1. **ABOUT THE DATASET**

**Title: Lerwick Observatory monthly mean Potential Gradient 1925-1984**

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**Description:** Measurements of atmospheric electricity, specifically the Potential Gradient (PG), are relatively rare but have occasionally been made at some sites, such as meteorological or geomagnetic observatories. A valuable series of PG measurements were made in the UK at Lerwick Observatory, Shetland, between 1925 and 1984. This archive provides mean monthly values of the Lerwick PG derived from the hourly measurements during this period.

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**Related publications:** Harrison and Riddick (2022); Harrison (2003); Harrison and Nicoll (2008);

1. **TERMS OF USE**

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1. **PROJECT AND FUNDING INFORMATION**

This dataset contains atmospheric Potential Gradient (PG) data from Lerwick Observatory, Shetland. The Lerwick data was originally obtained by the Met Office.

These data were collected and keyed as part of ongoing atmospheric electricity research by Prof Giles Harrison in the Department of Meteorology, University of Reading, during the past twenty years. No external project funding has been received. The data archive is only partially digitised, however a Citizen Science data entry project led by Dr Hripsime Mkrtchyan under a Marie Curie Fellowship is seeking to comprehensively key in the complete Lerwick dataset.

The values obtained were recorded on daily and monthly summary sheets, which were published annually by the Met Office in *The Observatories’ Year Book* (OYB). The last year of the OYB publication was 1967, after which the data values continued to be published, but by the Hydrological Service of the USSR. The observatory summary sheets from the post-OYB period are stored in the National Meteorological Library and Archive, which continued to 1984 when the measurements ceased. For long term preservation, these summary sheets were scanned by the Hadley Centre of the Met Office in 2003, with supervision from Prof Harrison: this scanning process only generated images for preservation purposes, and the data values were not keyed. Scanned images of the OYB for Lerwick from 1927 to 1967 have subsequently also been made by the British Geological Survey (BGS) at <http://www.geomag.bgs.ac.uk/data_service/data/yearbooks/ler.html> .

Since then, some of the data values have been keyed in from time to time by Prof Harrison with various collaborators and students, most notably Dr Keri Nicoll. This has been an entirely ad hoc activity. The scrutiny applied by different individuals at different times has helped identify erroneous values, which have been removed: incorrect values will no doubt remain. Further, where possible, averages which were provided in the original tabulations have been recalculated to verify the OYB tabulated values. Where discrepancies persisted after such checking, the final values as originally published in the relevant OYB have been retained in the data submission.

1. **CONTENTS**

This data submission contains monthly mean values observations of the Potential Gradient (PG) made in undisturbed and slightly disturbed conditions at the Geophysical Observatory at Lerwick, Shetland. Lerwick is at a northerly point of the UK (fig 1), and Observatory itself is just outside the town of Lerwick, on the main road to Scalloway.

The PG is a measure of the vertical fair weather electric field in the atmosphere. It is determined as the potential gradient at 1 m above the surface over open, flat ground, with units of volts per metre (Vm-1). In fair weather the PG is positive, and typically 100 Vm-1 to 150 Vm-1. If the measurements are not made in such conditions, a suitable correction (sometimes known as a *reduction factor*, or just *factor*) is applied. Principles and methods of PG measurement are given in Harrison & Bennett, (2022). An account of the history of Lerwick Observatory is given in (Harrison & Riddick, 2022).

A map of the united kingdom

Description automatically generated

Figure 1. Maps of (a) the UK and (b) the Shetland Islands, showing the position of Lerwick. (The two further atmospheric electricity monitoring sites at Kew and Eskdalemuir are also marked).

At Lerwick Observatory, the atmospheric Potential Gradient (PG) was measured in a consistent way as hourly values between 1927 and July 1984, with some earlier trial measurements available from 1925/6.

The data were originally classified by the “daily character method”, as 0a, 1a or 2a. These codes denoted: 0 - a day (midnight to midnight) with no negative PG recorded, 1 - a day with negative PG excursions totalling less than three hours, 2 - a day with negative PG totalling more than three hours. In any of the hourly periods of the day, the letter *a* signifies that the PG range did not exceed 1000 Vm‑1. A new classification method was introduced in late 1950s, implemented with some overlap with the older method. In the earlier period, the mean monthly values were derived from measurements on days on which the data fulfilled the daily character criteria, and in the later period, from hours during which the meteorological conditions were either, those of no precipitation (i.e. without rain, snow or hail), described as “no hydrometeors”, or, more demandingly, fair weather. A discussion of the criteria for fair weather in atmospheric electricity is given in Harrison and Nicoll, (2018).

Monthly mean values from the original Lerwick data tabulations (OYB or Archive sheets) are presented here. There are two data files:

|  |  |
| --- | --- |
| Filename | Contents |
| **LerwickMonthlyMeanPG\_0aFW.csv** | Monthly mean PG values from 1925 to 1984 obtained in undisturbed (1925-1963) and fair weather (1964-1984) conditions. |
| **LerwickMonthlyMeanPG\_1a2aNH.csv** | Monthly mean PG values from 1927 to 1984 obtained in slightly disturbed (1925-1956) and no hydrometeor (1957-1984) conditions. |

Both files are plain ascii text file, with each line of data values in columns running from left to right, comma separated. The files are organised as described in Table 1. Both have six header lines. Missing values are left blank.

**Table 1. Lerwick monthly mean data**

|  |  |  |  |
| --- | --- | --- | --- |
| Column number | Quantity | Description | unit |
| 1 | Year | Time variable (value runs from 1927 to 1984) | GMT |
| 2:13 | PG | Monthly mean PG (using day character classification) | Vm-1 |
| 14:25 | PG | Monthly mean PG (using hourly weather classification) | Vm-1 |

1. **REFERENCES**

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