

SCHOOL

CO₂-NET

The School CO₂-net

“Meten is weten”

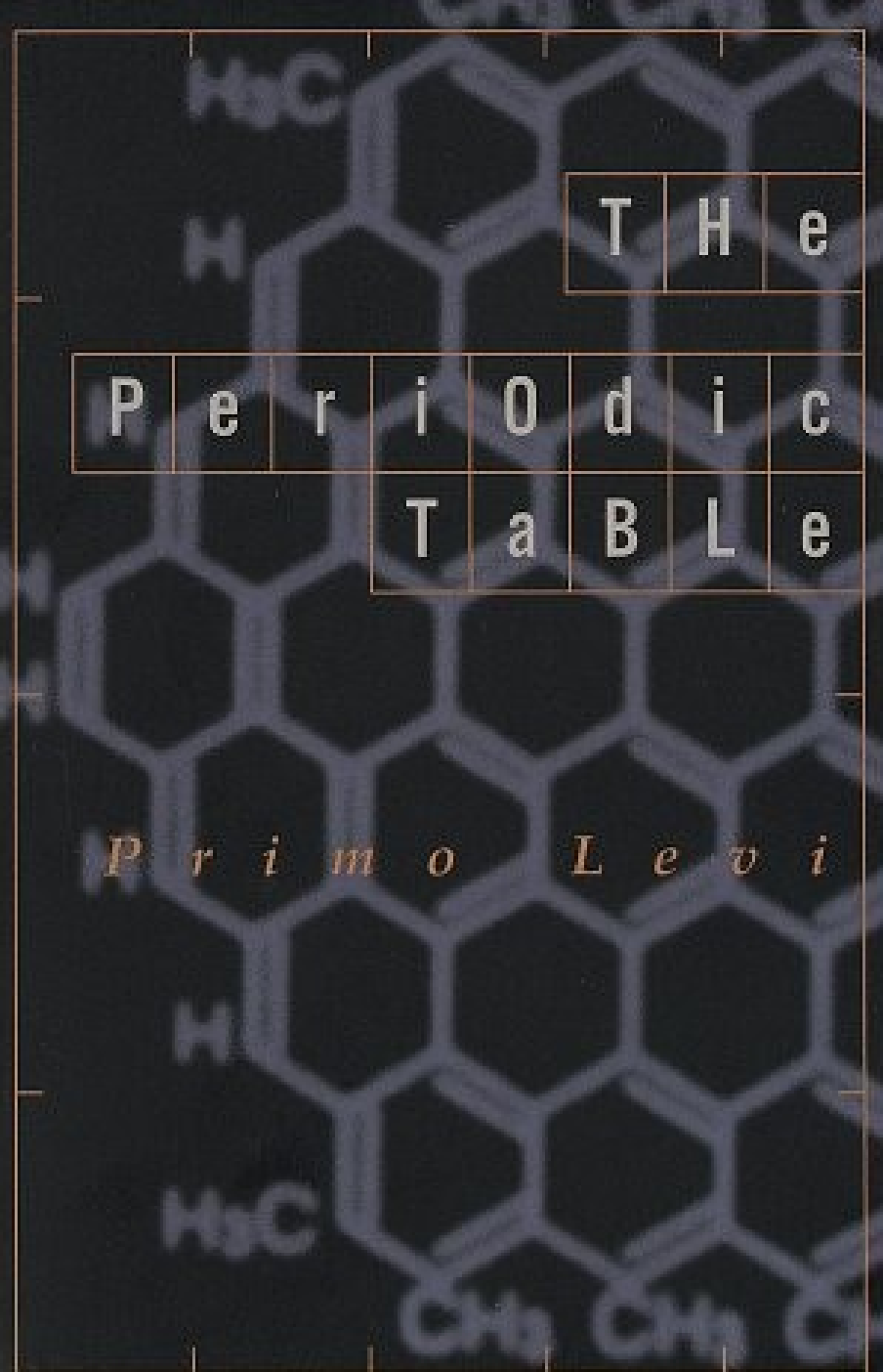
By measuring you will increase your knowledge



Maartens*College* Haren

interconfessionele school voor mavo, havo, atheneum, gymnasium, TFO en Internationaal Onderwijs te Haren (gn)

Daan Bosma
Groningen





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Primo Levi Task about the Carbon Cycle.

Imagine you are a carbon atom.

What would be the history of your life?

Write down your personal story.

Describe some main events you experienced.

Use about 600 words.

They liked it !!

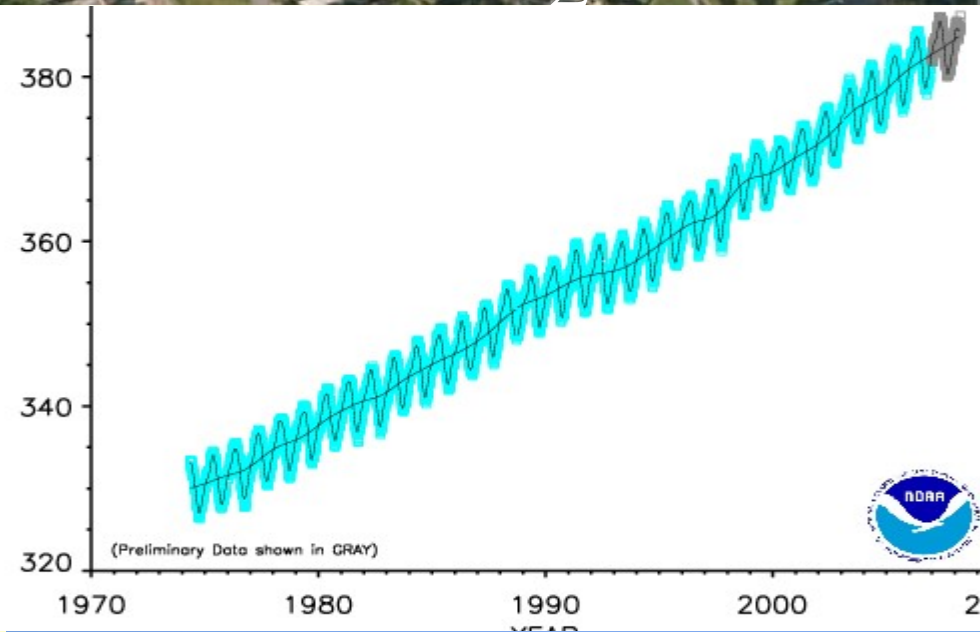
- o They invented names like **C**arlo, **O**lga and **O**scar.
- o They made vividly descriptions of different processes.
 - Respiration
 - Photosynthesis
 - Burning fuel
 - Alcohol production
- o They described emotions concerning these processes
- o They become more interested in the Carbon Cycle

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What's in a student's mind, thinking of carbondioxide?

