The Oxidant Production over Antarctic Land and its Export (OPALE-ANR- 09-BLAN-0226)

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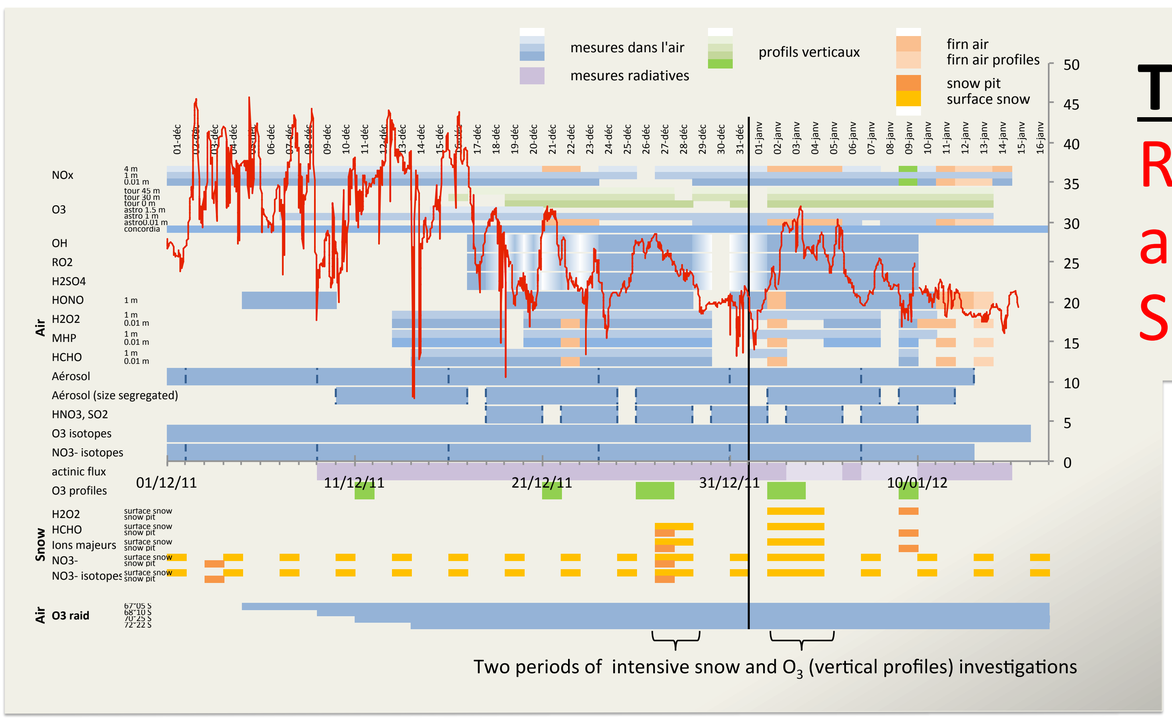
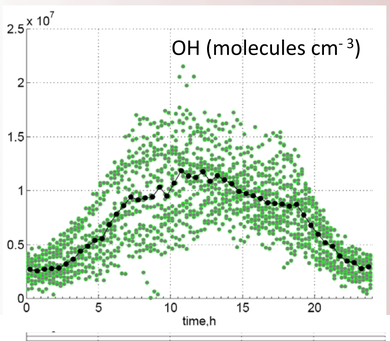


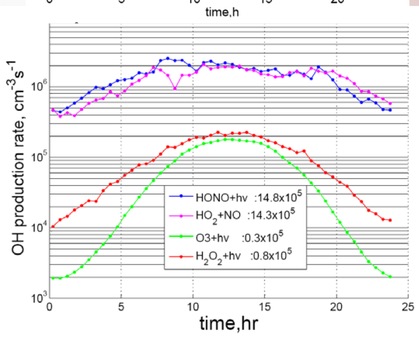
The OPALE campaign 2011/12 at Dome C:

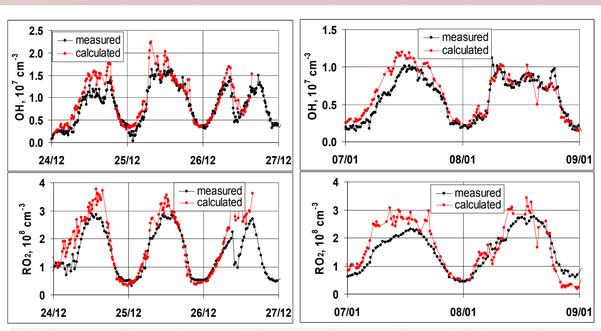
Remarkable Oxidation Conditions with HO_x and HONO levels 4 times higher than at the South Pole !!!

SAMU HOx mesurements at Dome C

- Highest OH and RO2 measurements ever made in Antarctica
- Major primary production via HONO
- Very good agreement between measurements and calculations

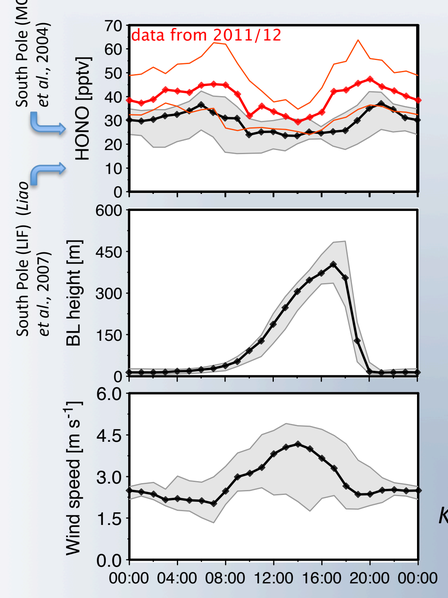






Kukui et al.,in prep.

