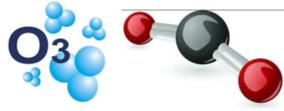


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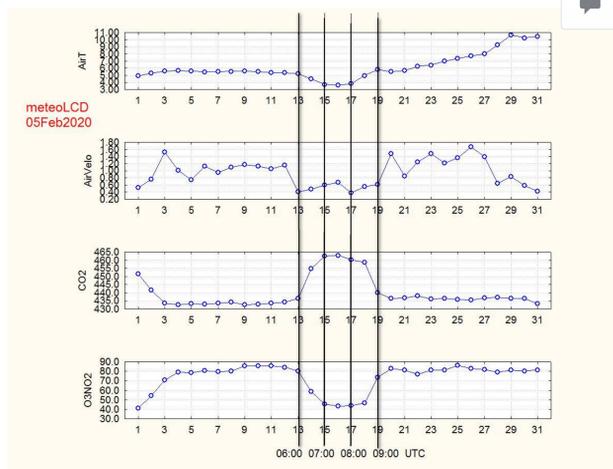
A weblog on climate, global change and climate measurements

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An interesting day for Ozone and CO2



Today 05 Feb 2020 is an interesting day to observe how ground ozone O3, CO2, NO2 and wind may play together. The next figure shows how air temperature, CO2, ground O3 (measured by the Cairsens O3&NO2 sensor) and wind velocity (in m/s) varied during the morning at meteoLCD:

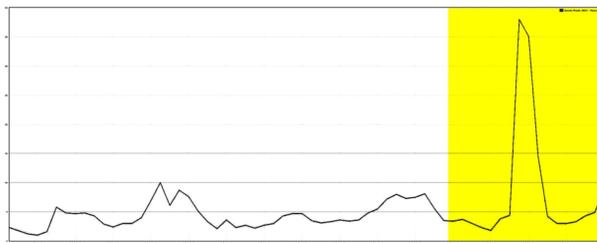


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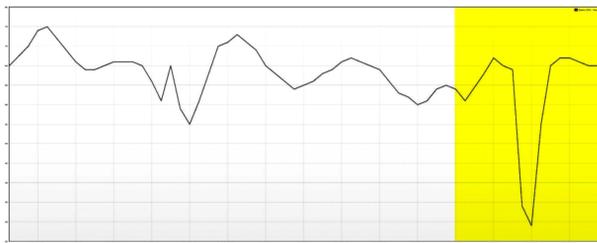
We see that CO2 makes a big jump starting at 06:00, with a peak at 07:30 and a fall back to "normal" at 09:00. Ground ozone varies in the opposite manner, as does the wind velocity and air temperature. What causes these variations? Probably the cooling of the boundary layer, together with lower wind, enhances the morning inversion. CO2 emissions from traffic and heating are trapped and CO2 levels rise; when the wind increases again, the boundary layer starts being mixed, which dilutes CO2. So far, so good. But why the sudden slump in O3?

Our period starts at 06:00 UTC, which is 07:00 local time. At that hour the nearby traffic from people driving to their workplace peaks, something we often have noticed in our NO/NO2 measurements. We know that O3 is destroyed by NO (and produced by NO2, among others); look [here](#) for a very small article on this I wrote in Dec. 1998 (!) with several of my students. So the best explanation is that a NO peak from this traffic (and NO being trapped in the inversion layer) operates to destroy ground ozone.

We find this situation at the official station of Beckerich, where the traffic situation is similar to that at meteoLCD (Diekirch). Beckerich curiously is the sole station showing NO2 readings (the other 4 having probably a problem with their sensors). NO2 is mainly the result of an oxidation of NO coming out of the tailpipes, so we may safely assume that the hourly variation is similar in shape. Here the Beckerich situation:



NO2 peaks at Beidweiler
(05 Feb morning = yellow)



... while O3 takes a plunge!

Two other stations (Luxembourg-Bonnevoie and Esch) show the same O3 dip, and two (Beidweiler and Vianden) do not.

Conclusion:

Once again we find an illustration of the importance of wind velocity (i.e. air movements) on the CO2 mixing ratio: lower wind (especially during an inversion) allows CO2 to accumulate, and more air movement makes for higher dilution and lowers the concentration.

Ozone levels in the relatively low sun morning hours (despite the sunny and blue sky morning, at 08:00 UTC solar irradiance was a meager 50 W/m²) are mostly affected by the destroying NO gas, whose concentration peaks normally during the high traffic morning hours. This would explain why the Vianden O3 levels do not plunge, as there is practically no traffic around that measuring station:



No O3 dip at traffic-free Vianden!

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