NCAR $NO_{xy}O_3$

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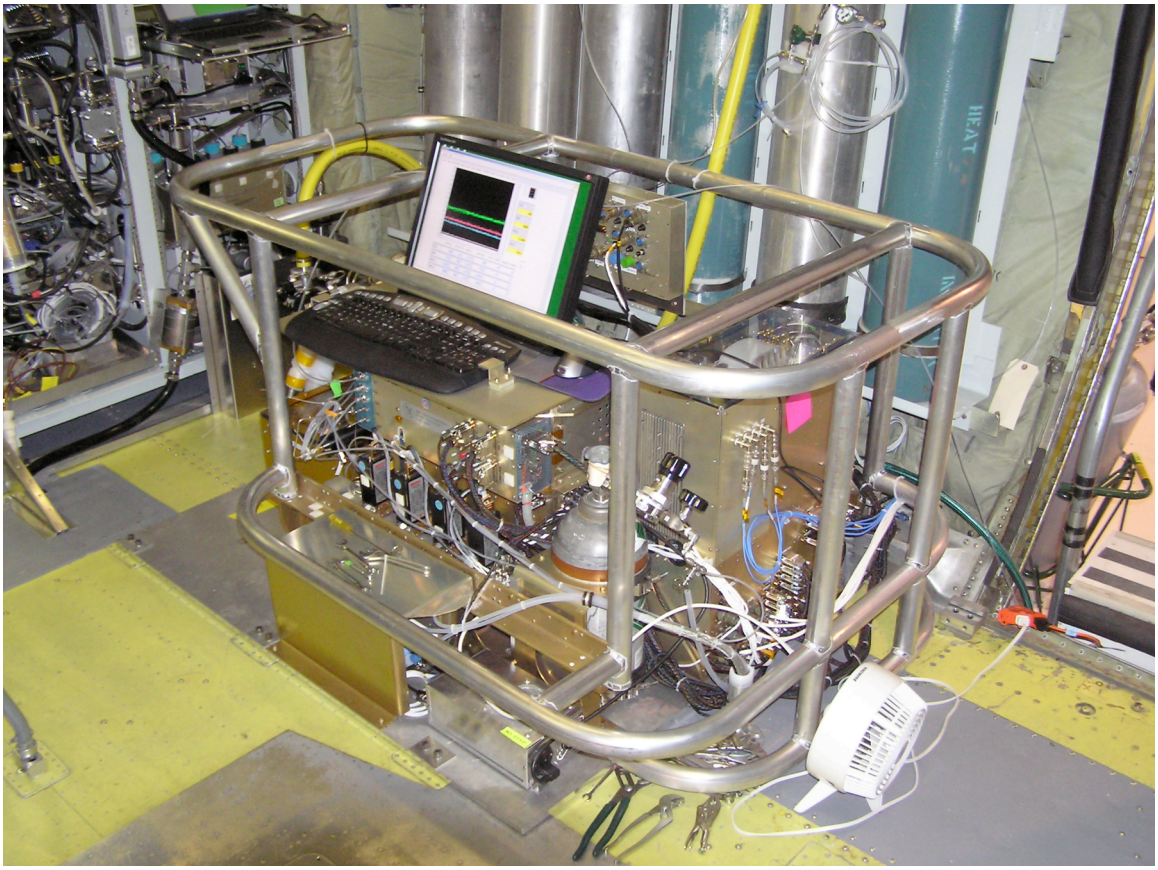
The NCAR $NO_{xy}O_3$ instrument is a 4-channel chemiluminescence instrument for the measurement of NO, NO_2, NO_y, and O_3. NO_x (NO and NO_2) is critical to fast chemical processes controlling radical chemistry and O_3 production. Total reactive nitrogen (NO_y = NO + NO_2 + HNO_3 + PANs + other organic nitrates + HO_2NO_2 + HONO + NO_3 + 2*N_2O_5 + particulate NO_3^- + …) is a useful tracer for characterizing air masses since it has a tendency to be conserved during airmass aging, as NO_x is oxidized to other NO_y species.

ARCTAS Objectives:

- NO_y & O_3 serve as tracers of long-range transport of polluted air into the Arctic.
- NO_x, NO_y, O_3 are expected to be strongly influenced by boreal fires.
- Influence of NO_x on chemical processes involving radicals and O_3 production.

NO_x (NO and NO_2), NO_y (total reactive nitrogen), and O_3 are measured using the NCAR 4-channel chemiluminescence instrument, previously flown on the NASA WB-57F and the NCAR C130. NO is measured via addition of reagent O_3 to the sample flow to generate the chemiluminescent reaction producing excited NO_2, which is detected by photon counting with a dry-ice cooled photomultiplier tube. NO_2 is measured as NO following photolytic conversion of NO_2, with a time response of about 3 sec due to the residence time in the photolysis cell. NO is measured with an identical time response due to use of a matching volume. NO_y is measured via Au-catalyzed conversion of reactive nitrogen species to NO, in the presence of CO, with a time response of slightly better than 1 sec. O_3 is measured using the same chemiluminescent reaction but with the addition of reagent NO to the sample flow. Time response for the ozone measurement is slightly better than 1 s. All 4 measurements are reported at 1 s in the standard archival.



Instrument Specifications (1-sec values):

Species	Time Response	Precision (1σ, low mixing ratio, 41 kft)	Overall Uncertainty (well above detection limit)
NO	~3 s	≤20 pptv	~10%
NO_2	~3 s	≤40 pptv	~10-20%
NO_y	≤1 s	≤20 pptv	~10%
O_3	≤1 s	≤0.1 ppbv	~5%