This paper generates three-dimensional biomass-burning emissions for Southeast and East Asia by developing new fire diurnal cycles and vertical injection profiles. The proposed diurnal cycle is derived by integrating fire radiative power data from both geostationary and polar-orbiting satellite observations. The vertical injection profile is produced using a machine-learning model trained on satellite-retrieved smoke plume heights and meteorological variables. However, the manuscript is not well-structured, and the methodology lacks clarity and robustness. Substantial revisions are needed before the work can be considered for publication.

Major comments:
1. **Weak integration between the fire diurnal cycle and vertical injection profile components**
   Although the overarching objective is to develop a three-dimensional biomass-burning emission dataset, the manuscript presents the derivation of the fire diurnal cycle and the vertical injection profile as largely independent processes. The authors first generate and validate 2-D fire emissions, then separately develop and validate smoke plume heights. However, the connection between these two components—and how they integrate to form the final 3-D emissions—is not clearly articulated. I recommend extensively restructuring the manuscript to better emphasize the methodological coherence and the interdependencies between these two parts.

2. **Insufficient background and regional context**
   The literature review does not adequately cover relevant studies conducted in Asia. Much of the discussion focuses on work from the United States or other regions, while several closely related studies in Asia are overlooked. These omissions weaken the contextual grounding of the study and obscure how this work builds upon or differs from existing regional research. The authors should expand the background section to include key Asian studies and clearly articulate their linkages to the current work.

   References:
   'Dynamics of fire plumes and smoke clouds associated with peat and deforestation fires in Indonesia'
   'Fire Particulate Emissions from Combined VIIRS and AHI Data for Indonesia, 2015-2020'
   'Improved estimation of fire particulate emissions using a combination of VIIRS and AHI data for Indonesia during 2015–2020'
   'Highly anomalous fire emissions from the 2019–2020 Australian bushfires'

3. **Methodological issues and lack of robustness**
   - **Choice of VIIRS 375-m product:**
     The manuscript uses 375-m VIIRS FRP, but this product is known to saturate under high-intensity fires. Why was the 375-m product chosen instead of the 750-m VIIRS FRP? This choice needs stronger justification beyond the higher spatial resolution. Have the authors tested or compared the 750-m FRP?
   - **AHI FRP correction:**
     The reference (Li et al., 2022) cited for the AHI FRP correction does not actually use AHI FRP, making this citation inappropriate.

- **Unclear machine-learning description:**
  The section describing the machine-learning method lacks clarity. Important details such as the training–testing strategy, sample selection, and dataset composition are not provided.
- **Missing validation subsection in the Methods:**
  A dedicated validation subsection should be added to the Methods section to clearly explain the evaluation workflow.
- **Lack of GFED products in evaluation:**
  It is unclear why the widely used GFED-related products are omitted from the evaluation. Including them would provide a more comprehensive comparison.
- **Section 3.3.2 — Rationale for comparison with inventories:**
  The manuscript evaluates the new emissions against existing emission inventories but mainly describes the differences without explaining the underlying causes. For example, why are the results lower than FINN but closer to FEER and QFED? Additional interpretation is needed in the Results or Discussion sections.
- **Lines 321–324 — Transferability of methods:**
  These lines describe a core component of the method, yet the supporting references are based on studies from the U.S. and Europe. The authors should justify whether such methodologies are appropriate for Asian fire regimes.
- **Line 465 — Limited validation case:**
  Validating the method using only a single biomass-burning episode is insufficient. More cases are needed to demonstrate robustness.

4. Errors in basic information
There are several factual inaccuracies that need correction. For example:
- Mixing up sensor and satellite names (line 97).
- Stating that MODIS fails to capture nighttime events (lines 131–132).
- Citing a reference for AHI FRP correction that does not actually use AHI FRP.

Minor to moderate comments:
- **Lines 33–34:** Please specify the versions of all datasets used—at minimum in the Data section—since different versions may produce substantially different values.
- **Lines 33–34:** Why not provide comparison results for all emission inventories included in the study?
- **Line 35:** Please use statistical metrics to demonstrate the performance of the SPH estimation rather than presenting a single numerical value.
- **Line 38:** "Satellite observations" should be specified. If you mean MISR SPH, please explicitly name the product here.
- **Lines 38–41:** It seems inconsistent that the study's final goal is to generate 3-D fire emissions, yet this section focuses only on analyzing drivers of SPH.
- **Line 41:** The phrase "are anticipated to" is not appropriate, since you have already generated an observation-driven, hourly 3-D biomass-burning emission dataset for SEA.

- **Lines 47–51:** If the manuscript focuses on validating CO, why not center the discussion on CO emissions in this section?
- **Lines 56–58:** The justification for selecting the SEA study area is not strong or straightforward.
- **Lines 56–81:** The background research for Asia is insufficient. Much prior work outside Asia is discussed, yet several important regional studies are missing.
- **Line 95:** Please add "three-dimensional" here for accuracy.
- **Line 97:** VIIRS and NOAA-20 should not be presented as parallel entities; one is a sensor, the other is a satellite platform.
- **Lines 102–103:** Please remove the final sentence—its style is more appropriate for a proposal rather than a manuscript.
- **Lines 129–130:** The description of Himawari-8's spatial and temporal resolution is unnecessary here, as these specifics have already been provided.
- **Lines 131–132:** MODIS can detect nighttime events due to its ~1:30 a.m. overpass, although it may not capture all nighttime fires. This statement should be corrected.
- **Lines 163–165:** Please clarify what constitutes the testing dataset.
- **Lines 171–174:** Why not directly include the common fire weather index variables (temperature, relative humidity, wind, and precipitation)?
- **Lines 177–180:** Why are widely used GFED products not included?
- **Section 2.3.1:** If this section refers to VIIRS FRP data calibration, please revise the title to reflect that.
- **Line 5.7:** Please indicate the source of the test data.
- **Figure 2:** Please add a legend explaining the colors.
- **Figure 4:** Use either "correction" or "calibration" consistently throughout the text and figures.