The Outdoor Dust Information Node - ODIN

Development and first tests

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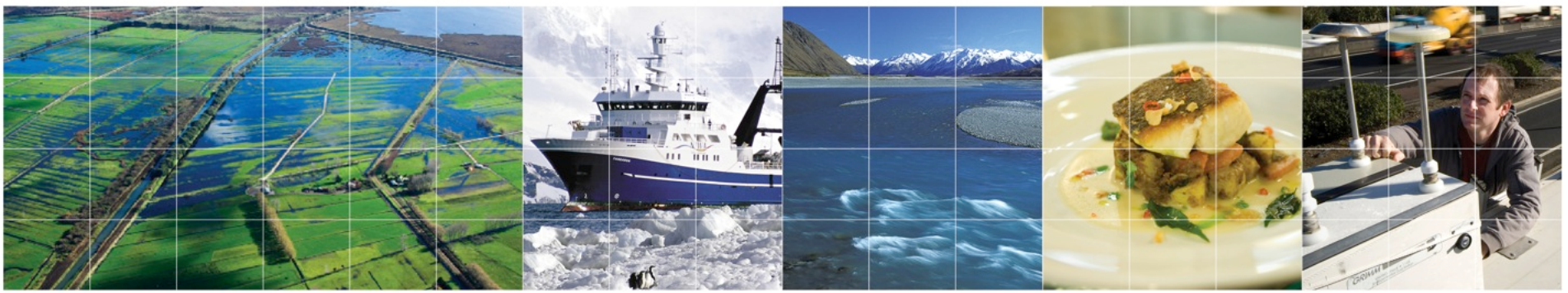


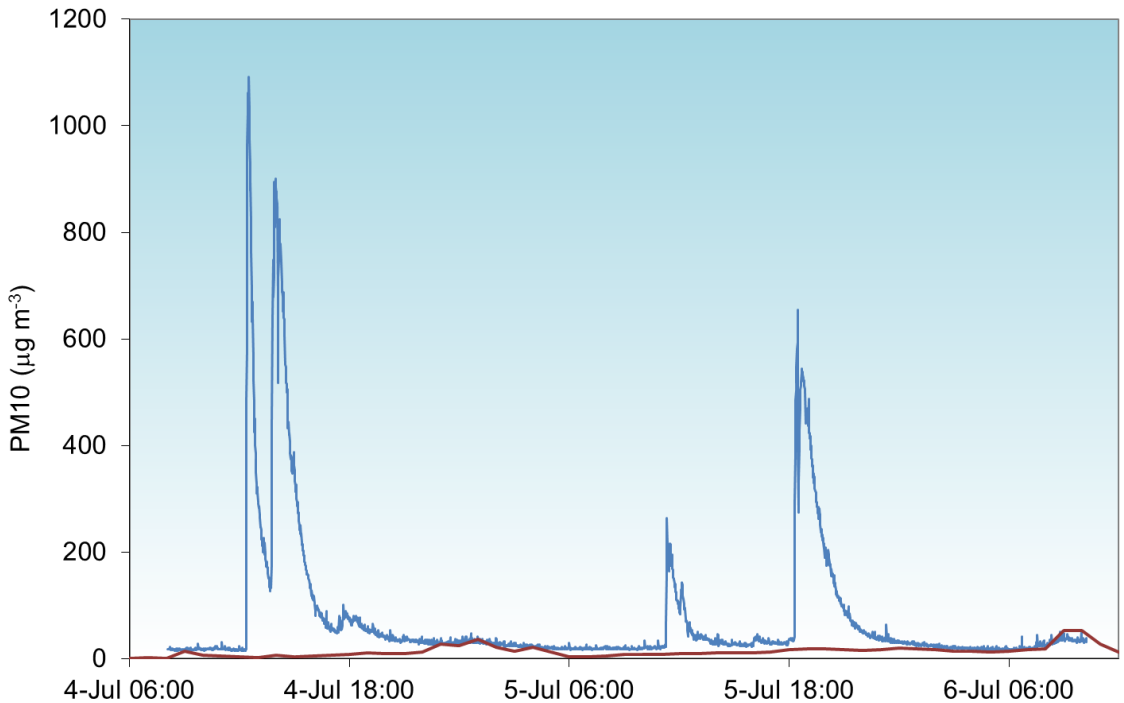
10th Australia and New Zealand Aerosol Workshop. 10 - 11 July. Wellington, New Zealand

Outline

- Origins - PACMAN
- Design goals
- First deployment
- Calibration
- And next?

