed gridded satellite resolution	Historical wildland fire perimeter dataset maintained by CAL FIRE FRAP from public and private lands, developed with cooperating agencies	Comprehensive California historical perimeter record useful for validation and operational comparison	Restricted to California and not directly a satellite-derived event inventory
Walters et al. (2011)	GeoMAC	United States	Historical record commonly described as 2000-2018 in derivative archives	Operational perimeter geometry	Interagency operational wildfire perimeter records and fire locations used for wildfire mapping	Useful historical operational perimeter comparison for managed incidents	Not a complete inventory of all fires; coverage depends on incident reporting and mapping practices
NIFC (2026)	WFIGS	United States	Recent operational record; used here for 2021-2024	Operational perimeter geometry	Interagency fire-perimeter dataset associated with official fire-event records	Useful recent operational perimeter comparison for active incidents	Operational rather than comprehensive; not designed as a complete national fire-event inventory directly comparable to satellite-derived objects

MTBS (2024)	MTBS	United States, including CONUS, Alaska, Hawaii, and Puerto Rico	Multi-decadal program	30 m Landsat-based mapping	Burn-severity and perimeter mapping for known large fires, with thresholds of at least 1000 acres in the western U.S. and at least 500 acres in the eastern U.S.	High spatial resolution and burn-severity information with a consistent national methodology	Omits smaller fires because of the large-fire thresholds

The CONUS Fire Extent (CONFEX) database was developed to address the lack of a spatially consistent, moderately high-resolution fire event product for the entirety of CONUS and Alaska. To date, no publicly available dataset provides high-temporal-resolution (twice-daily), event-level fire perimeters at 375 m spatial resolution across CONUS and Alaska using the VIIRS S-NPP active fire product. Existing products are either too coarse (MODIS/FIRED), geographically limited (FRAP/FEDS), omit smaller fires (MTBS), or lack perimeter geometry (NASA FIRMS (National Aeronautics and Space Administration Fire Information for Resource Management System) hotspots). CONFEX fills this gap by providing a comprehensive, VIIRS-based event inventory with perimeters, centroids, ignition timing and location, end-detection timing, and duration estimates for 2012–2024. By utilizing the VIIRS S-NPP 375 m active fire product, CONFEX converts scattered hotspot detections into interpretable fire objects, thus offering a foundational resource for understanding fire regimes at a national scale with high temporal frequency.

Section 2 presents the data and methods. Section 3 presents the results and discussion. Section 4 summarizes the main conclusions, followed by data availability.

Reviewer comment: "Limitations of existing approaches (e.g., converting active fire detections to burned area or fire perimeters) are not clearly discussed."

Response: We thank the reviewer for this suggestion. The revised Introduction now more clearly discusses the limitations of existing fire products and positions CONFEX relative to them. Specifically, the text distinguishes active-fire detections, burned-area products, operational perimeter datasets, and event-level perimeter products, and Table 1 now summarizes the major limitations of existing datasets in terms of spatial resolution, temporal coverage, geographic scope, event definition, and omission of smaller fires. The Results and Discussion section further clarifies that CONFEX should be interpreted as a VIIRS-derived event-envelope product rather than a direct replacement for burned-area or operational perimeter products.

Exact revised manuscript text:

1. Introduction, AF vs BA paragraph

"While BA products are valuable for mapping the final fire footprints, they are less suitable for rapid assessment because their algorithms require a sustained interval of post-fire observations to confirm surface changes (Chen et al., 2022)."

2. Introduction, existing-products paragraph

"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."

3. Introduction, gap paragraph

"Existing products are either too coarse (MODIS/FIRED), geographically limited (FRAP/FEDS), omit smaller fires (MTBS), or lack perimeter geometry (NASA FIRMS (National Aeronautics and Space Administration Fire Information for Resource Management System) hotspots)."

4. Table 1, Major limitations column

Examples from the Major limitations column include:

- Giglio et al. (2006): "Coarse spatial and temporal aggregation; not an event-level perimeter product"
- Global Fire Atlas: "Dependent on the MODIS burned-area product and moderate spatial resolution"
- FEDS: "Restricted geographic scope; temporal coverage ends before the full CONFEX study period"
- MTBS: "Omits smaller fires because of the large-fire thresholds"
- NASA FIRMS is mentioned in the text as lacking perimeter geometry.

