Weatherstation On Wheels (WOW)

Contact:

For all questions regarding the data-set contact:

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Description of the measurement platform

An instrumented car was deployed during T-REX from 22 March to 27 April 2006. WOW measured horizontal wind direction and speed, pressure, temperature and dewpoint, radiation and position while driving along different road legs in the Owens Valley.

Calibration drives were conducted under quiescent conditions to correct the influence of the driving car on the measurements. These drives yielded the following results:

- Pressure and wind data were reliable after calibration.
- The temperature sensors showed radiation and time lag errors which were **NOT** corrected.

Fig. 1: WOW on a measurement drive on the US395 near Bishop. Photo by T. Raab.

Due to the very strong sensible heat fluxes in the arid Owens Valley it is difficult to differentiate between true heating and overheating of the sensor in cases of abrupt change of incoming radiation. A simple pyranometer was mounted on the car to facilitate the interpretation of radiative effects. The pyranometer measurements were not corrected for inclination and should be used only quantitative. Time lag of the sensor results in a smoothed temperature profile and an overall too warm (cold) profile going from warmer (colder) to colder (warmer) regions, i.e. usually going uphill shows a profile which is too warm.

One has also to bear in mind the complex orography if some parts of the surveyed road legs, which results in small scale flow modification not representative for the overall air flow.

For more information on WOW you are referred to the literature.

Surveyed road legs and file naming convention

File names consist of the starting date and time (UTC) of the drive, followed by the road leg number. The last digit specifies the direction, in which the car drove:

- 1 → car heading north
- 2 → car heading south
- 3 → car heading west
- 4 → car heading east

Example: The file **WOW20060325184637_133.txt** contains data from the measurement drive starting at 18:46:37 UTC on 25 March 2006 from Independence heading west towards the Sierra Nevada on the Onion Valley road.

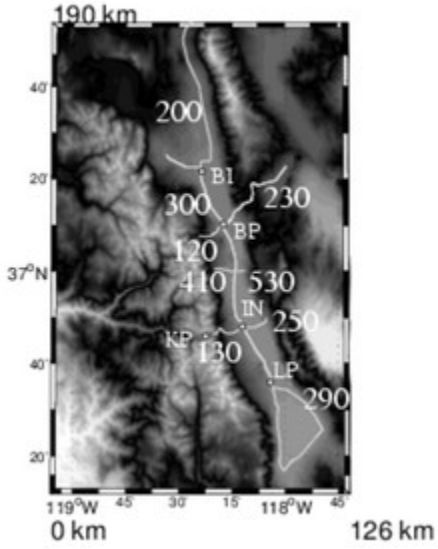

Fig. 2: Sierra Nevada, Owens Valley and surveyed road legs.

Instrumentation and Data processing

Table 1: Instrumental specification of the meteorological measurements.

	Pressure	Temperature	Temperature	Dewpoint	Wind
Model	Väisälä PTB220 U156	BetaTHERM mini-BetaCURVE 2.2K3MBD1	Meteolabor	Meteolabor TP3-S-SRS	Gill Windsonic
Sensor Type	Capacitive	NTC Thermistor	Thermocouple	Mirror	Ultrasonic
Range	500...1100 hPa	0...70 °C	-80...60 °C	-80...40 °C	0...60 ms^{-1}, 0...359 °
Resolution	0.01 hPa	<0.1 °C	<0.1 °C	<0.1 °C	0.01 m s^{-1}, 1 °
Accuracy (Factory)	± 0.15 hPa	± 0.2 °C	0.2 °C	± 2 % (12 m s^{-1}), ± 3 ° (20 m s^{-1})	
Response Time (Sensor)	0.2 s	0.4 s	5 s	<1 s (1000 hPa, +20 °C)	0.25 s
Temperature range	-40...+60 °C				

Table 2: Instrumental specification of the position measurements.

	GPS	DGPS	Radiation	Flow velocity
Model	Garmin GPS 16	Trimble Pathfinder Power	Apogee PYR-P	TSI 8455
Range			0...1750 W m^{-2}	0...50 m s^{-1}
Accuracy (Factory)	3...15 m (horiz.)	0.01...1 m (horiz.)	±5%	±2%
Response Time				0.2 s

The original measurements were logged in an approximately 1s interval. The ultrasonic anemometer sampled in a 4Hz interval. These data were averaged to 1s. All measurements at equal times were selected and missing data filled with NAN.

The road legs were pre-surveyed with differential GPS and all measurements were referenced to their specific DGPS positions. Measurements lying more than 12m horizontally away from the reference position were eliminated.
The heading of the car was derived from the gps.

Pressure measurements were corrected for the dynamic effect of the combined car/wind speed (which should have been eliminated by the static pressure port but calibration drives still revealed a slight speed dependence).

The alignment of the ultrasonic anemometer was a little bit off true north. This off-set was determined and removed during data processing.

A thermocouple and dew-point mirror bundle was placed inside a radiation shield in the design of a static pressure port (cf. Fig. 1). The instruments were placed in the tubular part. The shield was artificially ventilated and a velocity transducer measured throughput. Air flow inside the radiation shield was between 2 and 4 m s^{-1}. Due to hardware constraints the NTC-temperature sensors did not provide data when temperature dropped below 0 °C.

The true wind speed and direction was computed by Euler transformation and vector addition. Data were omitted when car speed was slower than 2 m s^{-1}, when the car accelerated and when the car made sharp turns.

Data Format

All files are column delimited ASCII files and start with a header in the following form:

```
%--------------------------------------------------------------------------
% ATREX 2006 WOW data
%--------------------------------------------------------------------------
% Contact:
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% Institute for Meteorology and Geophysics
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% Documentation:
% cf. project homepage:
% http://imgi.uibk.ac.at/mmetgroup/trex/WOW_desc.html
%--------------------------------------------------------------------------
```

% column 01 .... time (YYYYMMDDhhmmss UTC)
% -------- DGPS referenced position:
% column 02 .... latitude (deg)
% column 03 .... longitude (deg)
% -------- GPS data:
% column 04 .... true course over ground (deg)
% -------- Wind data:
% column 05 .... uWind component (m/s) raw
% column 06 .... vWind component (m/s) raw
% column 07 .... uWind component (m/s) corrected
% column 08 .... vWind component (m/s) corrected
% -------- Meteolabor T/Td data:
% column 09 .... dry air temperature (deg C)
% column 10 .... dew point temperature (deg C)
% -------- ntc T data:
% column 11 .... air temperature ntc1 (deg C)
% column 12 .... air temperature ntc2 (deg C)
% column 13 .... air temperature ntc3 (deg C)
% column 14 .... air temperature ntc4 (deg C)
% -------- Pressure data:
% column 15 .... atmospheric pressure (hPa)
% -------- radiation data:
% column 16 .... short wave radiation (W/m^2)
%--

followed by the data.

Literature

Mayr et al. 2002: First version of WOW
T. Raab Master Thesis 2007: Version 2, used during SRP 2004