Thanks to al Gore!

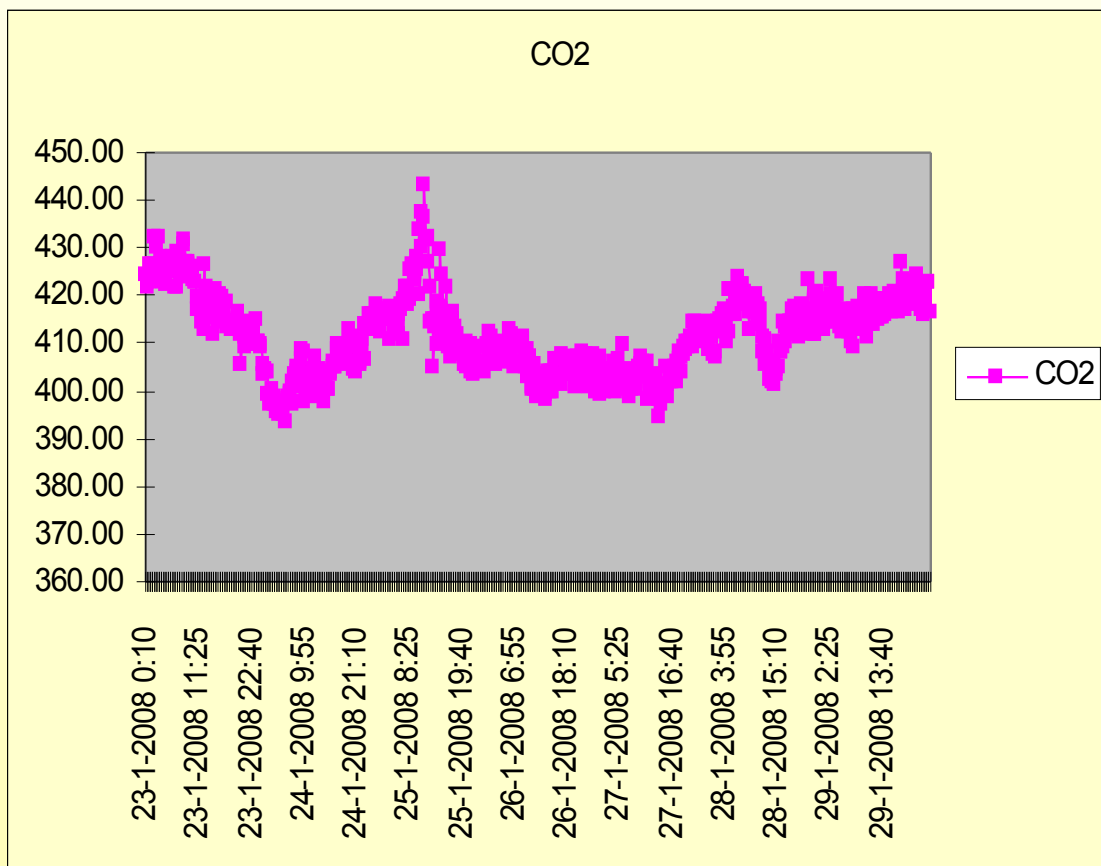


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On roof of school at sea level

The fluctuations
in only one week:
eight times
larger!





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*Is there traffic
nearby?*

*Is it the pressure
of the air?*

Is it the wind? **Raising questions**

*Is the heating
system to blame?*

*How about day
and night rhythm?*

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Start of an educational project
around Groningen University

Harro A.J. Meijer (CIO)

Martin J. Goedhart (IDO)



Idea: Pupils get hand-on experience with real CO₂ measurements: "CO₂ is for real!"

Raises their interest for carbon cycle and the global climate issues

Raises their interest for science and technology

Well-suited for exam projects

Stuadiestijgers

A network of teachers, working together

- Developing new courses
- With help of professionals of the university
- Several groups of different skills or subjects.
- 10 meetings each year.

The three pioneer schools...

Willem Lodewijk Gymnasium, Groningen



Lauwers College, Buitenpost



Maartens College, Haren



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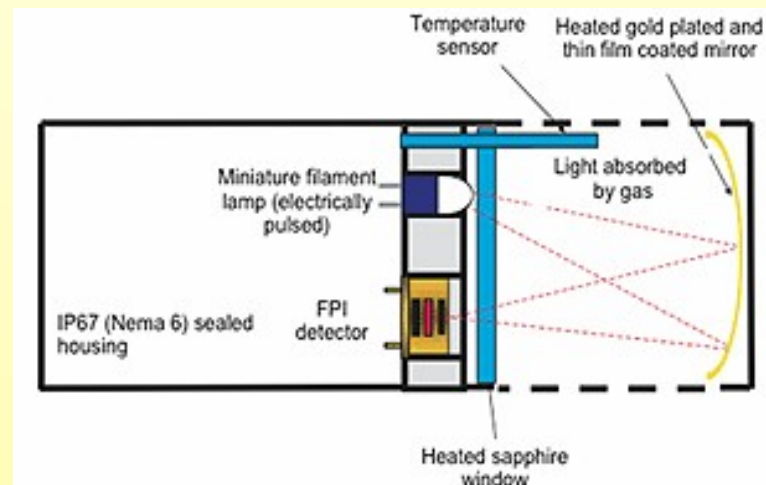
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Equipment for these schools

CO₂ analyser: needs to be

- reliable and robust
- quite accurate (≤ 1 ppm)
- yet affordable

⇒ Vaisala "Carbocap" GMP 343 CO₂ meter



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A basic meteorological station as additional instrument

- Wind speed and direction helpful for CO₂ interpretation
- Pressure and humidity for on-line correction of the CO₂ sensor

Our choice: **Davis Vantage Pro wireless.**

Extras: temperature, precipitation amount

CO₂ is the project focus,
the weather station is only secondary...