PACMAN Origins

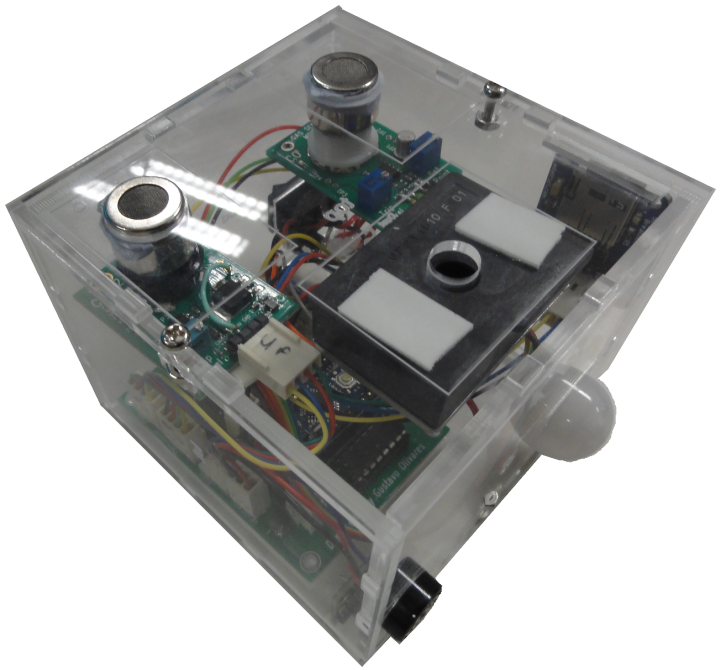
Very large indoor peak concentrations in woodburning homes that do not correspond to outdoor peaks.



