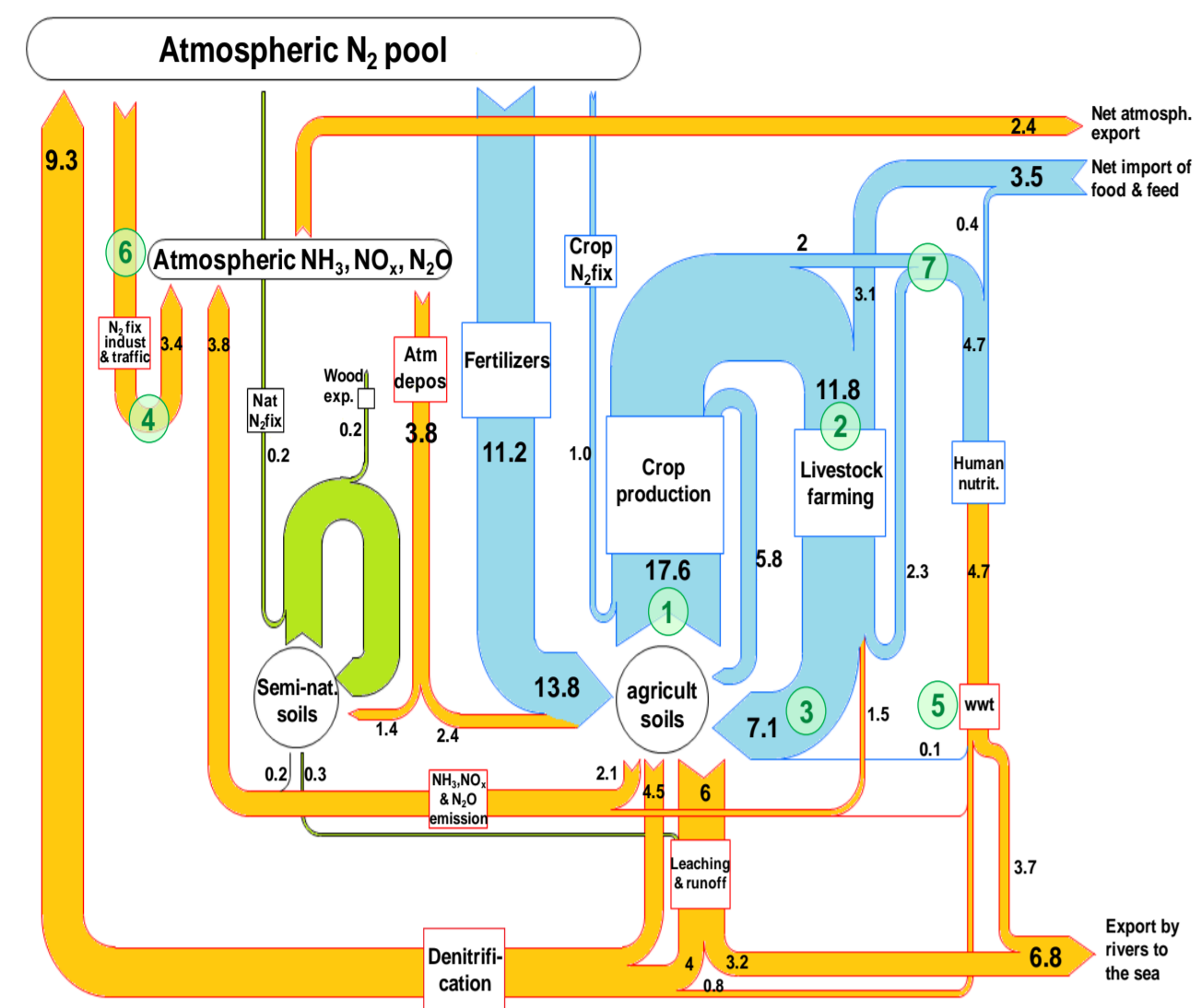


N flows in Europe (numbers: TgN/yr), ENA 2011



What are ambient ammonia concentrations?

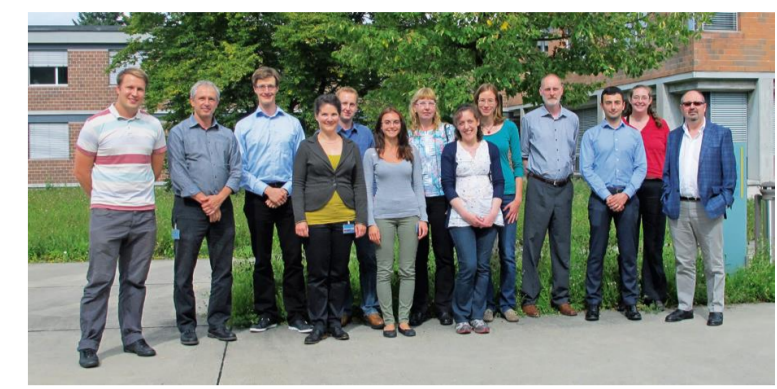
- Ambient ammonia concentrations are highly variable, e.g.:
 - remote or background <1.5 ppb
 - agricultural and urban background 1.5-20 ppb
 - source impacted >20 ppb
- Climate conditions: Temperature (T) and relative humidity (RH) affect both ambient concentrations & instrument/sampler performance
- Highly dependent on PM e.g. ammonium-nitrate-sulphate with re-partitioning of ammonia to gas phase possible

MetNH3 Project objectives

- Gas calibration standards
 - New static reference gas mixtures in pressurised cylinders
 - Development of devices for dynamic generation of traceable reference gas mixtures by permeation and dilution with portability
- Optical spectrometric standards
 - Development and characterisation of extractive optical transfer standards beyond the state-of-the-art
 - Characterisation and application of sampling-free open path laser spectrometers
- Validation/Dissemination
 - Validation and comparison of field applicable (wet) methods with optical transfer standards
 - Evaluate field applicable methods for monitoring of reduction measures



http://www.metnh3.eu



Project Partners



How can the research community get involved? Become a Stakeholder/Collaborator

Get the project newsletter!