Maartenscollege











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Maartenscollege

On the roof

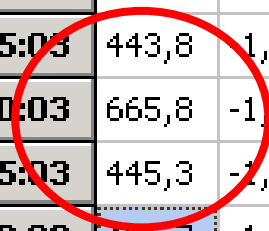
Thinking about
factors of
influence



Software: Driver program

- Initialises CO₂ meter
 - Shows the CO₂ data
 - Communicates between weather station and meter
 - Makes data files
 - *Automatically* e-mails data once a day to the central database
 - Service and testing facilities
- Future extension: Calibration support

Time	CO2	Tgas	Tmeteo	Hum	Rain	Barom	Wind	Dir	W_Av	Volt
2008-04-09 05:20:03	429,9	-1,0	0,9	93	0,0	999,9	0,0	165	0,0	2,18
2008-04-09 05:35:03	435,2	-1,0	0,7	93	0,0	999,8	0,0	165	0,0	1,63
2008-04-09 05:50:03	436,0	-1,0	0,7	93	0,0	999,7	0,0	165	0,0	1,68
2008-04-09 06:05:03	438,7	-1,0	0,7	93	0,0	999,7	0,0	165	0,0	1,78
2008-04-09 06:20:03	448,0	-1,0	0,7	93	0,0	999,7	0,0	165	0,0	2,19
2008-04-09 06:35:03	442,2	-1,0	0,7	93	0,0	999,7	0,0	165	0,0	1,63
2008-04-09 06:50:03	447,4	-1,0	0,7	93	0,0	999,7	0,0	165	0,0	1,68
2008-04-09 07:05:03	452,2	-1,0	0,7	93	0,0	999,6	0,0	165	0,0	2,37
2008-04-09 07:20:03	463,5	-1,0	0,7	93	0,0	999,7	0,0	165	0,0	2,37
2008-04-09 07:35:03	443,8	-1,0	0,7	93	0,0	999,7	0,4	193	0,4	1,68
2008-04-09 07:50:03	665,8	-1,0	0,7	93	0,0	999,7	0,9	229	0,4	1,73
2008-04-09 08:05:03	445,3	-1,0	0,7	93	0,0	999,7	0,4	210	0,4	1,68
2008-04-08 08:20:03	431,7	-1,0	3,9	80	0,0	1004,4	0,4	256	0,9	2,27



CO2: 443,8

CO2: 665,8

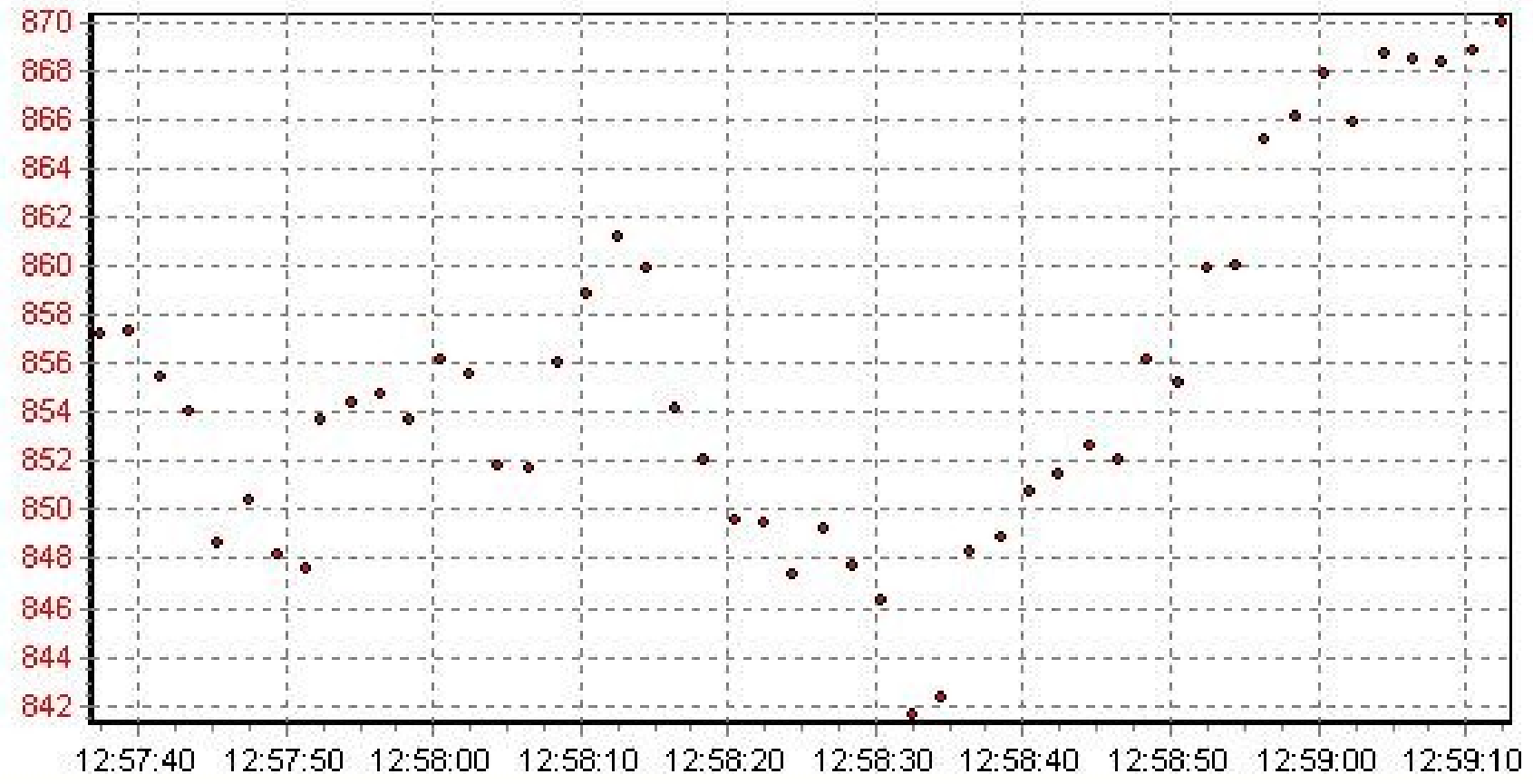
CO2: 445,3

 Save



Main | Data | Info | Settings

CO2 (ppm)



Mode

- Stop
- Fast (2 s)
- Medium (1 min.)
- Slow (10 min.)



