A Quality-Controlled Global Sub-daily Precipitation Dataset and Sub-daily Precipitation Indices

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INTENSE aimed to understand the nature and drivers of extreme sub-daily rainfall

- Lizzie Kendon and team, Robert Dunn, Nigel Roberts (UK Met Office)
- Stephen Blenkinsop, Steven Chan, Liz Lewis, Selma Guerreiro, Xiao-Feng Li, Haider Ali, Renaud Barbero, David Pritchard, Roberto Villalobos Herrera (Newcastle University)
- Geert Lenderink, Jessica Loriaux, Kai Lochbihler (KNMI)
- Other INTENSE partners
GSDR- Global Sub-Daily Rainfall dataset -~26,000 stations (Lewis et al. 2019)
1. **Quality control of hourly data** (Blenkinsop et al., 2017; IJC & Lewis et al., 2018, JH)

2. **Adapted checks to work globally using ETCCDI daily indices** (Lewis et al., submitted)

**Site specific tests**
- rain gauge metadata,
- implausible large values (1h & 24h records)
- Monthly maximum 1-day precipitation
- long dry periods due to gauge malfunction
- accumulated totals (often at 9am)
  - repeated values
  - Change in resolution
  - Duplicate records

**Nearby gauge comparisons**
- Statistical test of consistency with nearby gauges but problematical for extremes in summer/autumn therefore only partially applied

**Multiple QC flags applied to each hour for each test**

**Automated rule base to define exclusions**
For example:
- all implausible hourly totals
- “large” hourly totals if in winter at 9am after ≥23 dry hours
- “large” hourly totals if after gauge non-operation (long dry spell)
A rule based quality control method for hourly rainfall data and a 1 km resolution gridded hourly rainfall dataset for Great Britain: CEH-GEAR1hr

Elizabeth Lewis\textsuperscript{b,c}, Niall Quinn\textsuperscript{b}, Stephen Blenkinsop\textsuperscript{b}, Hayley J. Fowler\textsuperscript{a}, Jim Freer\textsuperscript{b,c}, Maliko Tanguy\textsuperscript{d}, Olivia Hitt\textsuperscript{d}, Gemma Coxon\textsuperscript{b}, Paul Bates\textsuperscript{b,c}, Ross Woods\textsuperscript{b,c}

Fig. 11. Average distance to an hourly gauge for each grid square over the period 1990–2014 and for the years 1990 and 2014 respectively.
Use of radar data for extreme precipitation at fine scales and short durations

Katharina Lengfeld¹, Pierre-Emmanuel Kirstetter²,³,⁴,⁵, Hayley J. Fowler⁶, Jingjing Yu⁶, Andreas Becker¹, Zachary Flamig⁷, and Jonathan Gourley⁵
GSDR- Global Sub-Daily Rainfall dataset -~26,000 stations (Lewis et al. 2019)
# Sub-Daily Extreme Precipitation Indices

<table>
<thead>
<tr>
<th>Maximum indices</th>
<th>Percentile indices</th>
<th>Diurnal cycle indices</th>
<th>Frequency/threshold indices</th>
<th>General indices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monthly and annual maximum 1-hour precipitation</td>
<td>Monthly and annual 95th percentile (1-, 3-, 6-hour)</td>
<td>Monthly likely wettest hour within a day</td>
<td>Monthly and annual count of hours ≥ 10mm</td>
<td>Monthly and annual total precipitation in wet hours</td>
</tr>
<tr>
<td>Monthly and annual maximum 3-hour precipitation</td>
<td>Monthly and annual 99th percentile (1-, 3-, 6-hour)</td>
<td>Monthly likely driest hour within a day</td>
<td>Monthly and annual count of hours ≥ 20mm</td>
<td>Monthly and annual number of wet hours</td>
</tr>
<tr>
<td>Monthly and annual maximum 6-hour precipitation</td>
<td>Monthly and annual total from hours &gt; 95th percentile (1-, 3-, 6-hour)</td>
<td>Dispersion around monthly likely wettest hour within a day</td>
<td></td>
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</tr>
<tr>
<td>Percentage of daily total that fell in the monthly maximum 1-hour precipitation</td>
<td>Monthly and annual total from hours &gt; 99th percentile (1-, 3-, 6-hour)</td>
<td>Simple hourly precipitation intensity index</td>
<td></td>
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<td></td>
<td>Maximum length of wet spell, maximum number of consecutive hours ≥ 1mm</td>
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<td></td>
</tr>
</tbody>
</table>
Monthly Rx1hr Time Series and Timing of Maximum Rx1hr (2000-)

Maximum Rx1hr (2000-)

- Rainfall intensity (mm/hr)

Monthly Rx1hr Time Series and Timing of Maximum Rx1hr (2000-)

Maximum Rx1hr Seasonality

- Month
Summary

We have collected a global sub-daily precipitation dataset, and applied automated quality control

- We have ~16,000 gauge records > 1yr data, ~11,000 > 10yr data
- We have calculated sub-daily extreme precipitation indices at the station-level and gridded indices under development to be hosted on the DWD and CLIMDEX websites
- We are developing a set of climate model evaluation metrics/indices for assessment of high resolution simulations and satellite data products
- Hourly observations have contributed to correcting a new blended 3hr precipitation product
- DWD and Copernicus are hosting the hourly gauge data (most not public) and an associated website with metadata (in progress).

There is great potential for further analysis and development of scientific studies using this new dataset
INTENSE publications (2020)


INTENSE publications (2019a)


INTENSE publications (2019b)


INTENSE publications (2018a)


INTENSE publications (2018b)


INTENSE publications (2016-17)


INTENSE publications (2014-15)