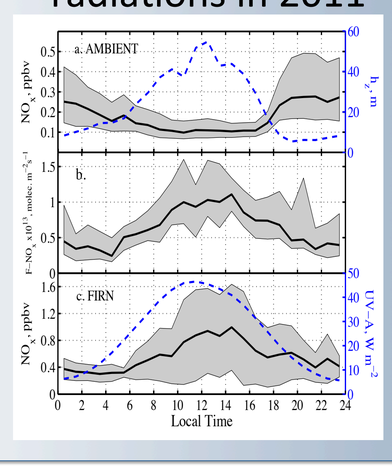
Multi annual HONO and NOx measurements at Dome C

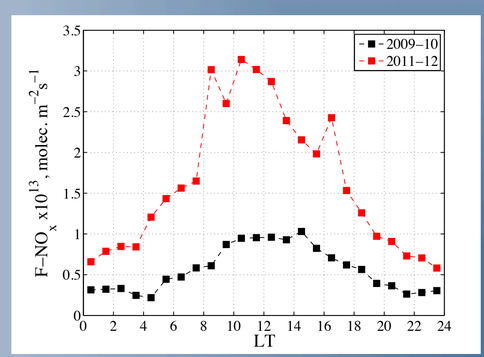


- LOPAP measurements from 2010/11 confirmed in 2011/12
- Absence of HNO4 artefact confirmed
- Laboratory experiments are currently performed to quantify the HONO snow source at DomeC.

Kerbrat et al., 2012 and Legrand et al., in prep.

As observed for HONO, NO_x show enhanced levels in 2011/12 compared to measurements in 2010 and 2009, respectively. This is probably due to an extreme low O_3 column and with that enhanced UV-B radiations in 2011



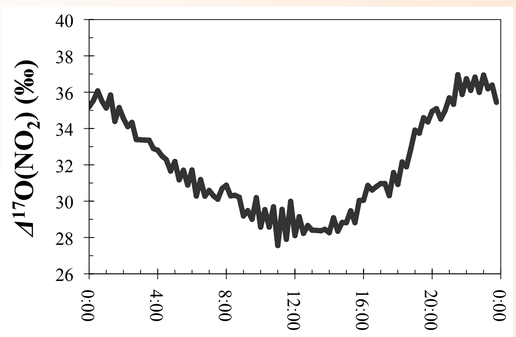


Frey et al., 2013 and Frey et al., in prep.

Occurrence of unexpected mechanism in nitrogen oxidation process: unexpected low NO/NO2 ratio and unclosed isotopic mass balance

The ^{17}O-excess ($\Delta^{17}O = \delta^{17}O - 0.52 \times \delta^{18}O$) of O_3 is transferred to NO_x via O_3-mediated oxidation reactions in the atmosphere. This is a very useful tool to study NO_x transformations.

The isotopic mass balance of atmospheric NO_3^- suggests the existence of an unexpected process that contributes significantly to the atmospheric NO_3^- budget over Dome C.

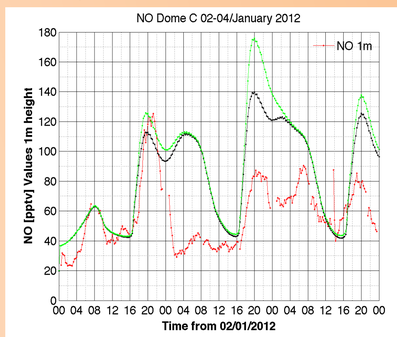


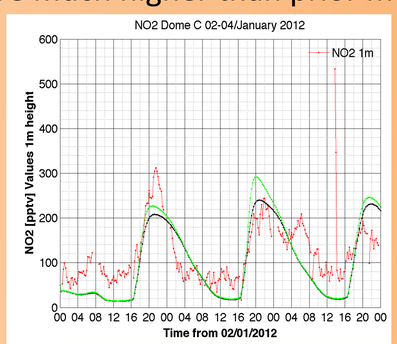
Potential explanations: (i) an increased $\Delta^{17}O$ transfer from OH due to its formation from HONO released from snow, (ii) the co-emission of reactive halogens acting as transfer intermediate of $\Delta^{17}O$ from ozone to NO_3^- and (iii) surface water chemistry converting NO_x to HNO_3.

Vicars et al., in prep.

Can bromine chemistry explain the NO/NO_2 ratio?

Model results show a good agreement with the measured NO and NO_2 when including high levels of bromine in the model. To correctly model the NO/NO_2 ratio, levels of HBr and BrO are much higher than prior measurements.





Sensistivity test are currently done to test whether clorine or iodine could explain the observed NO/NO2 ratio.

Gil Roca et al., in prep.

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