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On-line Database with free access

- Part of the Groningen web-site for Carboschoolsplus
- *Automatic* upload from member schools
- Free access, including *data download*
- Professional CarboEurope CO₂ observation sites also available

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The screenshot shows a web browser window with the address bar containing `http://129.125.13.192/`. The browser tabs include `mozilla.org`, `http://www.makelaar...`, and `Latest Builds`. The page title is `Database Homepage`. The FileMaker logo is visible in the top right corner. The main content area features a globe graphic on the left and the text `Select a database to view:` followed by a folder icon and the link `schoolCO2`. The text `Shared by Harro` is located in the top right of the page content.

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schoolco2.fp5

[Home](#)

[Help](#)

Table View

Form View

Search

Record Range

1-12 

Total Records: 14297

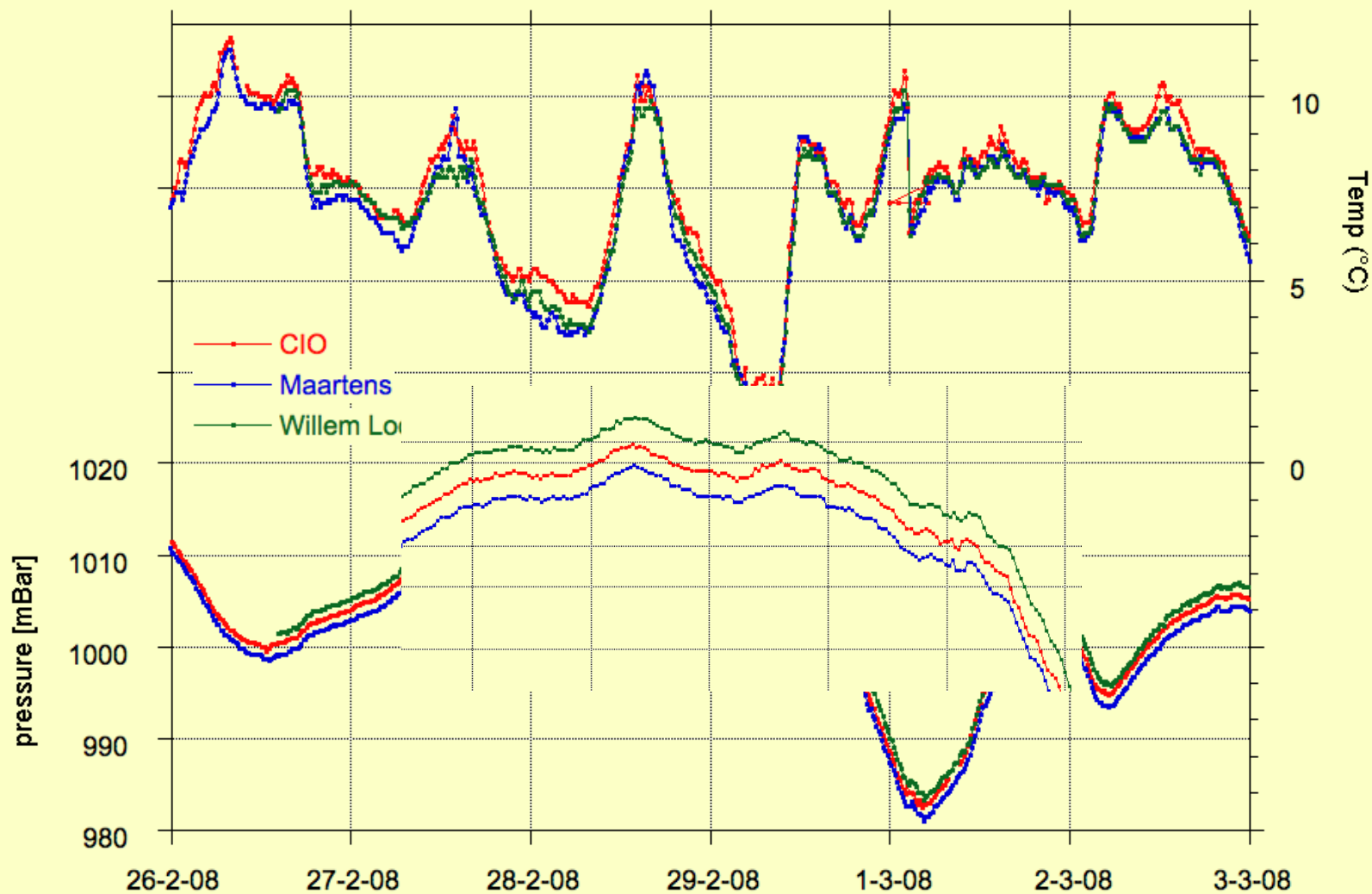
Sorted

Show All

Sort

Station	Datum	Tijd	CO2_conc	Luchtdruk	Temperatuur	T[gas]
CIO	2/2/2008	14:05:03	372.7	1011.6	3.2	4.7
CIO	2/2/2008	14:20:03	377.5	1011.5	3.7	7.6
CIO	2/2/2008	14:35:03	376	1011.6	3.3	6.1
CIO	2/2/2008	14:50:03	377.7	1011.7	3.6	7.2
MAA	2/2/2008	14:10:03	400.2	1010.7	2.4	-1
MAA	2/2/2008	14:25:03	397.9	1010.7	2.8	-1
MAA	2/2/2008	14:40:03	408.6	1010.9	3.5	-1
MAA	2/2/2008	14:55:03	398.1	1011	3.7	-1
WLG	2/2/2008	14:10:03	408.3	1012.8	2.7	-1
WLG	2/2/2008	14:25:03	403	1012.9	2.7	-1
WLG	2/2/2008	14:40:03	405.1	1012.9	2.9	-1
WLG	2/2/2008	14:55:03	401.2	1012.9	3.9	-1