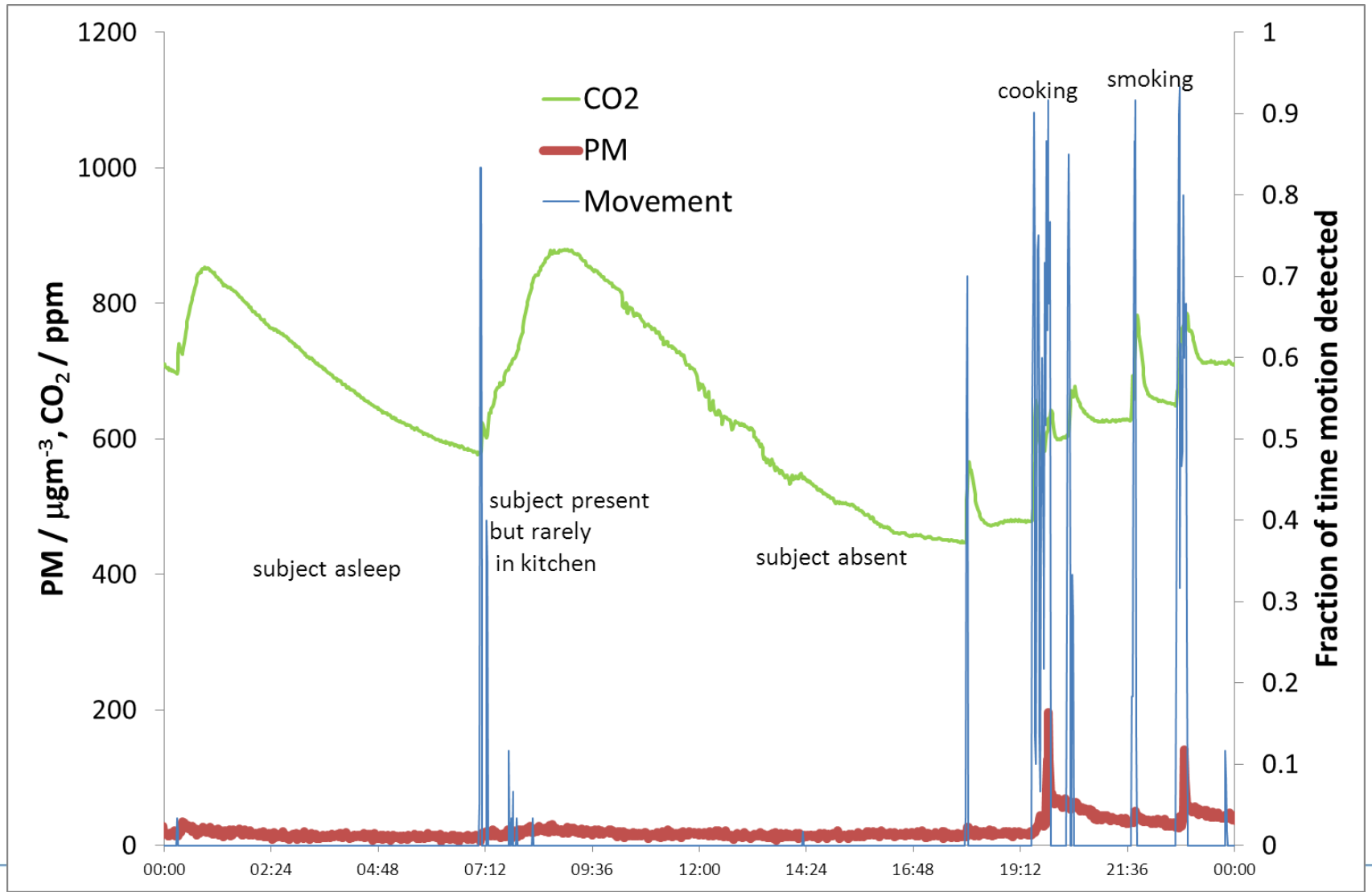
Enter PACMAN

If we had an instrument, what should it do?

