Weather station software

Fine Offset WH-1080 and WH-1081

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Weather observation devices

- Old style: thermometer, hygrometer, barometer and rain gauge.

- Digital devices start with inside/outside thermometer and inside hygrometer.

- Cost: about $30.

- Wireless versions include outside hydrometer, cost about $40.

- All of these are standalone devices.

Computer connected devices

- All include outside thermometer, hygrometer, barometer and wind gauge.

- Other features may be inside measurements and sunshine detectors.

- Used to be quite expensive.

- Older devices usually have async serial interfaces.

- Newer devices from China are much cheaper, have USB interface.

WH-1080 and WH-1081

- Made by Fine Offset.

- Marketed under many names.

- One of many products.

- WH-1080 has DCF receiver, not useful in Australia.

- WH-1081 has no DCF receiver, sold in Australia.

- Available on eBay for prices between $115 and $280.

- Search for `Weather stations USB`.

- Available from JayCar for currently $179.

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WH-1081 features

- External unit with wireless transmitter.
- Not clear if two can coexist.
- Thermometer, resolution 0.1°.
- Hydrometer, resolution 1%.
- Wind speed gauge, resolution 0.1 m/s.
- Wind direction measurement, resolution 22.5°.
- Appears to report only in increments of 45°.
- Rain gauge, resolution 0.3 mm.

WH-1081 external unit

WH-1081 internal unit
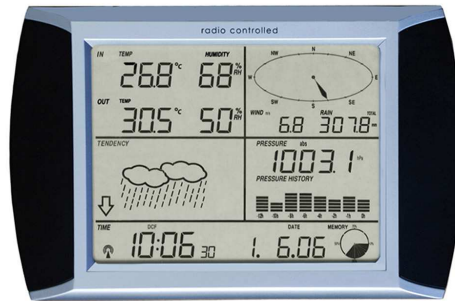
WH1081

WH1081-GRE

WH1081-PUR

WH1081-RED

WH1081-OAK

WH-1081 internal unit

- Includes USB interface to computer.

- Displays temperatures, percentage humidity, air pressure, wind speed and direction.

- Displays some kind of rainfall average.

- Attempts weather forecast.

- Includes clock.

- Touch screen communication.

- Very low contrast.

- Pretty much useless as a display.

Software

- Supplied with Easyweather software, runs on Microsoft only.

- Not supported out of the box by any free software.

- Steve Woodford adapted earlier code to *wview*.

- Only works on *wview* release 4.

- I adapted it to *wview* release 5.

Weather web sites

- A couple of world-wide weather sites on the web.
- CWOP (Citizens Weather Observer Program), `http://www.wxqa.com/`
- Not investigated yet.
- Wunderground seems less US-centric. `http://www.wunderground.com/`
- Has map feature.

Wunderground Dereel weather

Wundermap Ballarat area

wview (1)

- Written for a limited number of serial-connect weather stations.

- Thinks in American units, makes a half-hearted, inaccurate attempt to display metric units.

- Continually changing.

wview (2)
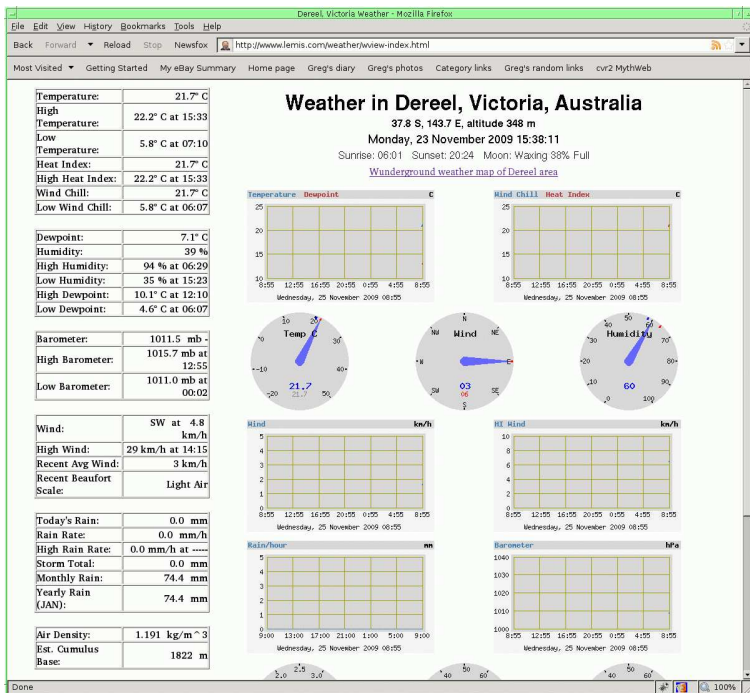
wview (3)

- Runs a number of processes.

- Emetic code.

- Communication by the Three Ugly Sisters (`MSG`, `SEM`, `SHM`).

- Stores readings in (undocumented) custom format (version 4) or *sqlite* (version 5).

- Frequently hangs, difficult to get started again.

Hardware issues: WH-1081 (1)

- No documentation of interface from manufacturer.
- Flaky interface.
- Frequently returns invalid data.
- Game of catch-up recognizing invalid data.
- Doesn't like NiMH batteries.

Hardware issues: WH-1081 (2)

- Code we got was written for *libusb*, first version (0 or 1, depending).

- Code had "just growed" and did all sorts of undocumented things.

- No easy way to get incorrect readings out of the *wview* database.

Powercor to the rescue

- We have frequent power failures.

- On 11 November 2008, had a 5 hour failure.

- One computer and inside unit of weather station damaged.

- Many invalid readings.

- Couldn't remove them from the record.