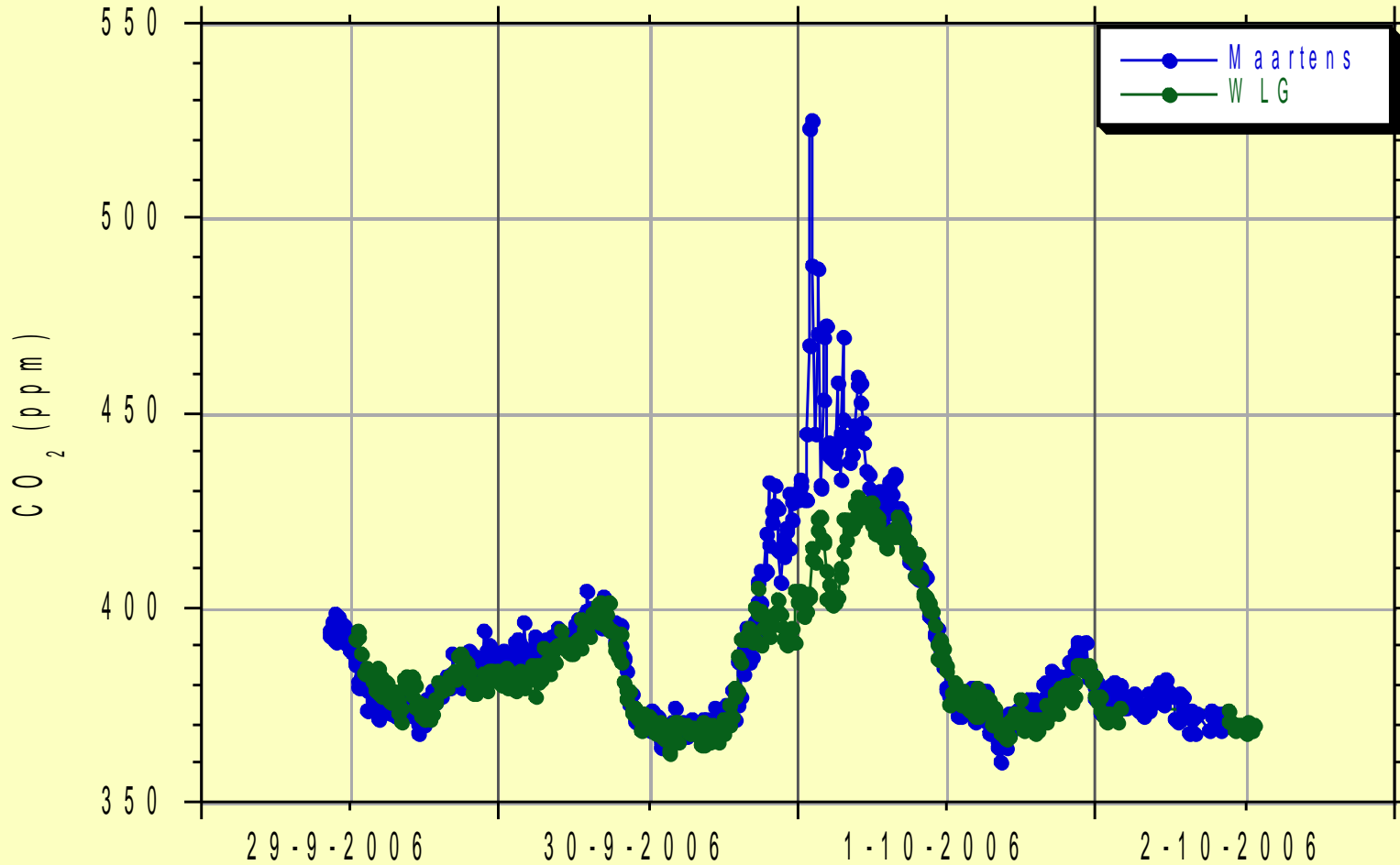
Pressure and Temperature

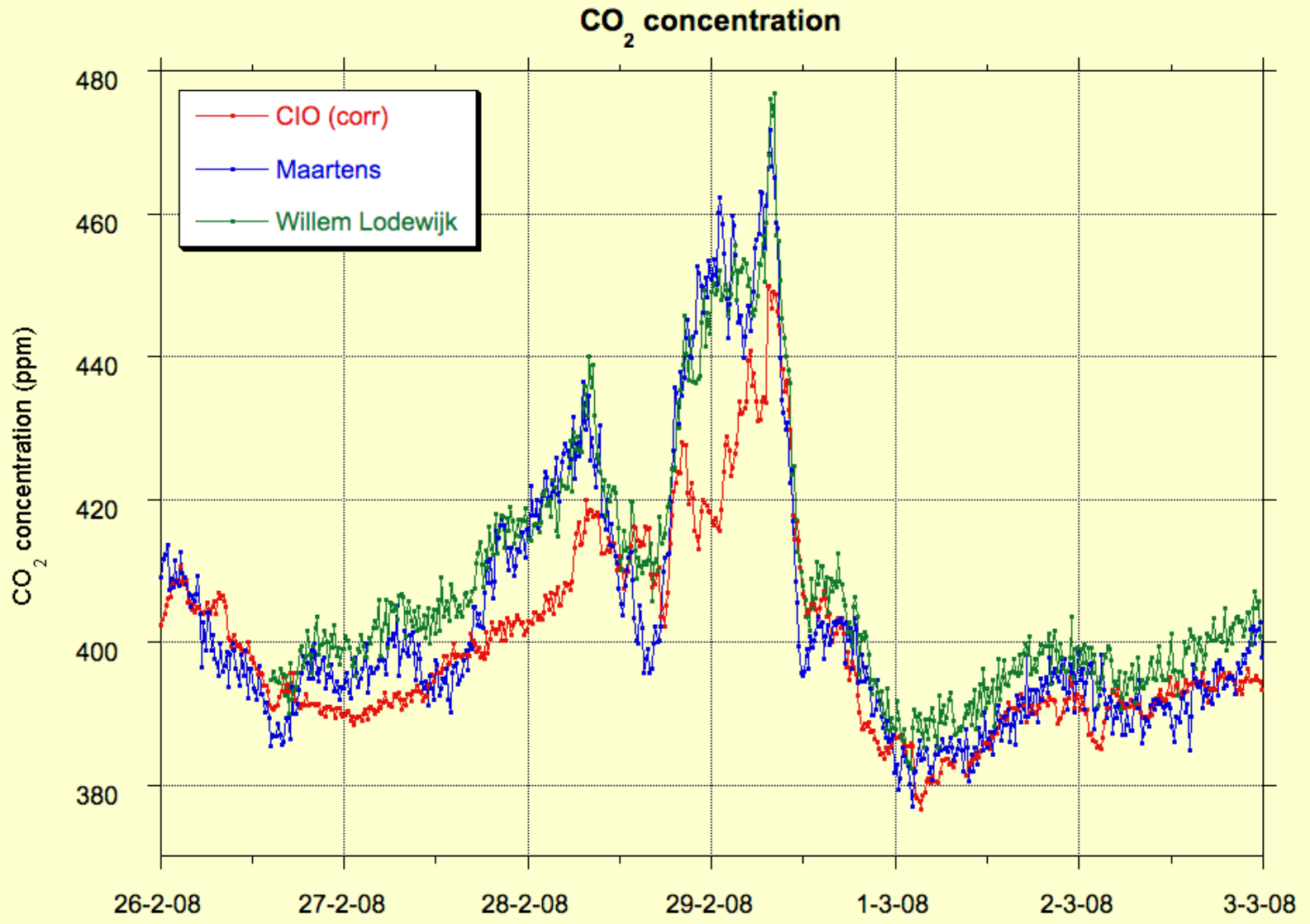


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