

# DLR Falcon CR-2 (Water vapor measurements)

## Authors:

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## 1.0 Data Set Overview

The data set contains in-situ measurements of water vapor by the DLR Falcon research aircraft during the DEEPWAVE experiment. The data cover a time period between 29 June and 20 July 2014. In this time 13 research flights of the DLR Falcon took place. The aircraft was stationed at the airport in Christchurch, New Zealand. The measurements were located between 20°-60°S and 130°-150°E.

For more information on the DEEPWAVE project please visit:

[https://www.eol.ucar.edu/field\\_projects/deepwave](https://www.eol.ucar.edu/field_projects/deepwave)

## 2.0 Instrument Description

The measurements were performed by a CR-2 Cryogenic Aircraft Hygrometer (Buck Research Instruments LLC), which is based on the chilled mirror technique. The hygrometer measures the dewpoint by pumping atmospheric air through a sample chamber and passing it over a mirror-like metal surface. At a state of equilibrium between rate of evaporation and condensation of water molecules on the mirror, the mirror temperature is equal to the dew point. At this point the water vapor concentration can be determined, according to the pressure in the measuring cell.

Information on the instrument can be found in the data sheet and the user's manual

(<http://www.hygrometers.com/products/cr-2/>).

Time resolution	Accuracy	Measurement range
0.3 Hz (stable conditions: < 0.1 Hz)	±0,1°C	Frost range: -100° to +30°C water vapor mixing ratio: 1-20000 ppmv

Uncertainty of the measurements for this campaign is around ±10%, regarding to calibration and measurement issues. A bias effect in stratospheric data could be possible.

### 3.0 Data Collection and Processing

Data were collected with a backward-facing inlet on the aircraft fuselage.

We corrected all data with a pressure dependent calibration, which was done before the campaign.

Data are deleted when mirror temperature was not in equilibrium.

The data set contains 13 files of each DLR Falcon research flight.

RF#	Date	File	Version
RF_F01	2014-06-29	DEEPWAVE_RF_F01_CR2_140629a	V3
RF_F02	2014-06-30	DEEPWAVE_RF_F02_CR2_140630a	V3
RF_F03	2014-07-02	DEEPWAVE_RF_F03_CR2_140702a	V3
RF_F04	2014-07-04	DEEPWAVE_RF_F04_CR2_140704a	V3
RF_F05	2014-07-04	DEEPWAVE_RF_F05_CR2_140704b	V3
RF_F06	2014-07-10	DEEPWAVE_RF_F06_CR2_140710a	V3
RF_F07	2014-07-11	DEEPWAVE_RF_F07_CR2_140711a	V3
RF_F08	2014-07-11	DEEPWAVE_RF_F08_CR2_140711b	V3
RF_F09	2014-07-12	DEEPWAVE_RF_F09_CR2_140712a	V3
RF_F10	2014-07-12	DEEPWAVE_RF_F10_CR2_140712b	V3
RF_F11	2014-07-14	DEEPWAVE_RF_F11_CR2_140714a	V3
RF_F12	2014-07-16	DEEPWAVE_RF_F12_CR2_140716a	V3
RF_F13	2014-07-20	DEEPWAVE_RF_F13_CR2_140720a	V3

Version V3: 2016-02-01

### 4.0 Data Format

The data set is provided in the NASA Ames Format.

The header lines of each data file contain metadata according to the guidelines.

Example of the header:

```
25      1001
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(Christiane.Voigt@dlr.de)
Deutsches Zentrum fuer Luft- und Raumfahrt e.V., Institut fuer Physik der
Atmosphaere
1|Falcon|CR-2
DEEPWAVE (June/July 2014)
1      1
2014 06 29      2016 02 01      Date of collection and last processing
0.0
UTC in sec after midnight (Falcon data system time)
1
1
-9999.99      Missing value
water vapor mixing ratio [ppmv]      Parameter and unit
9
-----
FINAL DATA
PLEASE CONTACT THE DATA OWNER CHRISTIANE VOIGT BEFORE USING THE DATA.
-----
The data are shifted to a regular time grid with 1 s grid spacing.
The measured parameter is the gas phase water vapor mixing ratio, sampled with a
backward-facing inlet and a time resolution of about 0.3 Hz.
Stratospheric data are not available due to a possible bias effect.
Uncertainty of the measurement: +/-10%
-----
1
UTC      H2O
81592    -9999.99
81593    9875.57
81594    10023.92
81595    -9999.99
81596    9950.76
81597    9868.08
-----
```

Description of authors and campaign

Date of collection and last processing

Missing value  
Parameter and unit

Comment lines

Start of data reading

## 5.0 Data Remarks

Missing data points due to balancing of the mirror temperature. A pressure dependent offset on the water vapor mixing ratios is corrected by a calibration.

No data available for stratospheric conditions due to a possible bias effect.