5. Results and Discussion, Caldor Fire example

"The larger CONFEX area reflects the detection-derived event-envelope definition used in this study: CONFEX constructs perimeters from clustered VIIRS active-fire detections and applies a sensor-scale geometric buffer, whereas FRAP and MTBS represent mapped perimeter products derived from agency or Landsat-based burn mapping workflows. This example therefore illustrates a methodological difference among the products rather than a direct one-to-one burned-area equivalence."

Major Comment 3: Satellite Wildfire Measurement

Reviewer comment: **"This section is also overly long and could be streamlined. Since the method is primarily based on VIIRS 375 m data: Discussion of other products (e.g., MODIS) should either be minimized or moved to supplementary materials."**

Response: We thank the reviewer for this suggestion. The former standalone Satellite Wildfire Measurements section was removed from the main manuscript. Historical discussion of AVHRR, GOES, MODIS, VIIRS, and the development of satellite active-fire products was moved to Supplementary Note S1. The revised Data and Methods section now retains only the VIIRS S-NPP and VNP14IMGML details needed to understand CONFEX generation, while the VIIRS channel information is summarized in Supplementary Table S1.

Text removed or condensed from the original manuscript: The original manuscript contained a standalone "Satellite Wildfire Measurements" section with extended historical discussion of AVHRR, GOES, MODIS, VIIRS, and successive algorithm generations. That material has been moved to the supplementary document, and concise details about the input product, VNP14IMGML (Suomi-NPP VIIRS 375 m ASCII fire location data), have been incorporated into the Data Sources and Preprocessing subsection.

The revised "Data Sources and Preprocessing" now reads:

"We used the standard VNP14IMGML (Suomi-NPP VIIRS 375 m ASCII fire location data) CSV data from the NASA FIRMS (NASA FIRMS, n.d.) for the period 2012–2024, which is the VIIRS S-NPP 375 m active fire product. The VIIRS has 16 moderate 750 m resolution M (Moderate resolution) bands, 5 high 375 m resolution I (Imaging) bands and one Day/Night band. The temporal resolution is 12 h or less, and the threshold for fire detection at nighttime is as low as 5 m^2 (Schroeder et al., 2014). Each VIIRS instrument (S-NPP, NOAA-20 (National Oceanic and Atmospheric Administration-20), and NOAA-21) has a ~3,040 km swath and completes ~14 sun-synchronous orbits per day (orbital period ~100 min), resulting in ~2 overpasses per day at the equator and ~3–4 at mid-latitudes. For this study, only the S-NPP VIIRS data were used because they provide a continuous record since late 2011. The S-NPP VIIRS sensor data record has been extensively validated and is suitable for long-term analyses (Cao et al., 2013).

VNP14IMGML is based on fire detections from VIIRS 375 m channels and fire radiative power (FRP) values from the 750 m channel. We are only using the 375 m hotspots in our product generation and the FRP analysis is out of the scope of our product. Additional historical background on satellite active-fire detection and the development of MODIS and VIIRS fire products is provided in

Supplementary Note S1, and the VIIRS channels used in the 375 m active fire detection algorithm are summarized in Supplementary Table S1.

We filtered the data to keep only the vegetation type. We excluded low-confidence detections that are often glint, water, or false alarms, and we only kept nominal and high confidence pixels that the algorithm considers physically valid and robust detections (Schroeder and Giglio, 2016; Schroeder et al., 2014)."

Reviewer comment: "Instead of detailed descriptions, it would be sufficient to cite existing literature comparing MODIS and VIIRS fire products."

Response: We thank the reviewer for this important suggestion. The detailed descriptions of historical satellite algorithms and products were removed from the main manuscript and moved to Supplementary Note S1. In the revised Introduction, we now cite and summarize relevant MODIS-, VIIRS-, burned-area-, and perimeter-based fire datasets more concisely, and Table 1 compares existing fire datasets and relevant foundational approaches with CONFEX in terms of spatial coverage, temporal coverage, spatial resolution, event definition, major strengths, and major limitations.

Exact revised manuscript text in "Introduction": "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."

Major Comment 4: Methodology

Reviewer comment: Section 3.2: This section is too brief to stand alone, and the description of preprocessing steps lacks sufficient detail.

Response: The former preprocessing subsection was expanded and reorganized as Section 2.1, "Data Sources and Preprocessing." The revised section specifies the source product, period of record, VIIRS S-NPP data choice, confidence filtering, vegetation-only screening, and the relationship between the 375 m active-fire detections and FRP values from the 750 m channel. The revised "Data Sources and Preprocessing" section is provided in response to Comment 3 above.