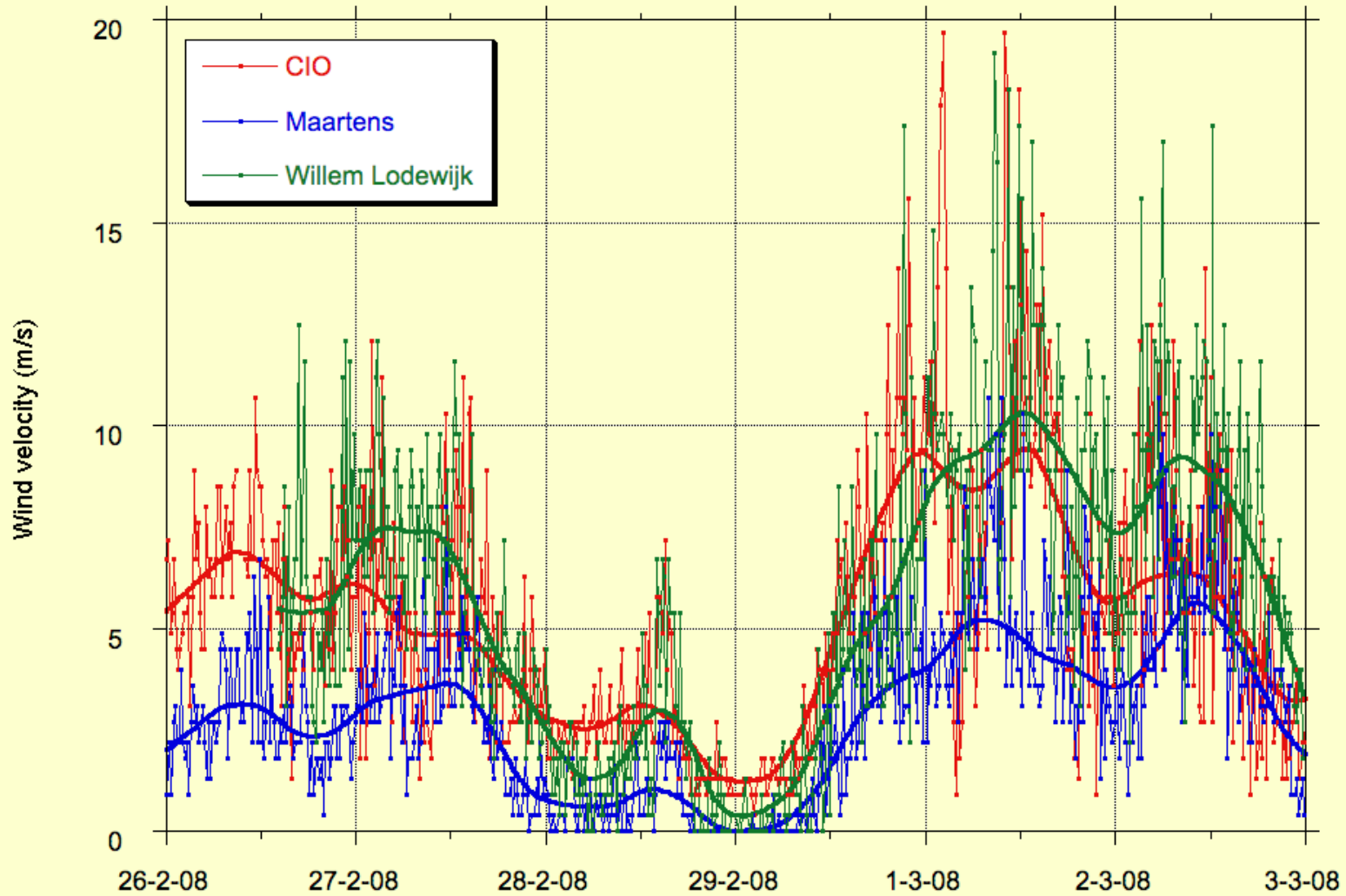
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First week data





Wind velocity (m/s)