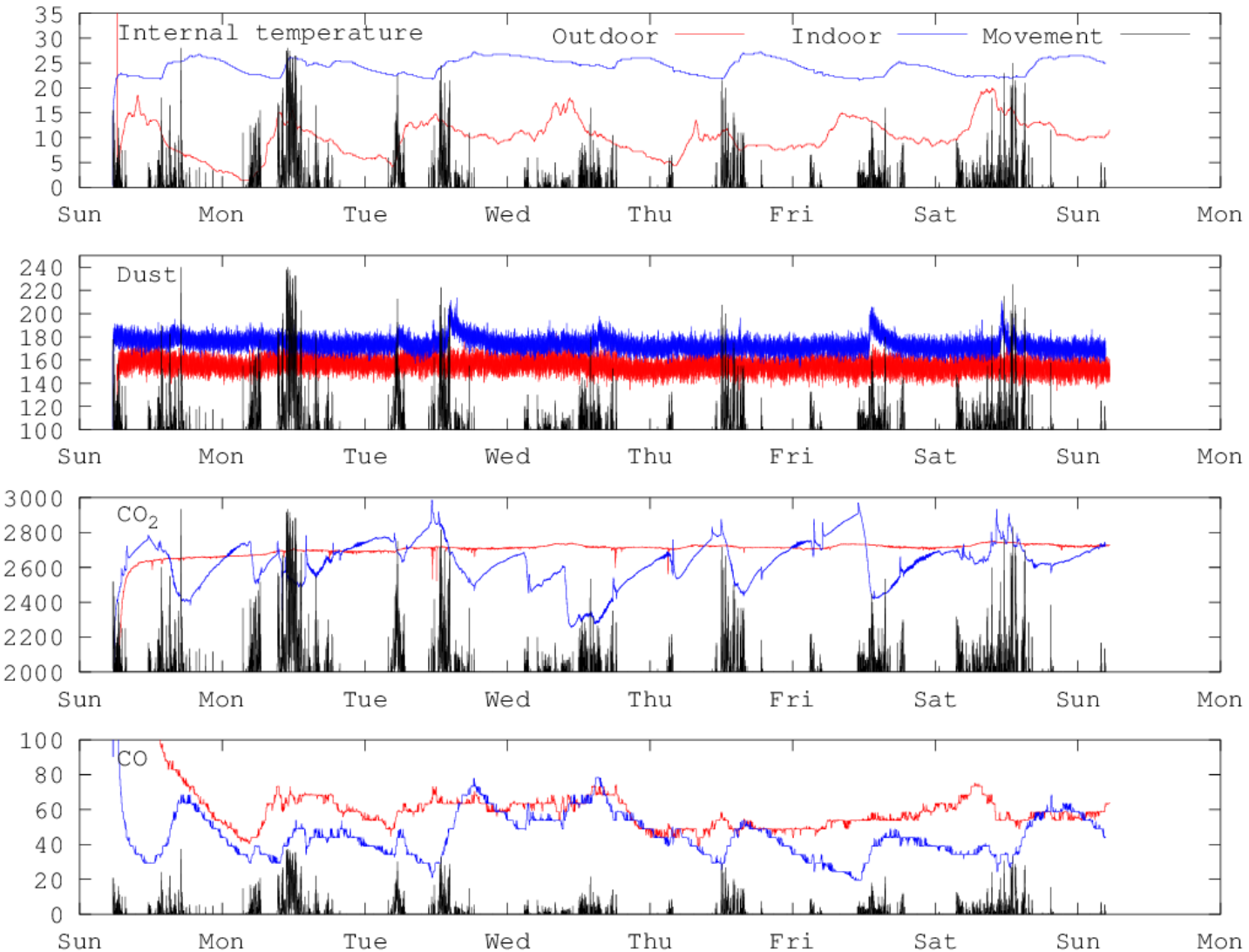
- Measure particles
- Characterise what happens around it
- Be small
- Be cheap
- Be extensible



Sample data - indoors (Chch)



What about outdoors?



Enter ODIN

Outdoor **D**ust **I**nformation **N**ode.