- Decided to write something more malleable.

My code (1)

- Still evolving.

- Uses web browser as primary display.

- USB interface based on Steve Woodford's code.

- One process reads the data and stores in a MySQL database.

- One process generates data for the web pages.

My code (2)

- Cron jobs synchronize data from remote weather stations and generate graphs.

- One process sends reports to Wunderground.

- No CWOP support (yet).

WH-1081 internals

- 64 kB memory.

- 32 byte "pages", addressed by USB code

- 16 byte entries containing weather information.

- All entries related to metric units.

- Page 0 contains magic numbers and a pointer to current page.

- Page 1 contains absolute and relative pressure.

- Rest unknown or unused.

- Purpose of pressure information in page 1 is unclear.

WH-1081 accuracy

- Temperature accuracy seems to be OK.

- Pressure measurements seem to have a random off-set.

- Appears to be a frequent problem with weather stations.

- Wind speed measurements appear to be very low.

- No way to confirm.

WH-1081 accuracy: rain gauge

- Measures in units of 0.3 mm.
- Doesn't match well with my manual rain gauge.
- Vibration or wind might cause too high a reading.
- Spiders nest in the gauge, obstructing the buckets and causing too low a reading.
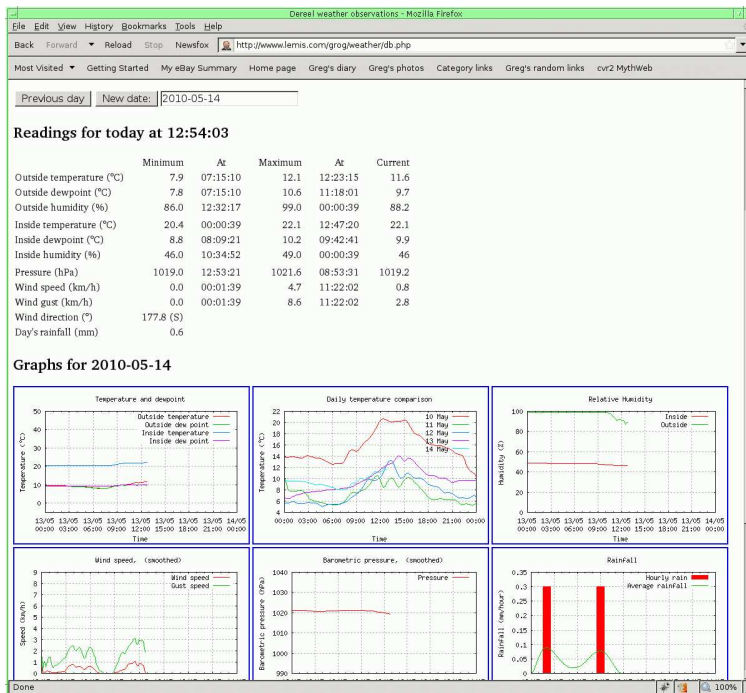
Rain gauge (1)
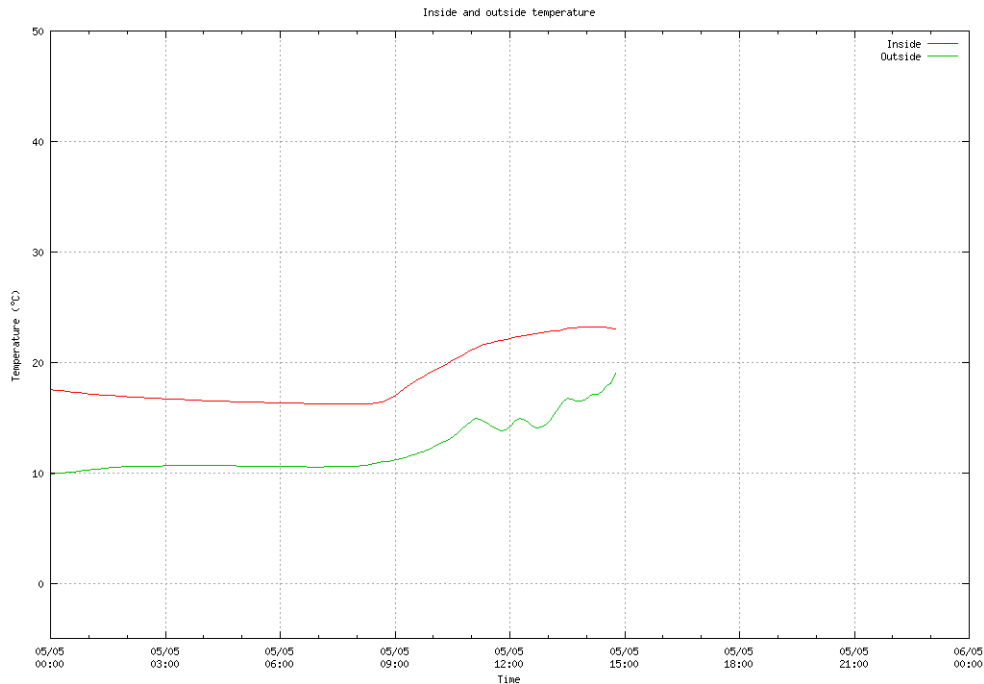
Rain gauge (2)