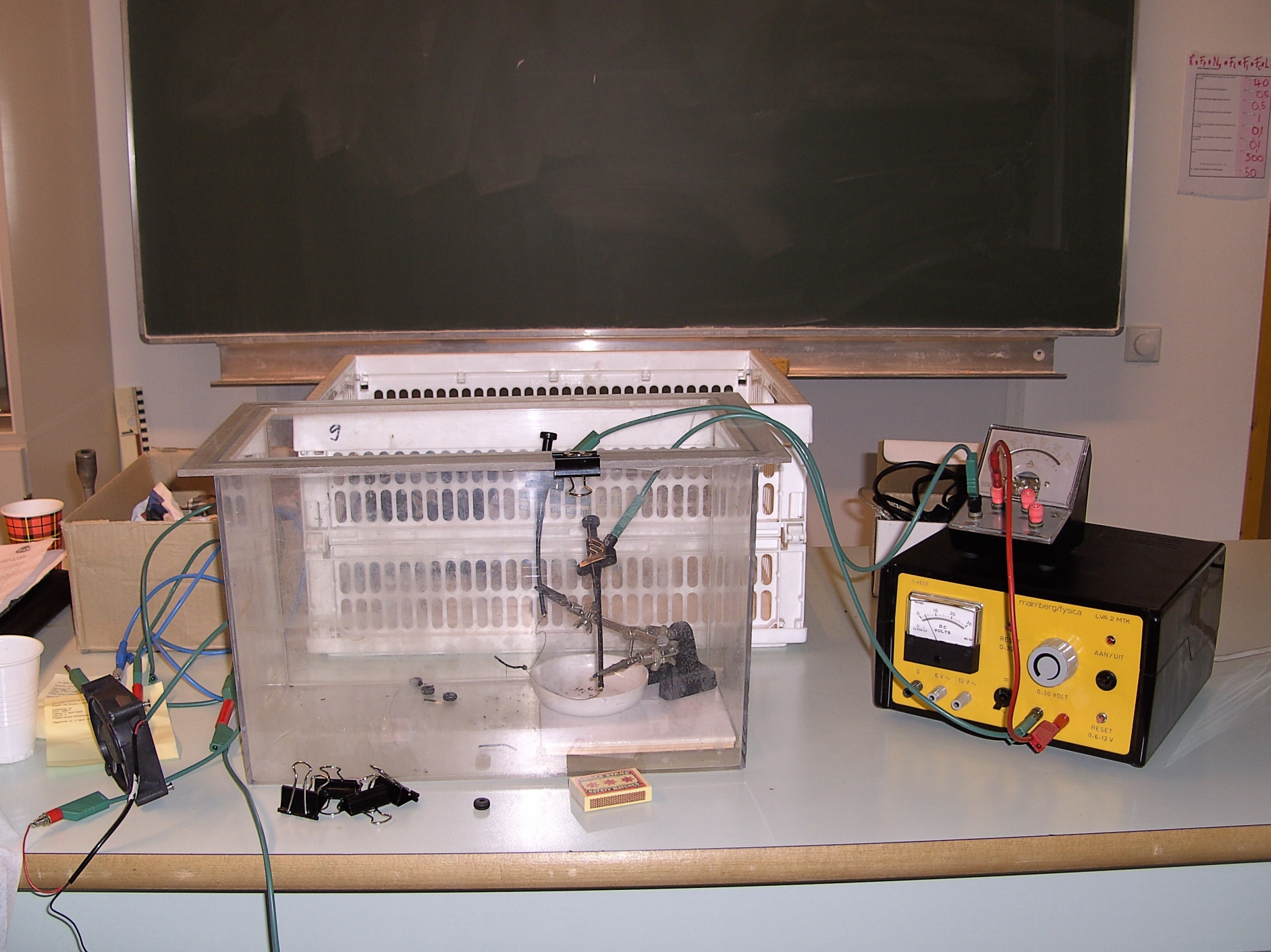


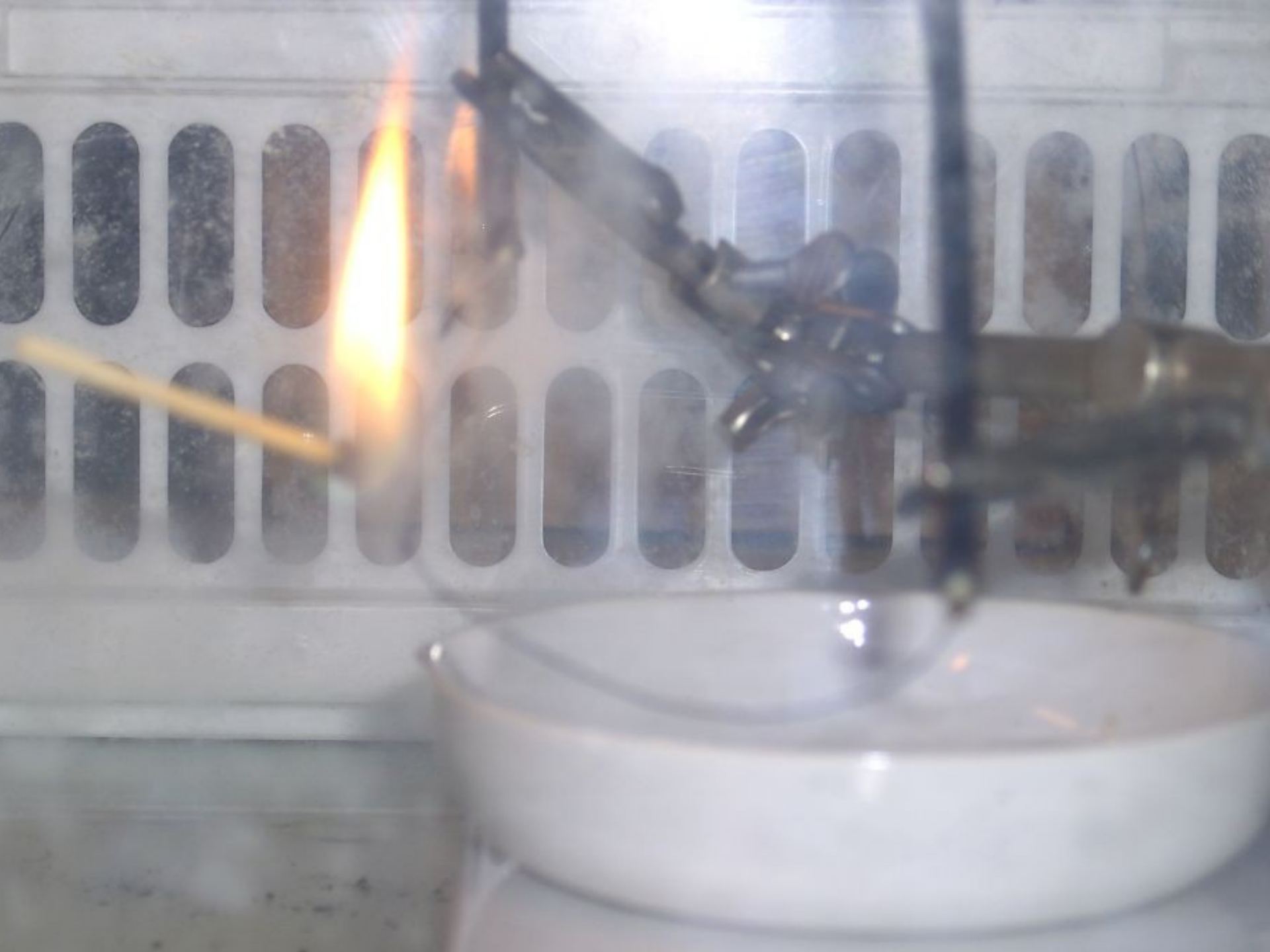
In the classroom

- Measuring the respiration of a class
- Subject for “profielwerkstuk” (masterproof)
- NLT module (nature, life and technology)
- Calculating on ecological footprints
- Measuring with a CO₂-box

Handwritten notes on a whiteboard, including a table with numerical values:

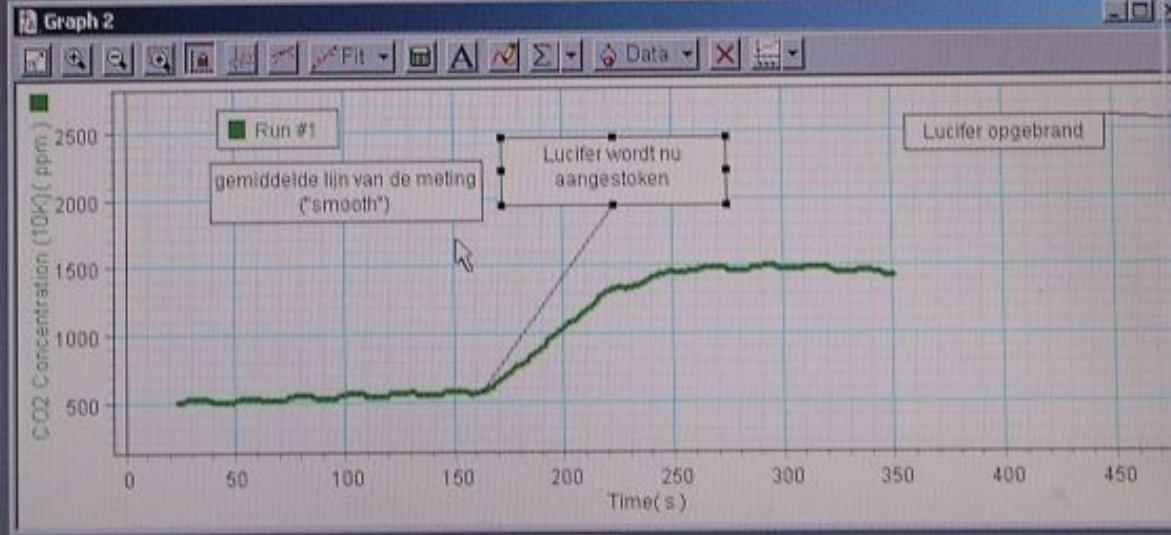
	4.0
	0.5
	0.3
	1
	0.1
	0.1
	500
	50

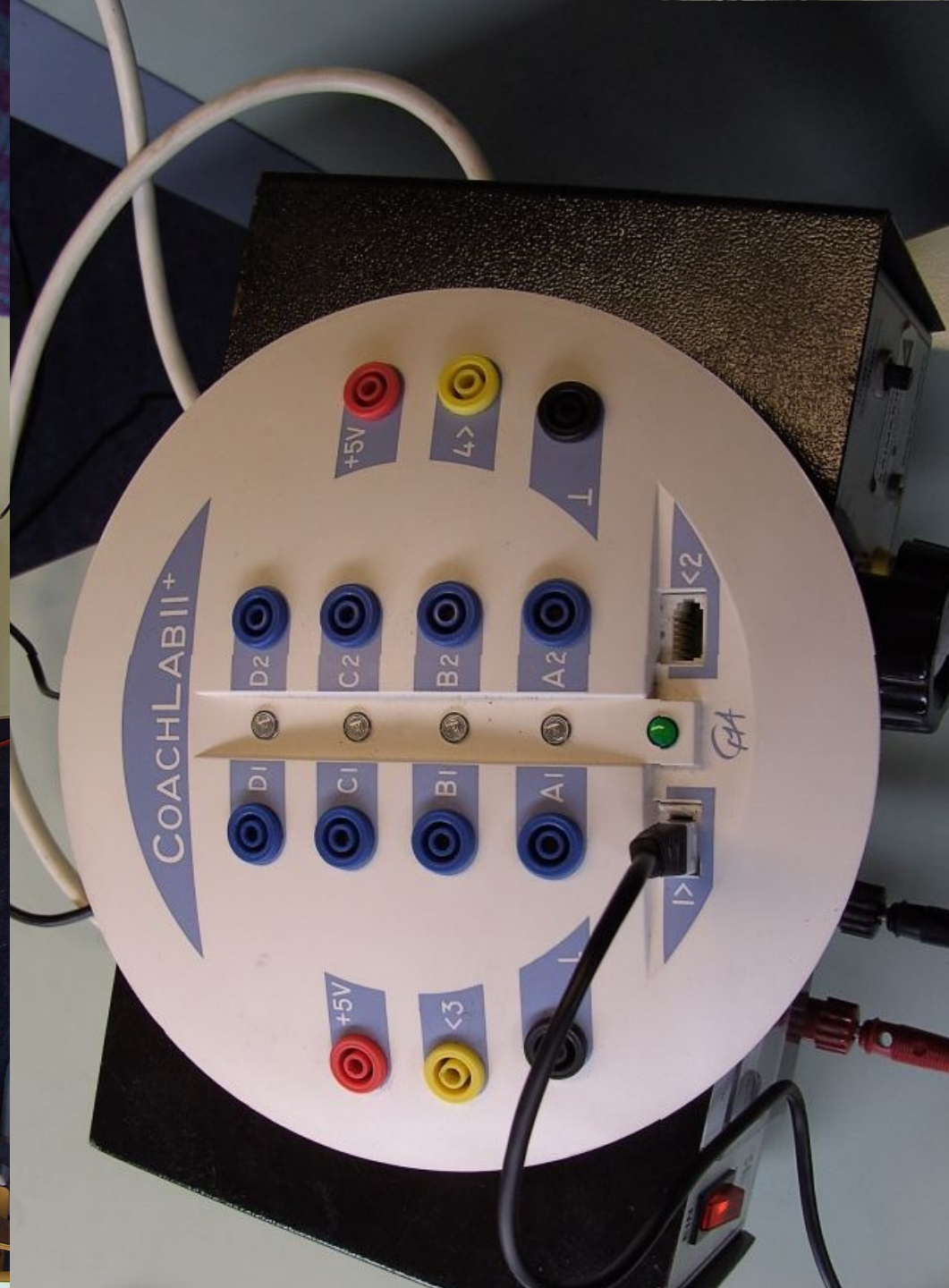




- Data
 - CO2 Concentration (10k) (ppm)
 - Run #1
 - y = smooth(50,x) (ppm)
 - Run #1

- Displays
 - 314 Digits
 - 314 Digits 1
 - Graph
 - Graph 1
 - Graph 2
 - Meter
 - Table
 - Workbook







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This year:

- Developping
- Testing

Next year:

- In use in curriculum Biology.
- Testing NLT module for certification