**README file for the "WFDEI" dataset** (version: 5th May 2016)**.**
*(This document is available for download at: www.eu-watch.org/data_availability)*

***Primary documentation of the WFDEI:***

**Weedon, G.P., Balsamo, G., Bellouin, N., Gomes, S., Best, M.J. and Viterbo, P., 2014. The WFDEI meteorological forcing data set: WATCH Forcing Data methodology applied to ERA-Interim reanalysis data. *Water Resources Research*, 50, doi:10.1002/2014WR015638.**

**Latest news:**

*5th May 2016:* LWdown_WFDEI (3-hourly and daily) for 201101 to 201107 inclusive now re-corrected to fix spurious "striping" in Antarctica. This error had previously been fixed in March 2014 for the existing LWdown_WFDEI files, but somehow Jan to July 2011 were missed out. The error was caused by use of the wrong elevation file when elevation-correcting Antarctic LWdown_WFDEI.

*16th Mar. 2016:* Rainf_WFDEI_GPCC and Snowf_WFDEI_GPCC files (3-hourly and daily) for 2011, 2012 and 2013 updated to correct a processing error related to formatting changes between GPCCv6 and GPCCv7. For the same variables GPCCv7 Outliers in Greenland have been corrected using CRU TS3.23 for Nov. 2011; Dec. 2011; May 2012; Jun 2012; Nov 2013; Dec 2013 (see **File updates** below for further information).

*4th Jan. 2016:* Years 2013 and 2014 added (2011, 2012, 2013 added for Rainf_WFDEI_GPCC and Snowf_WFDEI_GPCC) (see **File updates** below for further information).

*14th Aug. 2014:* WFDEI description paper (Weedon *et al.*) accepted by *Water Resources Research*.

*18th Sept. 2013:* Years 2010, 2011, 2012 added (see **File updates** below for further information).

*31st July 2012*: WFDEI initial release.

**Content:** Eight meteorological variables at 3-hourly time steps, and as daily averages, for the global land surface at 0.5° x 0.5° resolution including Antarctica. WFDEI = "WATCH Forcing Data methodology applied to ERA-Interim data".

**Data usage:** These data are provided for bona fide research purposes only. No warranty is given as to their suitability for user applications. No liability is accepted by the authors for any errors or omissions in the data or associated information and/or documentation.

**Contacts:** graham.weedon@metoffice.gov.uk, gianpaolo.balsamo@ecmwf.net, smgomes@fc.ul.pt

**Fair use:** If publishing using the WFDEI please cite:

Weedon, G.P., Balsamo, G., Bellouin, N., Gomes, S., Best, M.J. and Viterbo, P., 2014. The WFDEI meteorological forcing data set: WATCH Forcing Data methodology applied to ERA-Interim reanalysis data. *Water Resources Research*, 50, doi:10.1002/2014WR015638.

**Access:**

a) URL (e.g. for easy checking of directory structure, update dates and file sizes):
ftp://rfdata:forceDATA@ftp.iiasa.ac.at and click on /WATCH_Forcing_Data and /WFDEI

b) ftp downloads of individual files:
ftp.iiasa.ac.at, un=rfdata, pw=forceDATA then: "cwd /WFDEI".

**Navigation and additional information:**

All WFDEI data files include grid-box centre longitude and latitude (on a regular longitude-latitude 720 x 360 grid). File "WFDEI-elevation.nc" provides full-grid elevation data. For an ascii list of land points only as used in the WFDEI, see file "WFDEI-land-long-lat-height.txt". File "WFDEI-CRU-points-excluded.txt" is an ascii list of the CRU land points excluded from the WFDEI (but included in the WATCH Forcing Data = WFD).

**Comparison with WFD:**

NB: Since ERA-Interim used 4D-var reanalysis whereas ERA-40 used 3D-var it is inevitable that there will be offsets in some variables and some time steps between the WFDEI and WFD within the overlap interval (1979-2001).

| | **WFD** | **WFDEI** |
|---|---|---|
| *Coverage:* | Full years: 1901-2001<br>0.5 x 0.5 global land<br>(excluding Antarctica) | Full years: 1979-2012<br>0.5 x 0.5 global land<br>*including* Antarctica |
| *Basis:* | ERA-40 | ERA-Interim |
| *Monthly corrections:* | CRU TS2.1<br>GPCCv4 | CRU TS3.1/TS3.101/TS3.21<br>GPCCv5/v6 |
| *Format:* | Land points only,<br>3-hourly or 6-hourly and Daily,<br>NetCDF (each file = 1 month) | Full grid (720 x 360),<br>3-hourly and Daily, NetCDF,<br>gzipped (each file = 1 month) |
| *Number of land points* | 67,420 (exc. Antarctica)<br>CRU land-sea mask. | 67,209 outside Antarctica (NB: 211 CRU points excluded as not genuine) plus 27,533 within Antarctica |
| *3-hourly flux variables:* | | |
| LWdown | Average over next 3 hours | Average over previous 3 hours |
| SWdown | Average over next 3 hours | Average over previous 3 hours |
| Rainf-GPCC | Average over next 3 hours | Average over previous 3 hours |
| Snowf-GPCC | Average over next 3 hours | Average over previous 3 hours |
| Rainf-CRU | Average over next 3 hours | Average over previous 3 hours |
| Snowf-CRU | Average over next 3 hours | Average over previous 3 hours |

(NB: All daily flux files are based on averages of the 3-hourly data for the current day).