OS-related problems

- FreeBSD often returns `ENODEV` reading the device.
- Problem is not recoverable. Process must stop.
- New process normally works OK.
- Sometimes takes up to a minute.
- *libusb* returns bogus error indications under Linux.
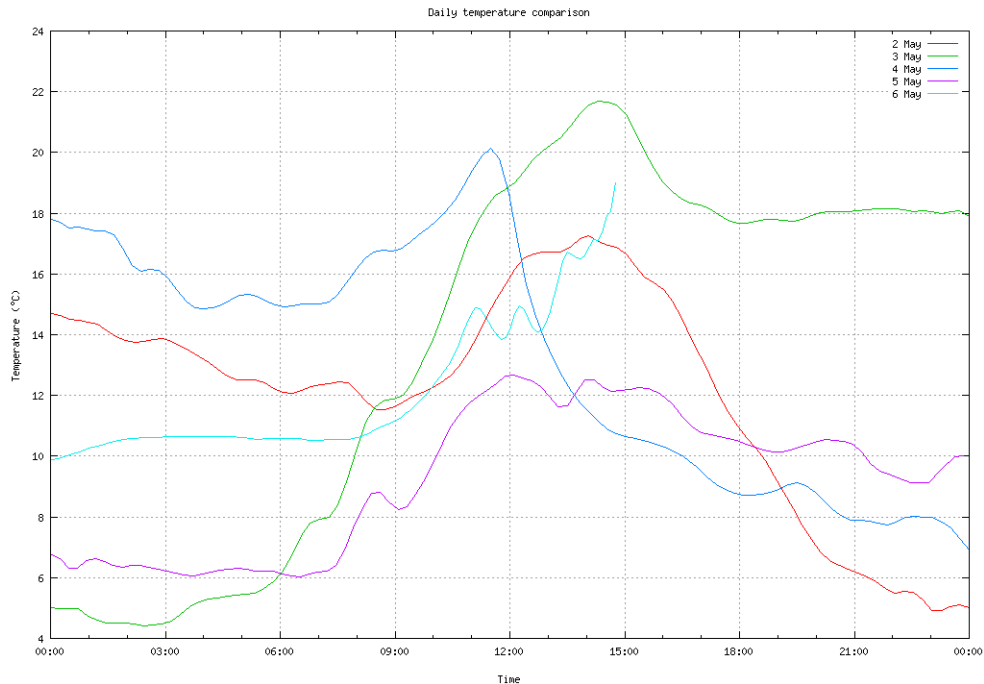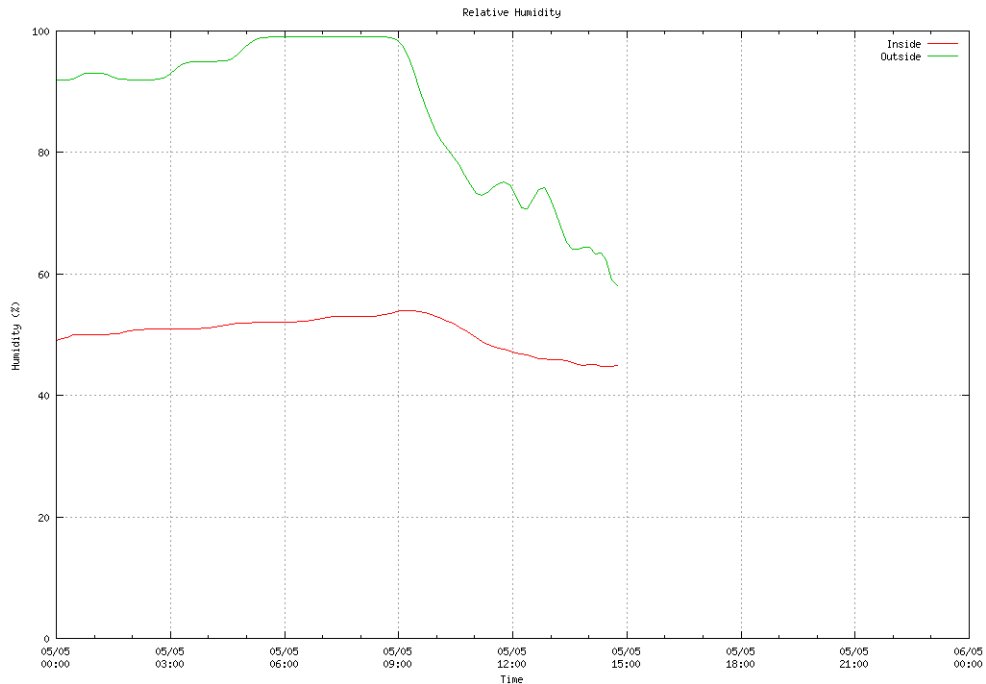- Not investigated further.
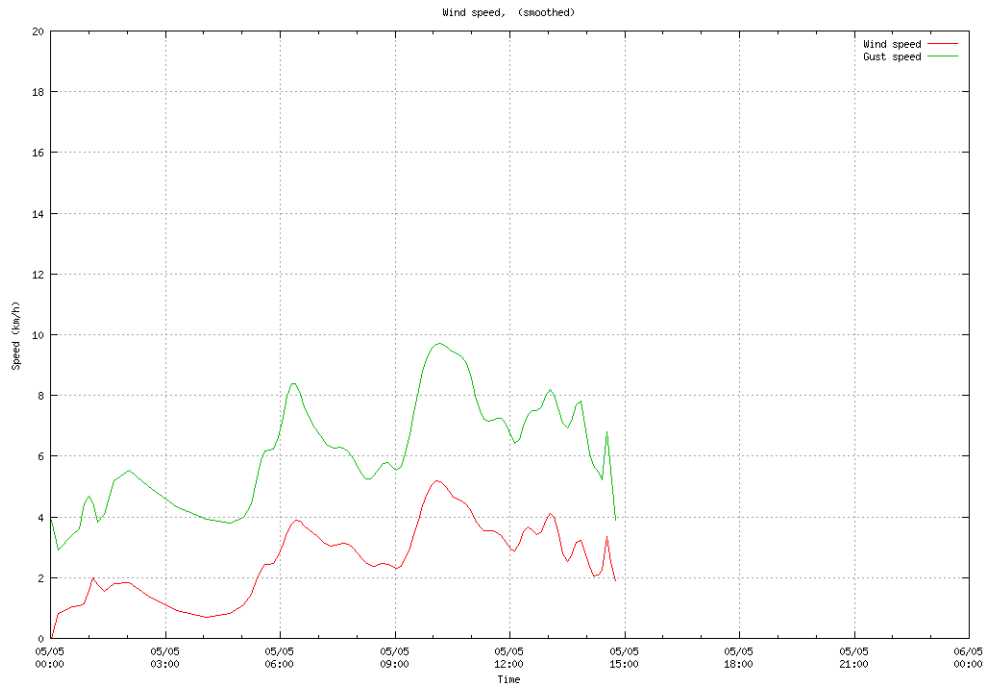
Main page

