

In Situ Measurements of NO, NO₂, NO_y, O₃
on the P3 in DISCOVER-AQ
Using the NCAR 4-channel Chemiluminescence Instrument

Andy Weinheimer (P.I.)
David Knapp, Deedee Montzka, Wengang Zheng, Frank Flocke



Four sample flows, each employing the chemiluminescent reaction:



Inlet to be mounted on a window plate on P3.

For NO, reagent O₃ is added to the flow of ambient air. Photons are counted.

For NO₂, ambient air flow through a photolysis cell to convert NO₂ to NO.

For NO_y, ambient air flows through a heated gold catalyst to convert NO_y species to NO.

For O₃, reagent NO is added to flow of ambient air.



Detection limits 1-s, 1-sigma:

NO: 20 pptv

NO₂: 30 pptv

NO_y: 20 pptv

O₃: 0.04 ppbv

Overall uncertainty, well above DL:

NO: 10%

NO₂: 10-15%

NO_y: 10%

O₃: 5%

Time response:

NO_y, O₃: ~1 sec

NO, NO₂: ~3 sec previously; better for DISCOVER-AQ

Data reported at 1 sec.



As flown on C130 for MIRAGE / INTEX-B. Similar for ARCTAS on DC-8.

Three modifications underway:

(1) Reconfigure to fit into 2 standard P3 racks. Necessary to fit through the door of the P3.

(2) Improved NO₂ photolysis with new LEDs. Will improve frequency response.

(3) Program for autonomous operation (as for prior use on B57).

Timeline:

- Start building up the racks in November
- Complete modifications then start testing February 1

Plans, concerns for integration:

- Intent is to install the pair of racks as a single unit, so as to avoid disconnections. Requires nothing sticking out front/back.

Plans for data analysis:

- Quick-look reduction hours after flight. Should be good when mixing ratios high. Final data n months later.
- Column NO_2 , O_3 for comparison with satellites.

Thank You

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**To advance understanding of weather, climate, atmospheric composition and processes;
To provide facility support to the wider community; and,
To apply the results to benefit society.**

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