**File nomenclature and units:**

Filenames include year and month e.g. "Tair_WFDEI_200912.nc" refers to 3-hourly Tair data for December 2009, "Rainf_daily_WFDEI_GPCC_197904.nc" refers to daily average Rainf data, created using GPCCv5 corrections (rather than CRU corrections), for April 1979. File naming and units follow the ALMA convention (see www.lmd.jussieu.fr/~polcher/ALMA/ ).

NB: To convert rainfall or snowfall rates (3 hourly or daily) to accumulated mm from $kg/m^2s$ multiply by 10800 or 86400 (i.e. the number of seconds in 3 hours or 24 hours).

| Filename | ALMA name | Variable description | Units (ALMA) |
|---|---|---|---|
| Tair_WFDEI | Tair | 2 m instantaneous air temperature | K |
| Wind_WFDEI | Wind | 10 m instantaneous wind speed | m/s |
| PSurf_WFDEI | PSurf | Instantaneous surface pressure | Pa |
| Qair_WFDEI | Qair | 2 m instantaneous specific humidity | kg/kg |
| LWdown_WFDEI | LWdown | Long-wave downwards surface radiation flux (average over previous 3 hours) | $W/m^2$ |
| SWdown_WFDEI | SWdown | Long-wave downwards surface radiation flux (average over previous 3 hours) | $W/m^2$ |
| Rainf_WFDEI_GPCC | Rainf | Rainfall rate, bias corrected with GPCCv5 data (v6 for 2010) and gauge "catch corrected" (average over previous 3 hours). | $kg/m^2s$ |
| Snowf_WFDEI_GPCC | Snowf | Snowfall rate, bias corrected with GPCCv5 data (v6 for 2010) and gauge "catch corrected" (average over previous 3 hours). | $kg/m^2s$ |
| Rainf_WFDEI_CRU | Rainf | Rainfall rate, bias corrected with CRU TS3.101 data (TS3.21 for 2010-2012) and gauge "catch corrected" (average over previous 3 hrs). | $kg/m^2s$ |
| Snowf_WFDEI_CRU | Snowf | Snowfall rate, bias corrected with CRU TS3.101 data (TS3.21 for 2010-2012) and gauge "catch corrected" (average over previous 3 hrs). | $kg/m^2s$ |

**File updates:**

*16th Mar. 2016:*

The corrected Rainf_WFDEI_GPCC and Snowf_WFDEI_GPCC (3-hourly and daily) files for 2011, 2012 and 2013 have the NetCDF header note: "This file replaces October 2015 version".

The files of Rainf_WFDEI_GPCC and Snowf_WFDEI_GPCC with corrected GPCCv7 Greenland outliers (for Nov. 2011; Dec. 2011; May 2012; Jun 2012; Nov 2013; Dec 2013) contain the NetCDF header note: "This file Greenland GPCCV7 outlier corrected using CRU TS3.23 values)".

Rainf_WFDEI_GPCC and Snowf_WFDEI_GPCC files (3-hourly and daily, 2011-2013) with the NetCDF header: "History = created October 2015" should be replaced with the corrected files.

*4th Jan. 2016:*

The 1979-2010 WFDEI files are unchanged. NB: Files named Rainf_WFDEI_GPCC and Snowf_WFDEI_GPCC are not yet available for 2014 (GPCC updates are running behind CRU updates). Bias correction for 2013-2014 files Rainf_WFDEI_CRU and Snowf_WFDEI_CRU (3-hourly and daily) used CRU TS3.23. Bias correction for Rainf_WFDEI and Snowf_WFDEI (3-hourly and daily) for 2011, 2012 and 2013 used GPCCv7.

*18th Sept. 2013:*

The 1979-2009 WFDEI files are unchanged. NB: Files named Rainf_WFDEI_GPCC and Snowf_WFDEI_GPCC are not yet available for 2011 and 2012 (GPCC updates are running behind CRU updates). Bias correction for 2010-2012 files used CRU TS3.21. GPCC versions of Rainf_WFDEI and Snowf_WFDEI for 2010 used GPCCv6.

**Acknowledgements:**

Thanks to Pavel Kabat and David Wiberg at IIASA (Vienna) for hosting the WFDEI files on their ftp site. The 3-hourly WFDEI data were tested by Richard Ellis (CEH Wallingford, UK) using JULES v3.0 for 1979-2009 and JULES v3.3 for 2010-2012. The daily WFDEI data were tested by Tobias Stacke (ZMAW, Hamburg, Germany) using MPI-HM vR44 for 1979-2009 and 2010-2012. GPW was supported by the EMBRACE EU FP7 programme.