General comments:

This manuscript is well written, clear, and a useful contribution to the field of Earth Radiation Budget research and observations. It clearly is in support of the science objectives of the ESA ECO mission that aims at high accuracy EEI measurements over annual to multi-annual timescales employing WFOV radiometry. This study isolates the problem of space-time sampling from other sources of uncertainty pertaining to instrumentation and anisotropy of the radiance field. The insights gained, support previous findings that sampling of diurnal and intra-annual variability is critical for ERB research. That said, the manuscript lacks a bit of background on the issues at hand and previous studies. I believe it would be beneficial to highlight (some of) the history of orbital constellation studies and put the new findings into perspective. Overall, I recommend this paper for publication. I hope the authors find my comments and suggestions below helpful for improving their manuscript

Specific Comments:

1) Line 65: Does the suggested 1 Wm^{-2} accuracy requirement meet the science needs? Who established this requirement and how/why?
2) Line 69: It is unclear to me how the camera "allows" to distinguish spatial resolution. I assume the authors are referring to sub-footprint variability that the camera resolves to some extent? What is the spatial/spectral resolution of the camera and how will it be used?
3) Line 77 ff: That the diurnal cycle represents an issue in sampling regional and global ERB correctly is a known fact. Likewise, inclined (precessing) orbits have been suggested by many studies to improve on this issue. There are likely many more studies on this. I was able to find these:

    - Kirk-Davidoff, D. B., R. M. Goody, and J. G. Anderson, 2005: Analysis of Sampling Errors for Climate Monitoring Satellites. *J. Climate*, **18**, 810–822, https://doi.org/10.1175/JCLI-3301.1.
    - T. H. V. Haar, T. H., and E. A. Smith, E.A. (1979). Theoretical comparison between radiometric and radiation pressure measurements for determination of the Earth's radiation budget, Atmos. Sci. Paper 317, Jul. 1979.
    - Campbel and Vonder Haar (1978); cited in above
    - Taylor, P. C., and N. G. Loeb, 2013: Impact of Sun-Synchronous Diurnal Sampling on Tropical TOA Flux Interannual Variability and Trends. *J. Climate*, **26**, 2184–2191, https://doi.org/10.1175/JCLI-D-12-00416.1.
    - Salby, M. L., 1988: Asynoptic Sampling Considerations for Wide-Field-of-View Measurements of Outgoing Radiation. Part I: Spatial and Temporal Resolution. *J. Atmos. Sci.*, **45**, 1176–1183, https://doi.org/10.1175
    - https://ntrs.nasa.gov/api/citations/20140006546/downloads/20140006546.pdf and other works by Harrison.

4) Line 110 ff: Is there a reference for the “kernel” and equation 1? I’m sure there are several. For example, papers that intercompared ERBE WFOV and scanner data back in the 1980s/90s.
5) Line 116: Is it shape factor or anisotropy factor? What is the difference? And where can the reader look up background information (reference)?

6) Line 117: What are typical cosine response errors and how would they affect the measurement? This simulation environment would be perfect for quantifying the requirements for these errors and instrument response. These errors cannot be corrected for once the measurement is taken. I’m wondering, however, if with this model the error scan be predicted using CERES or camera data to correct for it during data processing. Of course, this won’t be perfect either, but might become necessary.
7) Figure 4: What are the corresponding global mean OLR values? Is the right figure the same as left but multiplied with the kernel?
8) Line134: Since EEI is to be measured at high accuracy, what is the magnitude of atmospheric twilight transmission and the error induced? I’m wondering if this work by Loeb et al., 2002 might provide insight: https://journals.ametsoc.org/view/journals/clim/15/22/1520-0442_2002_015_3301_dtotaf_2.0.co_2.xml
9) Line 210: Please clarify what is ISR vs ISR_{CERES}. Is ISR_{CERES} the truth if perfectly sampled? And is ISR the undersampled measurement?

10) Lines 234-235: I believe the opposite may be true. The more satellites, the less susceptible the mission and data record is to loss of instruments. As mentioned earlier, the diurnal filling can be achieved in other ways. 6 satellites do not seem that impractical (e.g. compared to the Irridium66 example), and fixed local times (SSO) may have many advantages, e.g., well known return time and a better handle on intercalibration targets. It really depends on the needs of the mission and trade space. I would not completely disregard a SSO constellation. There are reasons why most Earth science missions fly in SSO and there may be more opportunity for reaching such orbits, e.g., on ride shares if needed.
11) Line 237: Even though the errors seem small when using the 2 or 3 sat constellation, the sampling of Earth is still far from complete. For example, what if a major event such as a volcanic eruption occurs? The CERES record does not cover any such event. This would be a good experiment to conduct. In general, this paper should end on “next steps” that will be taken to improve the model, and additional analysis that will be conducted to answer any remaining questions.
12) Line 255: What about even lower inclinations, e.g., 68deg? This would increase the sampling of diurnal cycle even more. Do you know at which inclination the benefit of diurnal sampling goes to near zero? Such a sensitivity study would be very useful. Previous studies suggested inclinations near 60 and 50 deg, probably to enhance the sampling specifically at low latitudes where it is most significant.

Technical Comments:

- Abstract line 5: “There has recently been a renewed interest in applying wide-field-of-view radiometers onboard satellites to measure the outgoing radiation, and hence deduce the global annual mean energy imbalance.” – It is unclear to me how one can deduce EEI from Earth out going radiation alone. I recommend this sentence to be rewritten.
- Line 16: A number of papers could be cited here after the first sentence, e.g., Loeb et al., 2021; Raghuraman et al. 2021; Kramer et al., 2021…
- Line 28: I believe there is consensus that the “solar constant” is not a constant at all. “Total Solar Irradiance (at 1 AU)” would be more fitting.
- Line 33: Stephens et al. (2015) provide a history of albedo values and studies.
- https://agupubs.onlinelibrary.wiley.com/doi/10.1002/2014RG000449
- Line 40: “Spread” might not be the proper wording. Do you mean “combination of”?
- Line 46: Hakuba et al., 2021 is also a good example of satellite-based ocean heat uptake and change in EEI deduced from it. https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2021GL093624
- Line 53: I recommend these references for the Libera mission:
    - Harber, D., K. Catani, J. Gieseler, R. Haun, N. Kruczek, J. Sprunk, N. Tomlin, C. Yung, J. Lehman, M. Stephens, T. Kampe, S. Collins, J. Peterson, H. Latvakoski, C. Monte, M. Hakuba, and P. Pilewskie (2013). The Libera Mission: Bringing Next-Generation Technology to an Established Climate Data Record. 15th International Conference on New Developments and Applications in Optical Radiometry (NEWRAD 2023), 11–15 Sep. 2023, NPL, Teddington, UK.
    - Hakuba et al. (2024): Maria Z. Hakuba, Bruce Kindel, Jake Gristey, Alejandro Bodas-Salcedo, Graeme Stephens, Peter Pilewskie; Simulated variability in visible and near-IR irradiances in preparation for the upcoming Libera mission. *AIP Conf. Proc.* 18 January 2024; 2988 (1): 050006. https://doi.org/10.1063/5.0183869.