Reviewer comment: Restricting the analysis to nominal and high-confidence pixels may lead to omission of important fire types (e.g., peatland fires).

Response: We agree with the reviewer that filtering for nominal and high-confidence pixels introduces a trade-off between data purity and detection completeness. While this filter is necessary for reducing false alarms caused by sun glint, water, and other non-fire artifacts, it may omit low-intensity or smoldering fire types, such as peatland fires. We have acknowledged this limitation in Section 3.7, "Dataset Limitations," and added the relevant citations to the manuscript.

Exact revised manuscript text in "Dataset Limitations": "Filtering the database to nominal- and high-confidence detections is necessary to reduce false alarms associated with sun glint, water, and other non-fire artifacts; however, it introduces a known omission bias for low-intensity or smoldering fire types (NASA FIRMS, n.d.; Schroeder et al., 2014). This is particularly relevant for peatland fires, which are often slow moving and smoldering and are therefore more difficult to detect with satellite active-fire algorithms (Usup et al., 2004; Rein and Huang, 2021). As a result, CONFEX may underrepresent these fire regimes, especially in high-latitude regions such as Alaska."

Reviewer comment: The methods are presented largely as an operational workflow, with limited explanation of innovation, justification, or methodological advancement.

Response: We thank the reviewer for this important insight. We revised the Data and Methods section to better emphasize methodological justification and advancement beyond an operational hotspot-processing workflow. The revised text now explains that CONFEX combines normalized spatiotemporal DBSCAN clustering, a Chebyshev hard-threshold linkage rule, region-specific projected processing for CONUS and Alaska, and cluster-size-dependent perimeter construction from VIIRS 375 m active-fire detections. The manuscript also explains that the Chebyshev metric enforces independent hard thresholds in space and time, thereby reducing chaining errors that may arise when unrelated ignitions are linked through intermediate detections. In addition, the revised section clarifies the use of region-specific tuning, the geometric decision logic used for perimeter reconstruction, the use of separate projected coordinate systems for CONUS and Alaska, and the inclusion of gridMET 1000-hour dead fuel moisture for managed-fire candidate attribution in the CONUS workflow.

Reviewer comment: The calculation of the centroid (an output of CONFEX) is not described. It is unclear whether this refers to a geometric centroid or another definition. The relevance of this variable is also not sufficiently justified.

Response: We thank the reviewer for this suggestion. We clarified in the Data and Methods section that CONFEX reports the geometric centroid of the final event perimeter. Specifically, after final fire-event objects are generated, the workflow calculates mapped area and centroid coordinates for the final concave, convex, or ellipsoid perimeter geometries. The centroid is therefore a detection-derived geometric summary of the final event perimeter, not an independently observed ignition point or field-observed fire center. We also clarified in the Dataset Limitations section that centroids should be interpreted as detection-derived geometric summaries because CONFEX is derived from clustered VIIRS active-fire detections rather than direct field observations.

Exact 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. The centroid of each fire event is defined as the geometric centroid of the final event perimeter."

Revised text in Dataset Limitations:

"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: "More informative outputs—such as initial ignition points, fire spread dynamics, or temporal progression—could significantly enhance the dataset's value."

Response: We thank the reviewer for this suggestion. The dataset already includes ignition-related proxy information: event attributes include ignition timing and location derived from the first associated VIIRS detections, together with end time, mapped area, and centroid coordinates of the final event perimeter. These ignition-related attributes should be interpreted as first-detection proxies rather than field-observed ignition points. We agree that additional outputs such as fire spread dynamics, spread vectors, spread rate, fire-line movement, and explicit daily temporal progression would further enhance the value of the product. These developments are an important direction for future work and are currently being explored by the authors. However, they are beyond the scope of the present study, whose focus is on the construction and validation of an event-level fire-perimeter database derived from VIIRS S-NPP detections.

Reviewer comment:

Regarding evaluation:

• The manuscript uses burned area products for validation but does not clearly explain the relationship and differences between burned area and fire perimeter datasets.