Requirements

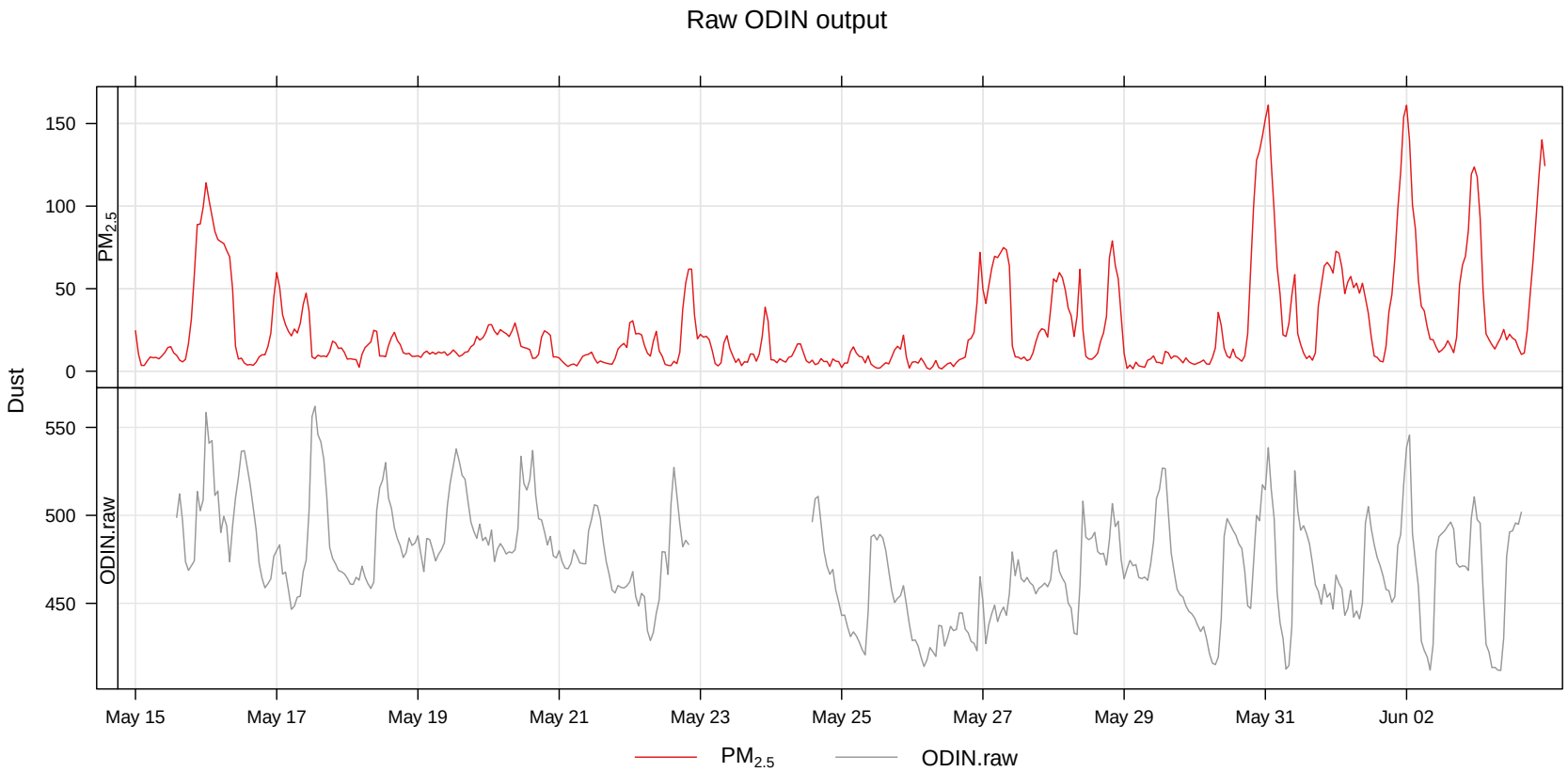
- Measure dust.
- Simple.
- Low power.
- Comparable to PACMAN.