Inside and outside temperature

Inside and outside temperature

5 day comparison

Daily temperature comparison

Relative humidity

Wind speed

Wind speed, (smoothed)

Barometric pressure

Barometric pressure, (smoothed)
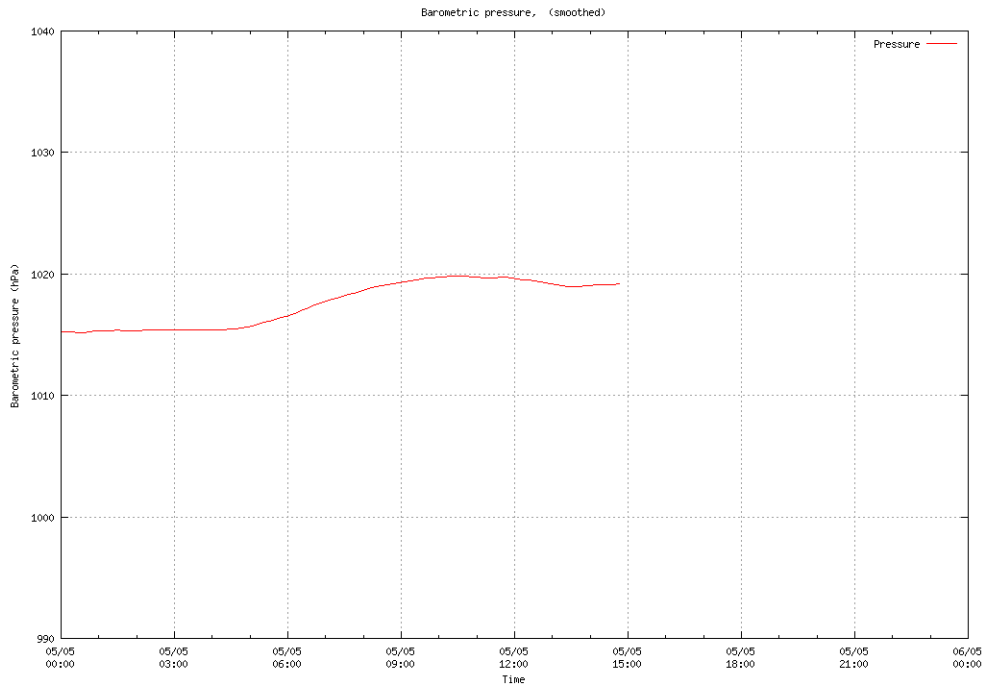
Rainfall
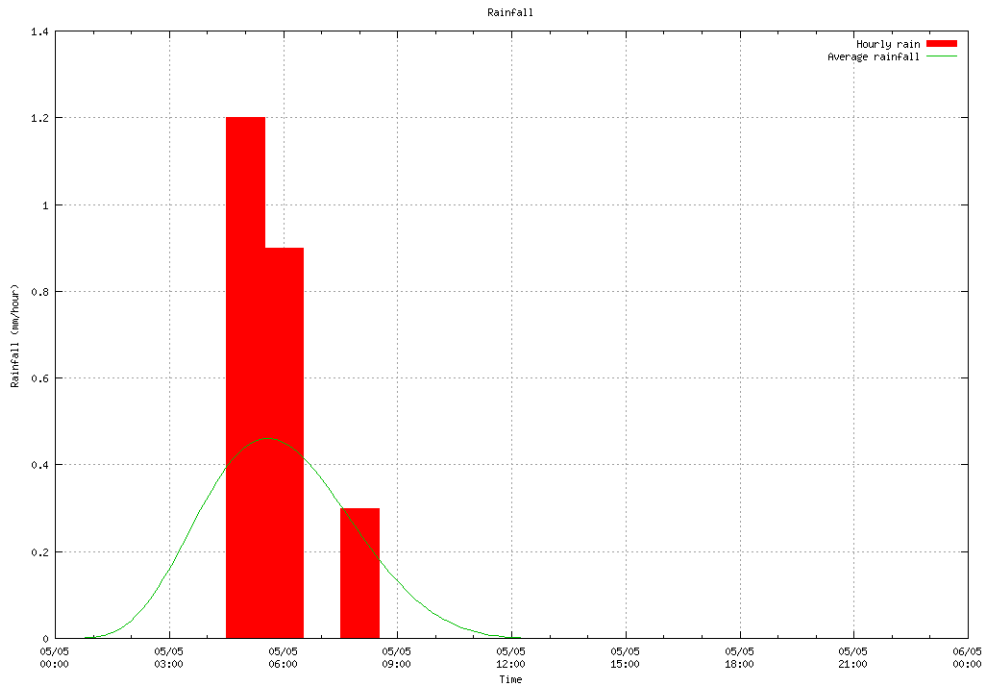
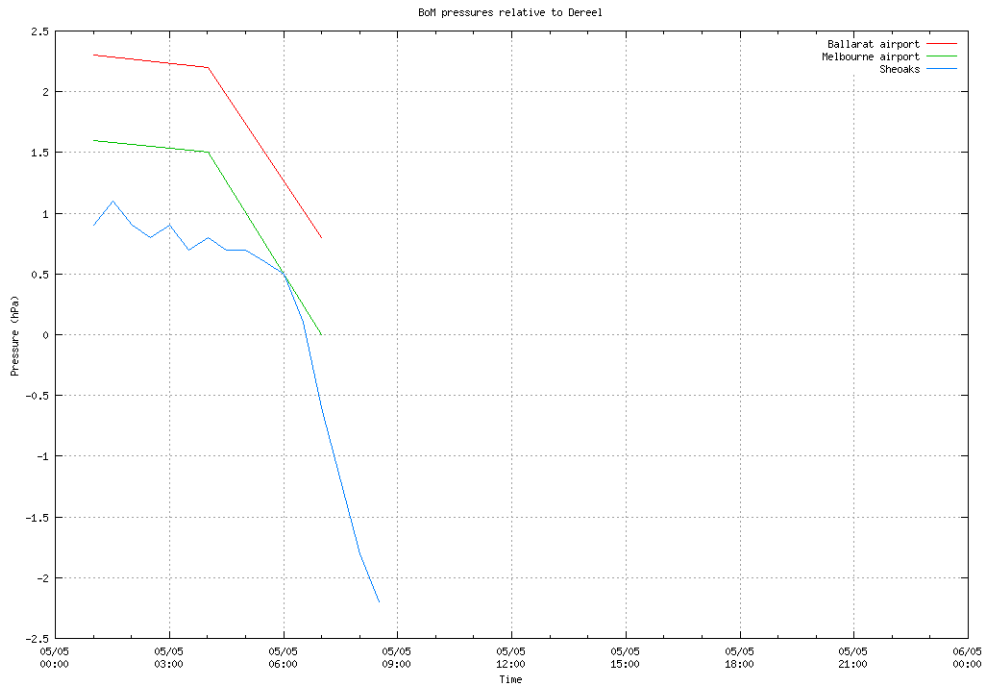# Temperatures: BoM and Dereel

