A new instrument for in-situ nitrous acid (HONO) measurements by Iterative Cavity enhanced DOAS

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Motivation

- NO_x chemistry → HONO
- Investigation of sources, sinks and processes
- Current measurement techniques are complex

Typical HONO concentrations

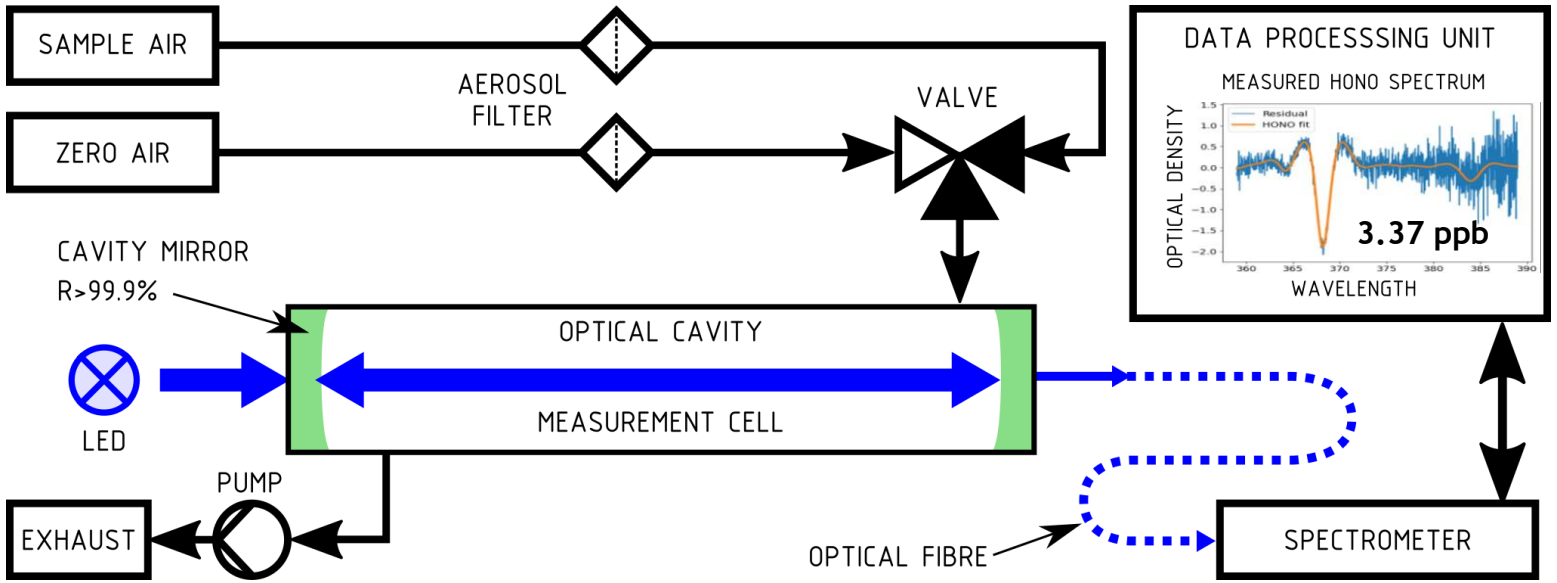
Urban/rural day:	0-1 ppb
Urban/rural night:	0-2 ppb
Indoor:	1-2 ppb

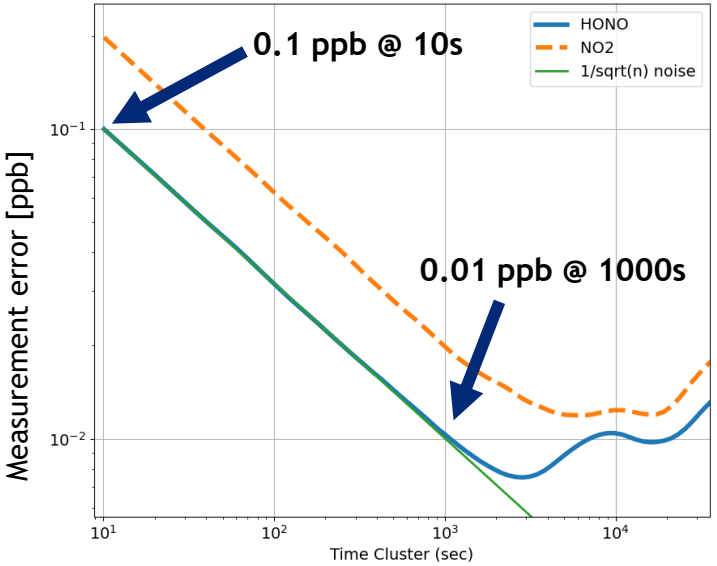
Direct spectroscopic detection of HONO and NO_2