Components

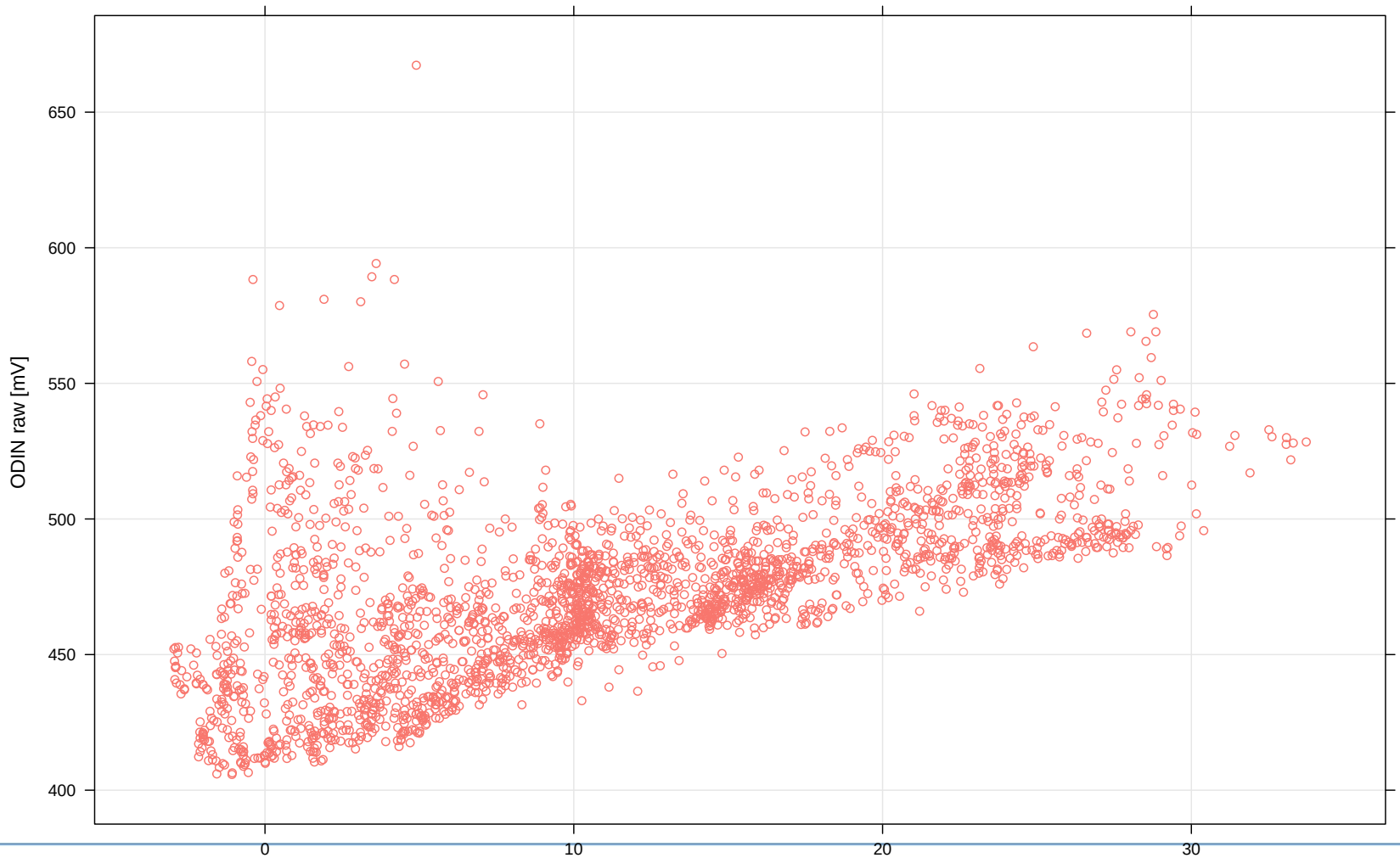
- **Dust sensor**. Sharp Optical Dust Sensor GP2Y1010AU0F (same as PACMAN).
- **Temperature and relative humidity**. HUMID temperature-humidity sensor from Freetronics.
- **Microcontroler**. Sparkfun's Arduino Pro Mini (same as PACMAN).
- **Memory**. A 2GB μSD card with Adafruit's adapter board.
- **Clock**. The DS3231 based temperature compensated RTC Chronodot (same as PACMAN).
- **Power**. The unit runs from 5v but it is possible to operate from 3.7v (lithium battery) with an adapter board.

Deployment

Results - RAW


Raw ODIN output
Dust
PM2.5
ODIN.raw
150
100
50
0
550
500
450
May 15
May 17
May 19
May 21
May 23
May 25
May 27
May 29
May 31
Jun 02
PM2.5
ODIN.raw

That doesn't look good!