BoM temperatures relative to Dereel

Pressures: BoM and Dereel
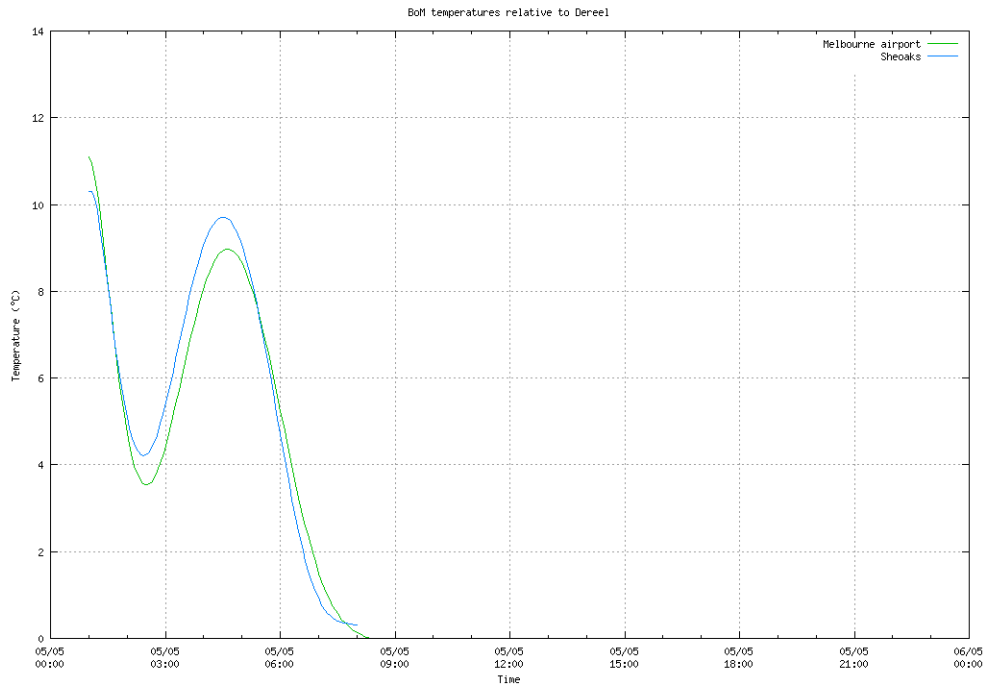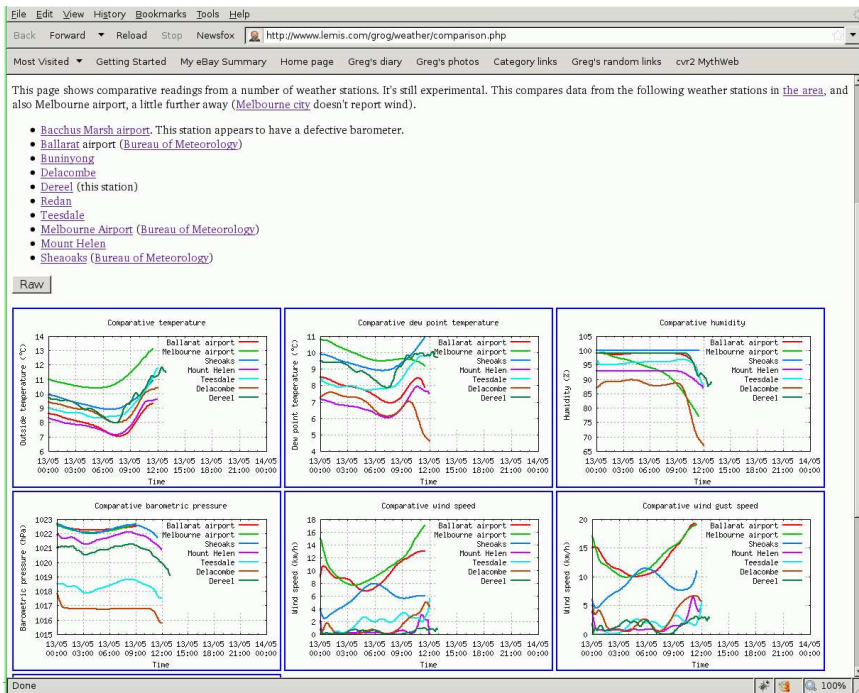

