The paper proposes a new dataset of spectral indices for Europe, based on Landsat Analysis Ready Data version 2 (ARD V2) for the period 2000-2022. The dataset is fully available to the public on Zenodo, and the code is accessible on GitHub, greatly facilitating the review process. The paper is well-written.

The article's strengths are the strategies followed for building the bi-monthly composites (what authors call Tier 1) and the **extensive validation performed**. The dataset validation includes ground truth data from several sources, such as the Land Use and Cover Area Frame Survey (LUCAS), European cropland surveys (Edlinger papers), and Eurostat's tillage area statistics. These ground truth datasets are primarily used to assess the utility of the temporal-spectral feature (i.e., Tier 3, Figures 5, 6, 7, 8, and 9). Additionally, the paper evaluates annual trends in long-term temporal-spectral indices (i.e., Tier 4, Figures 10, 11, 12, 13, 14, and 15). Finally, a classification (land cover) and regression models (soil organ carbon) are trained using the dataset presented in this paper as input data, with LUCAS data as the target variable (Figures 18, 19, 20, and Tables 5, 6, 7). A statistical comparison of classes of land cover with other Landsat-derived products (i.e., EcoDataCube, Witjes et al. (2023)) was also carried out (Figure 16).

I have some concerns about the high correlation between this paper and the Consoli et al. (2024) paper, which is available only as a preprint and published just one month ago (https://www.researchsquare.com/article/rs-4465582/v1). However, if the **editor thinks this similarity is irrelevant**, I would **recommend a minor revision (see comments below)**.

Major concern

This paper, "Bi-monthly and Annual Landsat Spectral Indices for Europe 2000-2022," **is very similar to the dataset presented in Consoli et al.'s (2024) "Global Bi-monthly Landsat Aggregated Product 1997-2022. " Both papers have not been published yet but are available as preprints.**

This journal states: *"The editors encourage submissions on **original data or data collections** of sufficient quality that have potential to contribute to these aims."*

The **Consoli et al. (2024)** paper focuses on Tier 1, i.e., generating plausible aggregation and performing gap-filling in a single step by simply adjusting a convolution kernel. It introduces a new algorithm, TSIRF, which appears to outperform traditional methods like Savitzky-Golay in terms of both computation time and accuracy. The editor should consider that many authors of the **Consoli et al. (2024)** paper are also authors of this paper under review. The **Consoli et al. (2024)** paper is available as a preprint here: https://www.researchsquare.com/article/rs-4465582/v1.

The primary difference between these two papers lies in the **estimation of spectral indices**, specifically Tier 2 (Vanilla Spectral Index), Tier 3 (Temporal-Spectral Index), and Tier 4 (Long-term Temporal-Spectral Index). Essentially, **this paper builds on the data presented by Consoli et al. (2024)**. For instance, on Page 3, Line 24 **the Bimonthly aggregated cloud-optimized bands must be the same that Consoli et al. (2024) paper.**

I believe that an ESSD brief communication, as an extension of the Consoli et al. (2024) paper—published after its acceptance—would be more appropriate for this paper, as the principal novelty is the estimation of complex temporal-spectral indices and their validation.

Minor comments

- Experiments demonstrating the time-series reconstruction performance in Tier-1 would be highly relevant for readers.

- **Line 10, Page 2:** "which cover approximately 67% of the Earth's surface" – Please either remove this phrase or provide an accurate citation.

- **Line 20, Page 5:** What is SIRCLE? This term is not mentioned in either Consoli et al. (2024) or the scikit-map documentation. Please clarify the difference between SIRCLE and TSIRF.

- **Line 5, Page 6:** SIRCLE is cited as part of Consoli et al. (2024), but the acronym only appears in Figure 3 without further reference. Please ensure that SIRCLE is introduced properly if it is central to the methodology.

- **Line 20, Page 3 and Line 5, Page 36:** Referring to Witjes et al. (2023) as "limited" for presenting quarterly rather than bi-monthly maps may be a bit misleading. Especially considering the high amount of missing data at high latitudes (see Figure 1 in this paper), a more nuanced wording may be more appropriate.

- **Line 5, Page 37:** What is HLS? Please provide a brief explanation of the acronym.

- **Line 5, Page 37:** The limitations section should address the known limitations of ARD V2, such as cloud detection accuracy over Europe and the challenges in harmonizing Landsat products.