Response: We thank the reviewer for this important comment. The revised manuscript now more clearly distinguishes active-fire detections, burned-area products, and event-level fire-perimeter datasets. In the Introduction, we explain that active-fire products capture instantaneous thermal anomalies at the time of satellite overpass, whereas burned-area products identify post-fire land-surface change and therefore represent cumulative end-state fire footprints rather than event-based fire evolution. We further clarify that perimeter datasets derived from active-fire detections are intended for event-level analysis because they aggregate individual hotspots into coherent fire objects with ignition timing, event duration, and spatial extent. This distinction is also reflected in the revised validation framing, where MTBS, FRAP, GeoMAC, and WFIGS are used as reference datasets for spatial comparison while acknowledging that burned-area, operational perimeter, and active-fire-derived perimeter products are not strictly equivalent representations of fire.

Exact revised manuscript text in “Introduction”: “Remote sensing methods, utilizing satellite and low elevation airborne instruments, have emerged as a primary alternative. They typically use two distinct detection methods: active fire (AF) detections and burned area (BA) products. AF products identify instantaneous thermal anomalies at the time of satellite overpass by using the near infrared and mid-infrared spectral ranges (Schroeder et al., 2014). In contrast, BA products are based on detection of land-cover and moisture changes after a fire has already passed (Giglio et al., 2018). While BA products are valuable for mapping the final fire footprints, they are less suitable for rapid assessment because their algorithms require a sustained interval of post-fire observations to confirm surface changes (Chen et al., 2022). Seminal work by Giglio et al. (2006) established the foundational methodology for using AF pixel counts as a statistical proxy for burned area, at a coarse 1° resolution. Perimeter-based datasets generated from active fire detections are better for event-level analysis, as they synthesize these scattered detections into coherent fire objects that provide ignition and event duration information. Even in the absence of complex daily progression tracking, the provision of an ignition location, geometric centroid, and a precise temporal duration offers a level of operational detail that neither individual hotspots nor cumulative burned area grids can provide."

Reviewer comment:

• It is unclear whether the fire perimeter product is intended as a substitute for burned area. If so, the novelty relative to studies such as Giglio et al. (2006) should be more explicitly emphasized.

Response: We thank the reviewer for this comment. CONFEX is not intended as a substitute for a burned-area product. Rather, it is designed as a complementary event-level fire-perimeter dataset derived from VIIRS active-fire detections. Its primary purpose is to represent individual fire objects with associated ignition timing, event duration, and spatial extent, which makes it more suitable for applications such as ignition analysis, event-based fire tracking, and comparison with existing perimeter products. In contrast, burned-area products represent cumulative post-fire surface change and are therefore conceptually different from event-based perimeter datasets. We have revised the Introduction to make this distinction more explicit and to clarify the relationship to Giglio et al. (2006), whose work established a foundational methodology for relating active-fire detections to burned area at coarse spatial resolution. We now state more clearly that CONFEX extends the use of active-fire detections in a different direction, namely toward event-level perimeter delineation rather than burned-area estimation. We also clarify that reference datasets such as MTBS, FRAP, GeoMAC, and WFIGS are used for spatial comparison, not because burned-area, operational perimeter, and active-fire-derived perimeter products are identical, but because they provide complementary benchmarks for evaluating final fire extent.

Exact revised manuscript text in "Introduction": "AF products identify instantaneous thermal anomalies at the time of satellite overpass by using the near infrared and mid-infrared spectral ranges (Schroeder et al., 2014). In contrast, BA products are based on detection of land-cover and moisture changes after a fire has already passed (Giglio et al., 2018). While BA products are valuable for mapping the final fire footprints, they are less suitable for rapid assessment because their algorithms require a sustained interval of post-fire observations to confirm surface changes (Chen et al., 2022). Seminal work by Giglio et al. (2006) established the foundational methodology for using AF pixel counts as a statistical proxy for burned area, at a coarse 1° resolution. Perimeter-based datasets generated from active fire detections are better for event-level analysis, as they synthesize these scattered detections into coherent fire objects that provide ignition and event duration information. Even in the absence of complex daily progression tracking, the provision of an ignition location, geometric centroid, and a precise temporal duration offers a level of operational detail that neither individual hotspots nor cumulative burned area grids can provide."

Major Comment 5: Data Characteristics and Discussion

This section should be reorganized for clarity:

• Separate into two sections: Results and Discussion.