BoM pressures relative to Dereel

Comparisons page

- These measurements leave some questions open.

- Is my data correct? How do I know?

- How does the weather here differ from the surrounding area?

- Thus the comparisons page.

- Already helped calibrate the barometer.

- Currently only for current day.

Comparisons page

Comparisons: temperatures

Comparative temperature

Legend:
- Ballarat airport
- Melbourne airport
- Sheoaks
- Mount Helen
- Teesdale
- Delacombe
- Redan
- Dereel
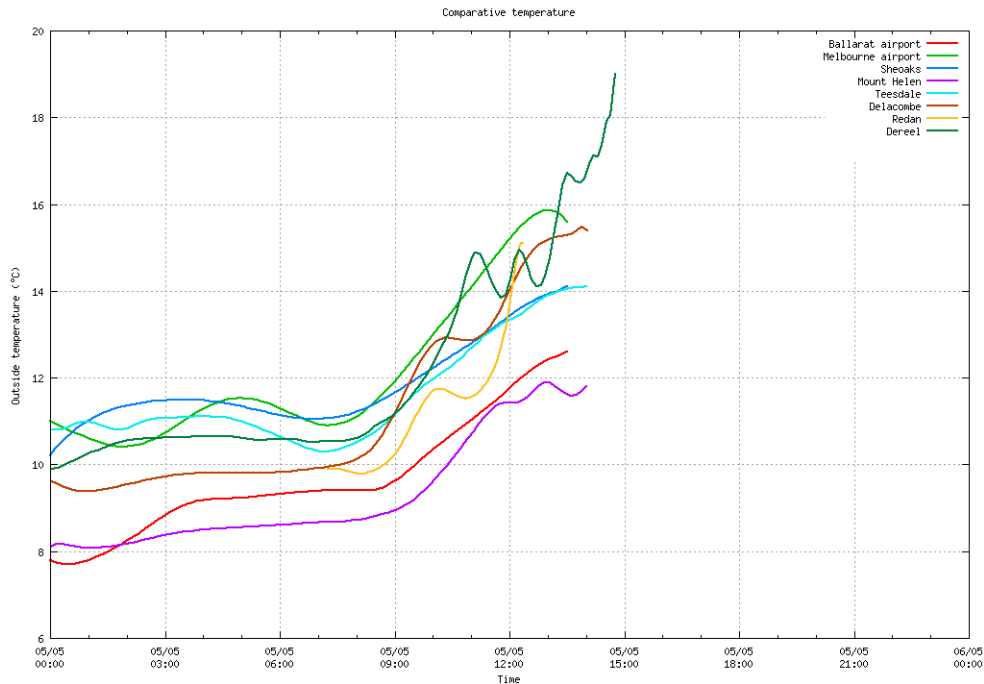
Comparisons: dewpoint

Comparative dew point temperature

Legend:
Ballarat airport
Melbourne airport
Sheoaks
Mount Helen
Teesdale
Delacombe
Redan
Dereel

Dew point temperature (°C)