Low zero and calibration drift

No HONO/NO_2 calibration gases needed

ICAD Setup and Method





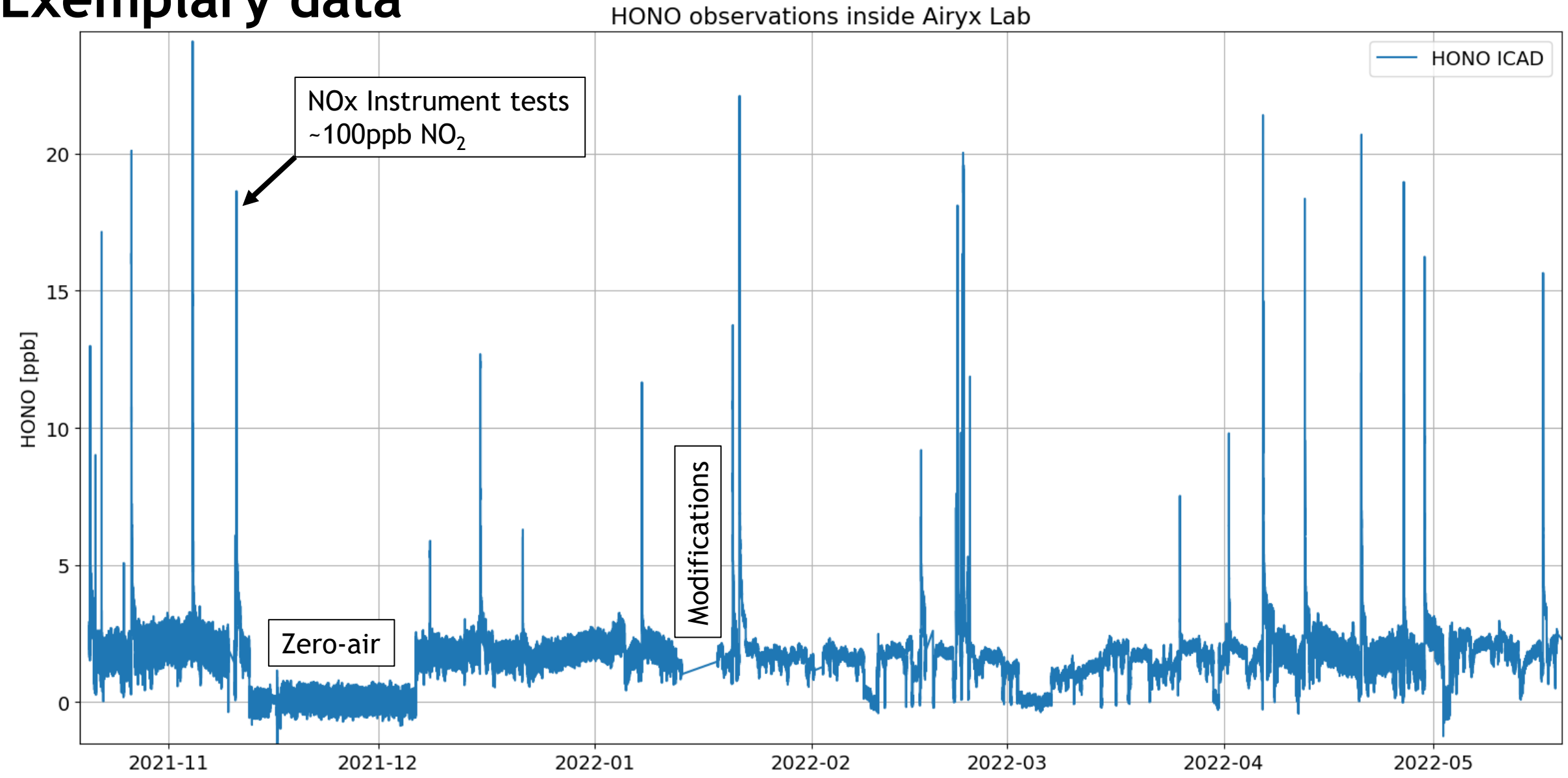
The ICAD HONO instrument:

- Simultaneous and direct spectroscopic measurement of HONO and NO_2
  - 350nm-390nm
- Use of reliable and tested ICAD algorithm
- Fast response time
- No consumables, fully automatic operation
- No significant zero point drift

Measurement range	HONO 0 - 500 ppb	NO_2 0 - 2000 ppb
LOD (at 10s)	0.2 ppb	0.4 ppb
LOD (at 1000s)	20 ppt	40 ppt

[1]Horbanski et al.: Atmos. Meas. Tech., 12, 3365–3381, 2019 https://doi.org/10.5194/amt-12-3365-2019

Exemplary data



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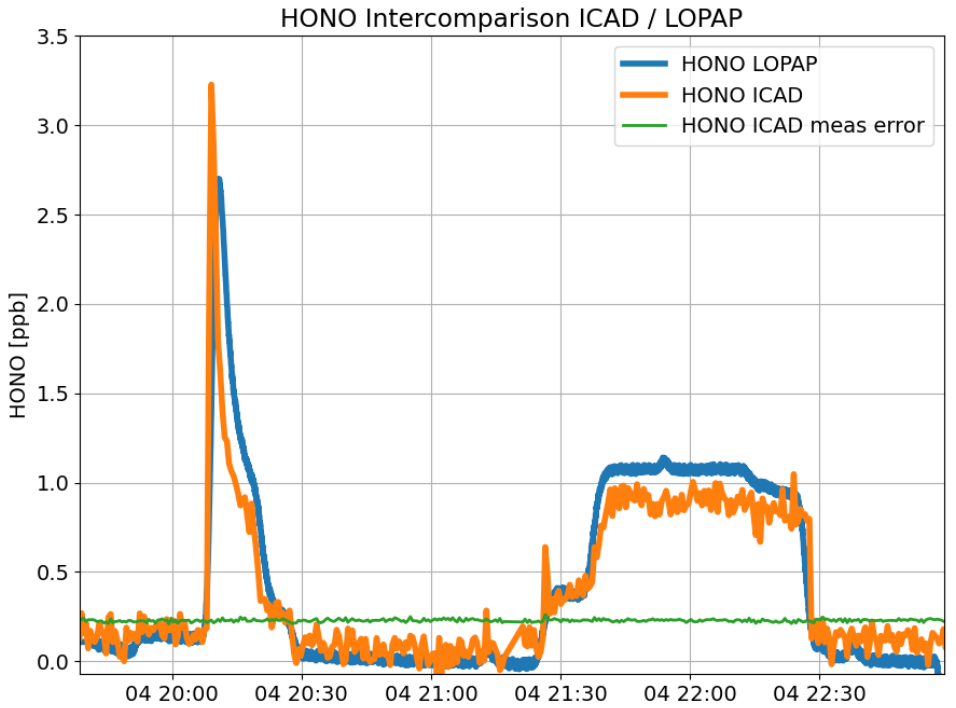
Exemplary data

Indoor/outdoor ambient air

Comparison with LOPAP



Intercomparisons of a HONO ICAD prototype with LOPAP measurements in cooperation with the group of Ammann et al at PSI/Switzerland.

Summary

ICAD HONO properties	
High accuracy	• Direct spectroscopic HONO (and NO_2) measurement → no significant interferences • High sensitivity, low measurement error • No zero-point or calibration drift, 100% reproducibility • Fast response within seconds
Simple and low-cost operation	• Robust setup • High stability (not sensitive to shocks, vibration, temperature) • No consumable gases/liquids required • No calibration gases (HONO, NO_2) required • Light weight (11kg) • Low power consumption (<40W at 12 V)
Outlook	• Extension towards shorter wavelengths to cover other gases: HCHO, Ozone, SO_2

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Thank you for your attention!