

## General Comments

This manuscript presents a 20-year observational dataset collected at the Met Office Cardington site in the United Kingdom. A key strength of this site is that the surrounding environment has undergone only limited changes over the past two decades, which effectively minimizes the influence of urbanization on climate-related studies. In addition, the site has many ground-based instruments, providing an observational basis for atmospheric research applications. Overall, the scientific value of this dataset is clear.

The manuscript is well structured and generally easy to follow. I recommend publication after minor revisions.

I mainly focus on three aspects: 1. incomplete introduction for some remote sensing instruments, which may limit their potential applications; 2. missing measurement uncertainty information for certain instruments or variables; 3. the lack of consistency checks or adjustments among overlapping measurements from different instruments. While the latter may not be mandatory, users should at least be made aware of this issue.

## Major Comments

1. Section 5 introduces a variety of remote sensing instruments. However, for some instruments, essential information is not sufficiently documented. For instance, it is unclear whether the Doppler lidar operates at 1565 nm or 1.55  $\mu$ m, and the channel configurations of certain microwave radiometers are not fully provided. This lack of information may limit the usability of the dataset. With complete instrument specifications, users could perform synergistic retrievals of cloud properties or data assimilation using combined observations. Similar issues may arise for other instruments due to missing key information. I therefore recommend either providing the full set of instrument specifications most relevant to users or explicitly referencing detailed technical documentation where this information can be found.
2. Climate analysis and data assimilation both require stringent quality control procedures and measurement uncertainties, which are key concerns for users. I note that the core hydrometeorology instrumentation is well documented in terms of quality control. However, this information is missing or incomplete for many other instruments. For some non-core instruments, it may be sufficient to summarize the uncertainty information available in the instrument manuals or to provide appropriate references.
3. Some instruments measure similar variables over overlapping time periods, which provides an opportunity for consistency checks and possible inter-instrument adjustments. Examples include measurements from multiple Doppler radars, wind profilers, and radiosonde observations. While such analyses may be beyond the scope of the current manuscript, it would be helpful to explicitly inform users of these overlaps and to remind them to consider potential inconsistencies when combining data from different instruments.

## Minor Comments

1. Although the manuscript is generally well written, its overall length is relatively large. Some sections appear to have limited importance. For instance, it is unclear whether Section 8 needs to describe the file storage format in such detail. This information could instead be clearly documented

on the data webpage.

2. Given the richness of the dataset, providing a time series or catalogue of major weather events observed at the site, if possible, would be highly valuable. This would facilitate targeted analyses of specific weather phenomena and could also help users identify and exclude certain outliers in climate studies.
3. Lines 345 and 592: please arrange the supplementary materials in the order in which they are cited in the manuscript.
4. Section 5.1 devotes substantial space to describing the principles of three-dimensional wind retrieval using Doppler lidar. In my view, these principles are largely consistent with commonly used approaches and may not require such detailed explanation. Instead, I would be more interested in the uncertainties associated with the retrieved three-dimensional wind fields. Similarly, the impact of near-field effects on lidar backscatter measurements warrants further attention. It would be beneficial to inform users of the height range where data uncertainty is expected to be relatively high, or to provide the corresponding quality flags. This also applies to Section 5.3.
5. At line 715, the phrase “frequencies between 22.24 and 31.4 GHz” should be made more specific by listing the individual channels and providing their corresponding  $NE\Delta T$  values. For the retrieved temperature and humidity profiles, I also recommend providing retrieval uncertainties profiles, or alternatively referring to relevant technical documentation.
6. Lines 539–540 emphasize that “The configuration of JULES here is the MetUM-JULES Regional Atmosphere and Land configuration as described in Bush et al. (2025).” Does Figure 3 use a different configuration from the other data? If the configuration is the same, this statement could be moved earlier to avoid potential confusion.