Time
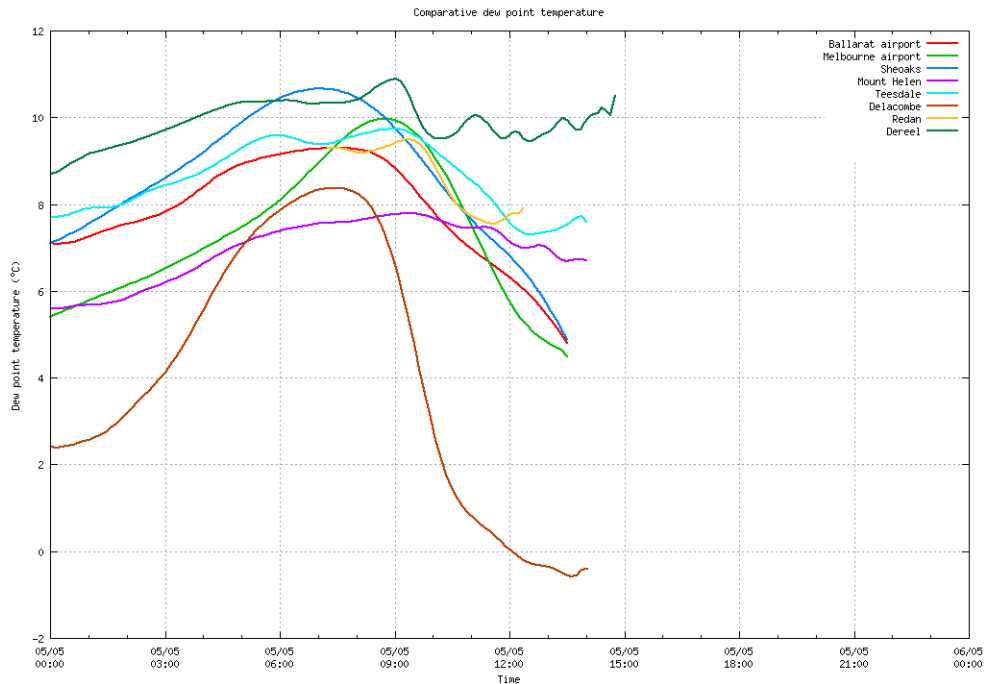
Comparisons: humidity

Comparative humidity

Legend:
- Ballarat airport
- Melbourne airport
- Sheoaks
- Mount Helen
- Teesdale
- Delacombe
- Redan
- Dereel

Humidity (%) vs Time
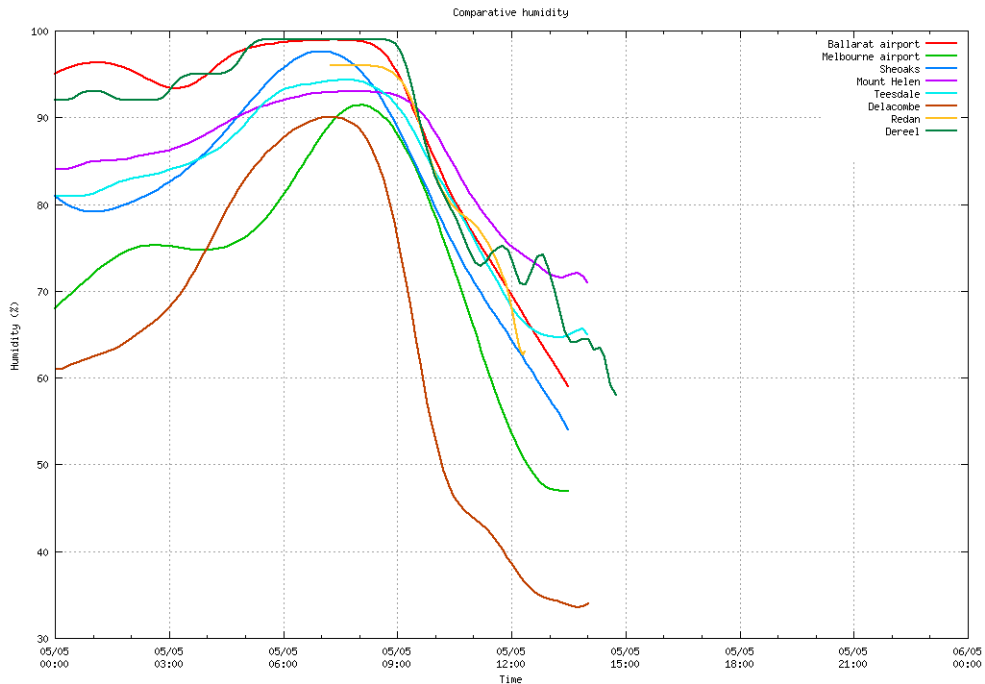
Comparisons: barometric pressure

Comparative barometric pressure

Legend:
- Ballarat airport
- Melbourne airport
- Sheoaks
- Mount Helen
- Teesdale
- Delacombe
- Redan
- Dereel

Barometric pressure (hPa) vs Time
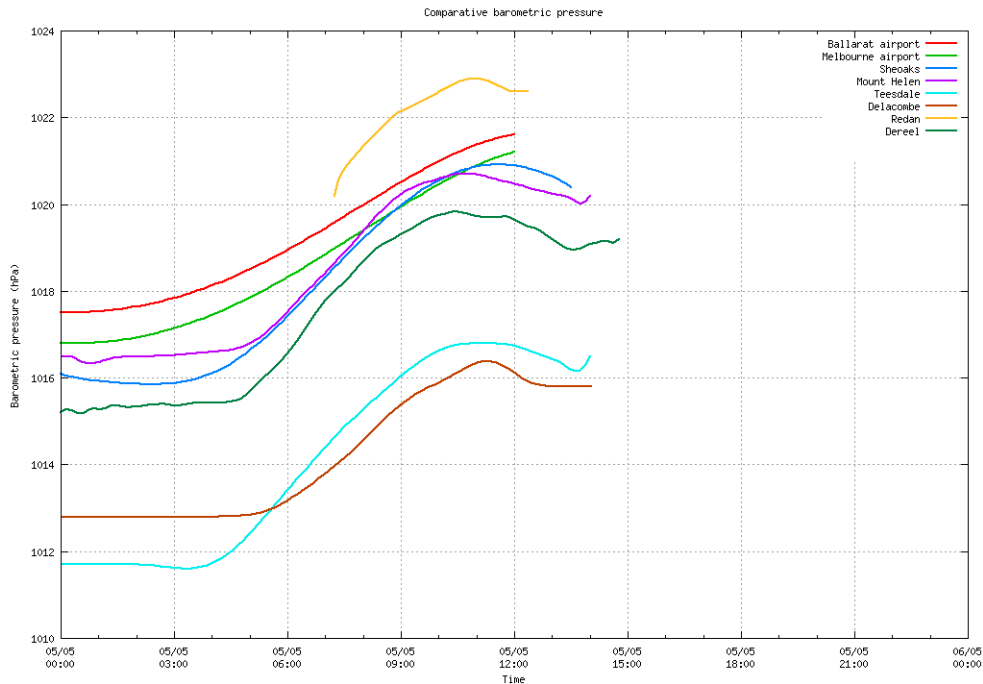
Comparisons: wind