• Suggested structure:

o Section 4.1: Content currently in lines 324–357

o Section 4.2: "Alaska Fire Dynamics"

o Discussion: "Dataset Limitations" and broader interpretation

Response: We thank the reviewer for this suggestion. We reorganized the former Data Characteristics and Discussion section to improve clarity and to separate the major types of content more clearly within a combined Results and Discussion section. The revised Section 3, "Results and Discussion," now presents regional threshold decisions, validation results, validation interpretation, fire-event database characteristics, Alaska fire dynamics, ecoregion and diagnostic-attribute summaries, an example fire-event case study, and dataset limitations. This structure keeps the results and their necessary interpretation together while making the limitations and broader interpretation more explicit. The revised manuscript is followed by a separate Conclusion and Data Availability section.

Reviewer Comment:

Additionally, the Discussion section needs substantial expansion, including:

• Clear articulation of the study's advances relative to existing work

• Implications and potential applications of the dataset

Response: We thank the reviewer for this important suggestion. The revised Results and Discussion section and Conclusion have been expanded to more clearly articulate both the advances of CONFEX relative to existing datasets and the implications of the released product. The Results and Discussion section now provides the supporting evidence for this interpretation through expanded multi-reference validation, CONFEX-only candidate analysis, regional validation interpretation, managed-fire candidate and volcanic-source diagnostics, and dataset limitations. The revised manuscript emphasizes that CONFEX is a spatially consistent, detection-derived fire-event inventory rather than an exact high-resolution burned-area boundary product or a replacement for existing reference perimeter datasets. In addition, the revised Conclusion now describes the dataset's potential applications, including regional fire-regime analysis, historical inventory development for VIIRS-detected fire events, ignition-focused studies using first-detection proxies, stratified analyses by land-cover setting and ecoregion, and evaluation of differences between VIIRS-derived fire-event records and existing perimeter datasets. We also explicitly note that daily fire progression, spread vectors, spread rate, and fire-line movement would be valuable future extensions but remain beyond the scope of the present study.

Exact revised manuscript text in the "Results and Discussion" section: "The validation results show that no single reference dataset captures the full evaluation problem for CONFEX. MTBS is useful for evaluating agreement with a widely used burned-area perimeter product, but its reporting thresholds make it less complete for small fires and many managed burns."

"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."

Exact revised manuscript text in the "Conclusion": "Validation against MTBS, FRAP, GeoMAC, and WFIGS showed the strongest spatial agreement in Alaska, California, and CONUS West, while agreement was lower in the Midwest, Appalachian-Mid-Atlantic, and southeastern CONUS regions. Northeast validation was interpreted primarily using WFIGS because MTBS contained too few VIIRS-era reference fires in that region for stable regional validation. These regional differences are reported with complementary area-based, object-level, unmatched-object, merge/split, and overlap diagnostics rather than interpreted as simple false-positive or false-negative rates. CONFEX should therefore be used as a spatially consistent, detection-derived fire-event inventory rather than as an exact high-resolution burned-area boundary product or a replacement for existing reference perimeter datasets."

"The main limitations of CONFEX arise from its dependence on VIIRS active-fire detections and from the event-delineation assumptions used to group detections into fire objects. The database is retrospective and does not currently provide daily fire progression, spread vectors, spread rate, or fire-line movement. Event representation can also be affected by satellite overpass timing, cloud and smoke conditions, fire intensity, detection confidence, and the availability of thermal anomalies during the active period. Fire-type, managed-fire candidate, volcanic-source, and overlap attributes should be interpreted as diagnostic screening variables rather than confirmed fire-cause or event-quality labels."

"Despite these limitations, CONFEX provides a broad-domain, moderately high-resolution fire-event perimeter and attribute database for CONUS and Alaska. By providing consistent VIIRS-derived event perimeters, ignition-proxy locations, timing attributes, duration, centroid locations, mapped area, and diagnostic context across the full 2012-2024 study period, CONFEX can support regional fire-regime analysis, historical inventory development for VIIRS-detected fire events, ignition-focused studies using first-detection proxies, stratified analyses by land-cover setting and ecoregion, and evaluation of differences between VIIRS-derived fire-event records and existing perimeter datasets."

Minor Comments:

Reviewer comment: "Figure 1: This appears to function as a table rather than a figure. I recommend converting it to Table 2."

Response: We thank the reviewer for this suggestion. The former spectral-channel figure was converted into a table. Because the detailed satellite active-fire background was moved from the main manuscript to the supplementary material, this channel summary is now provided as Supplementary Table S1 rather than as a main-text table. The main manuscript now refers readers to Supplementary Note S1 and Supplementary Table S1 for the historical background and VIIRS channel details.

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