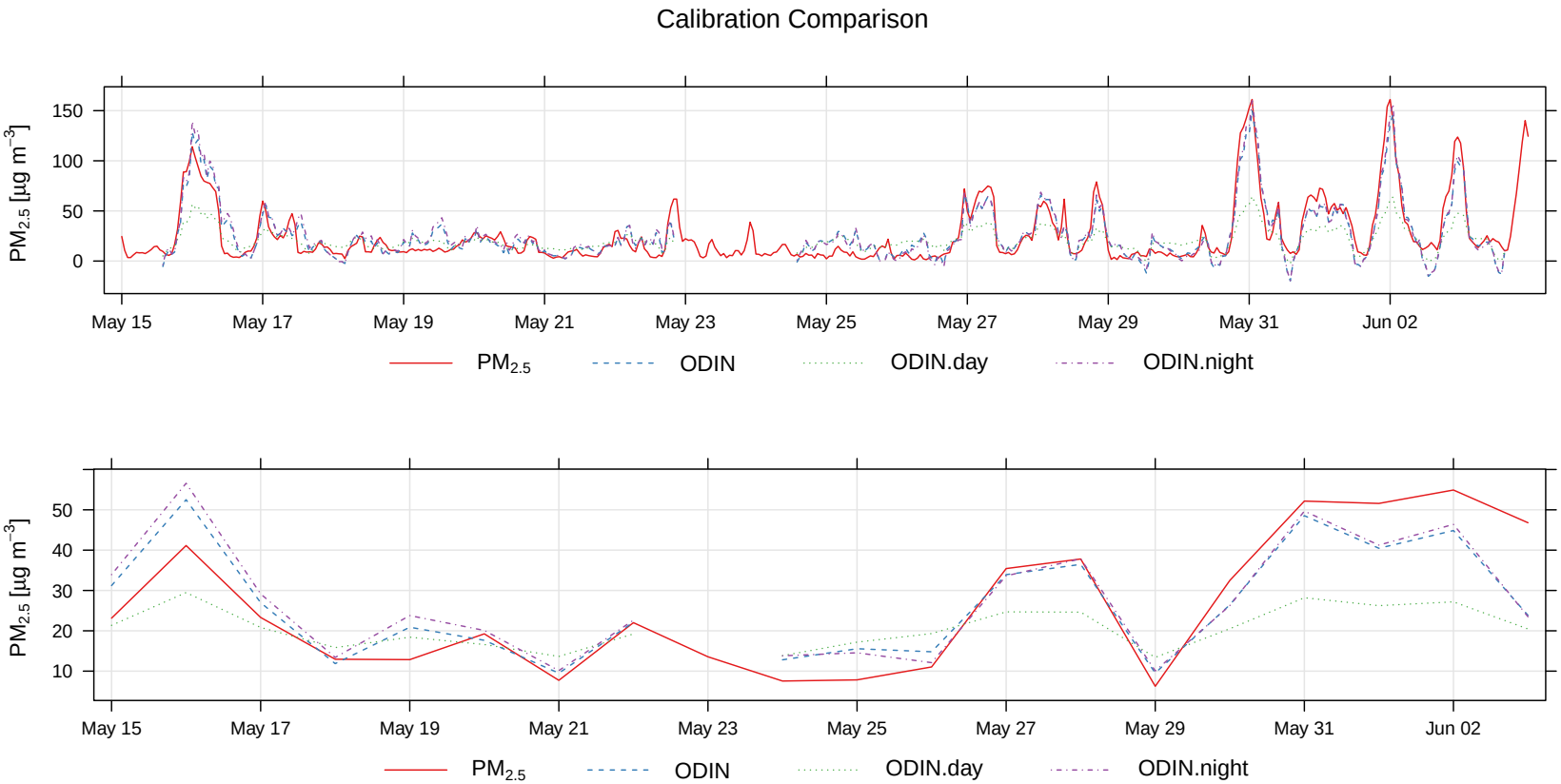
So, let's see if we can fix this

$$Dust_{calibrated} = A * Dust_{raw} + B * Temp_{ODIN} + C * RH_{ODIN} + D \quad (1)$$

Table: Calibration coefficients for ODIN. The error estimates correspond to the 95% confidence interval.

Coefficient	Full time series	Daytime	Nighttime
Raw dust	0.91 ± 0.05	0.33 ± 0.11	1.01 ± 0.05
Temperature	-5.51 ± 0.25	-2.30 ± 0.73	-5.62 ± 0.27
RH	-1.03 ± 0.12	-0.29 ± 0.23	-1.04 ± 0.17
Intercept	-284.94 ± 23.71	-96.01 ± 41.61	-331.66 ± 27.92

But does it work?



And now?

- How much are they?
- All this is nice but how reliable are those little things?
- Does the calibration from one day remains stable?
- If I have two units, would they agree?
- Do the calibration coefficients depend on something else?
- Can it measure **X**?

Thanks

You can find these slides here:
`http://dx.doi.org/10.6084/m9.figshare.1097641`