Comparative wind speed

Legend: Ballarat airport, Melbourne airport, Sheoaks, Mount Helen, Teesdale, Delacombe, Redan, Dereel

Comparisons: wind gust

Comparative wind gust speed
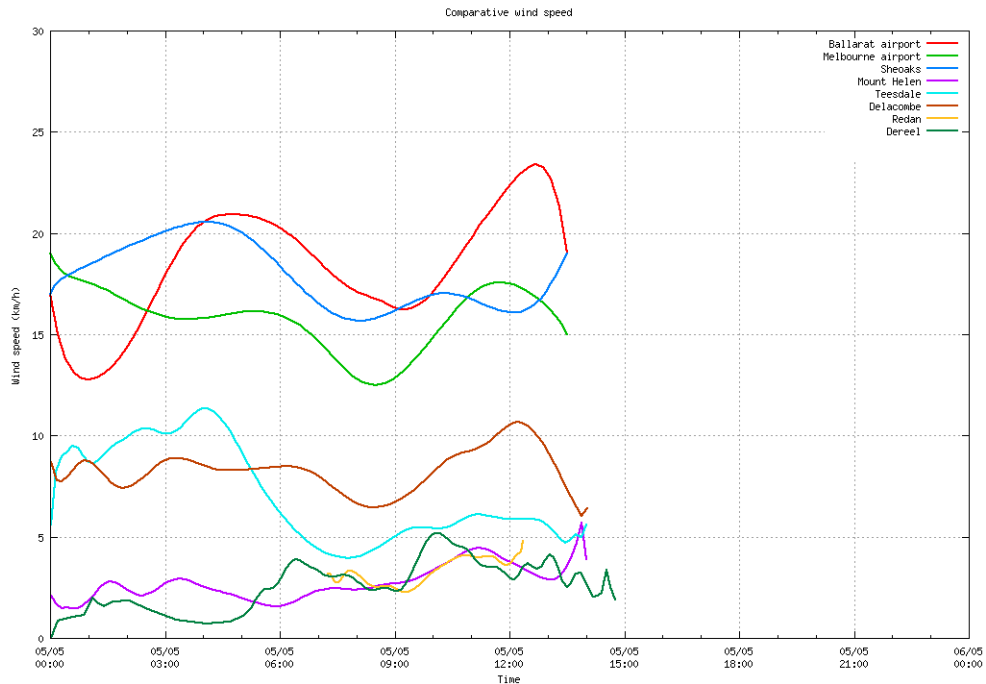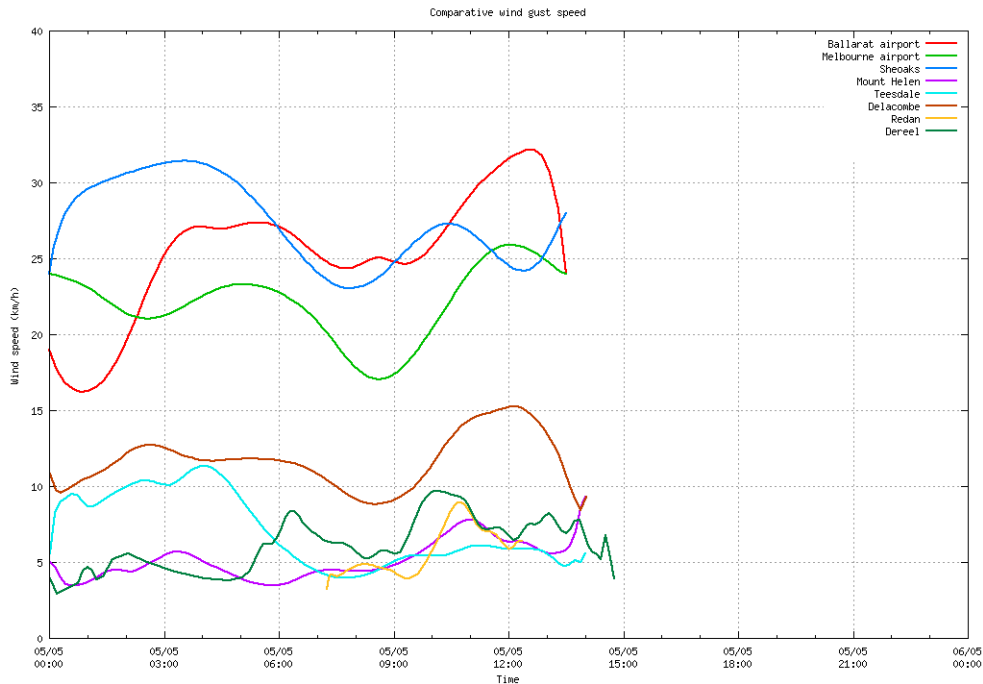
To do

- Lots of things.

- Replicate MySQL database to remote site.

- Find a more general way of generating graphs (also known as "I *hate* gnuplot").

- Fix myriads of bugs.

- Think out more features.

- Make it easy for other people to install.

References: external

- Manufacturer Fine Offset `http://www.fos-hk.com/en/products/show.asp?id=41`

- *wview* software `http://www.wviewweather.com/`

References: my site

- These slides at
  `http://www.lemis.com/grog/Pa-`
  `pers/WH-1080.pdf`

- Power outages at
  `http://tinyurl.com/powercor`

- My code at
  `http://www.lemis.com/grog/pro-`
  `grams/WH1080.tar.gz`

- Dereel weather observations at
  `http://tinyurl.com/dereel-weather`