Contact Project coordinator:

Bernhard Niederhauser bernhard.niederhauser@metas.ch

Pre-announcements:

Stakeholder/Project Workshop May 2016

Ammonia field intercomparison in summer/autumn 2016

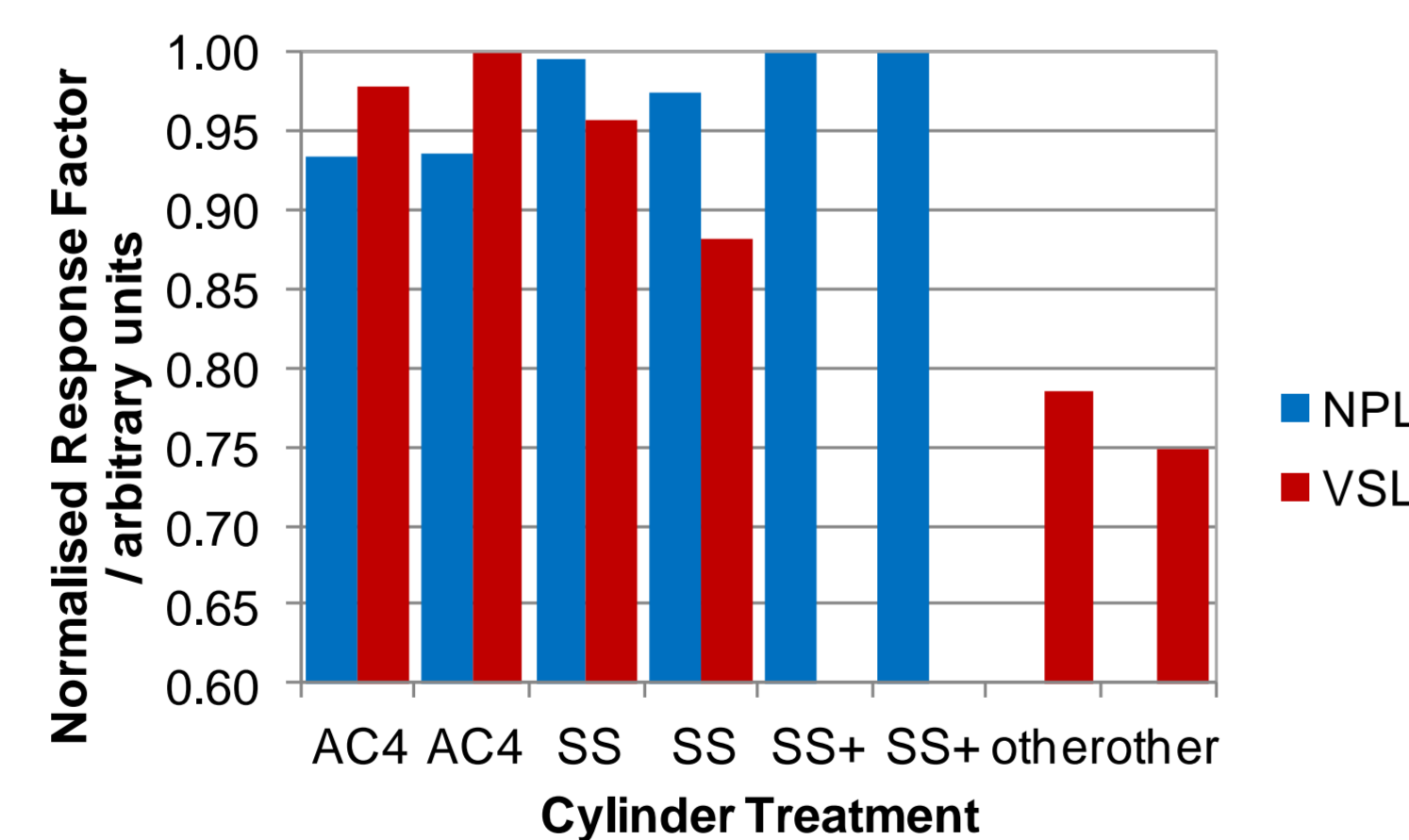
Why is now the time to improve ammonia metrology?

- Ammonia is a major pollutant, key to understanding ambient air quality including PM & atmospheric impacts on ecosystems
- The Executive Body to the UN Convention on Long-range Transboundary Air Pollution is due to adopt a guidance document on preventing and abating ammonia emissions from agricultural sources*
- Recent developments have occurred in the range and capability of spectroscopic instruments available for measurements
- Integration and intercomparability of low-cost low-temporal resolution ammonia measurements with high-cost high-temporal resolution
- There is a need to improve the metrology from standards at the ppm mixing ratios to concentrations more relevant to ambient atmospheric concentrations

*http://www.unece.org/fileadmin/DAM/env/documents/2014/AIR/EB/ECE_EB_AIR_2014_8_E.pdf

1. Gas calibration standards

- The partners from NPL and VSL have produced reference gas mixtures prepared by gravimetry at
 - 10 ppm
 - 100 ppm
- These mixtures are stored in different commercially available cylinders in order to test their long-term stability over the course of the project.
- Comparison is of individual cylinders at 10ppm ammonia in nitrogen to determine the best surface treatment for ammonia mixtures and to quantify absorption of ammonia on cylinder walls



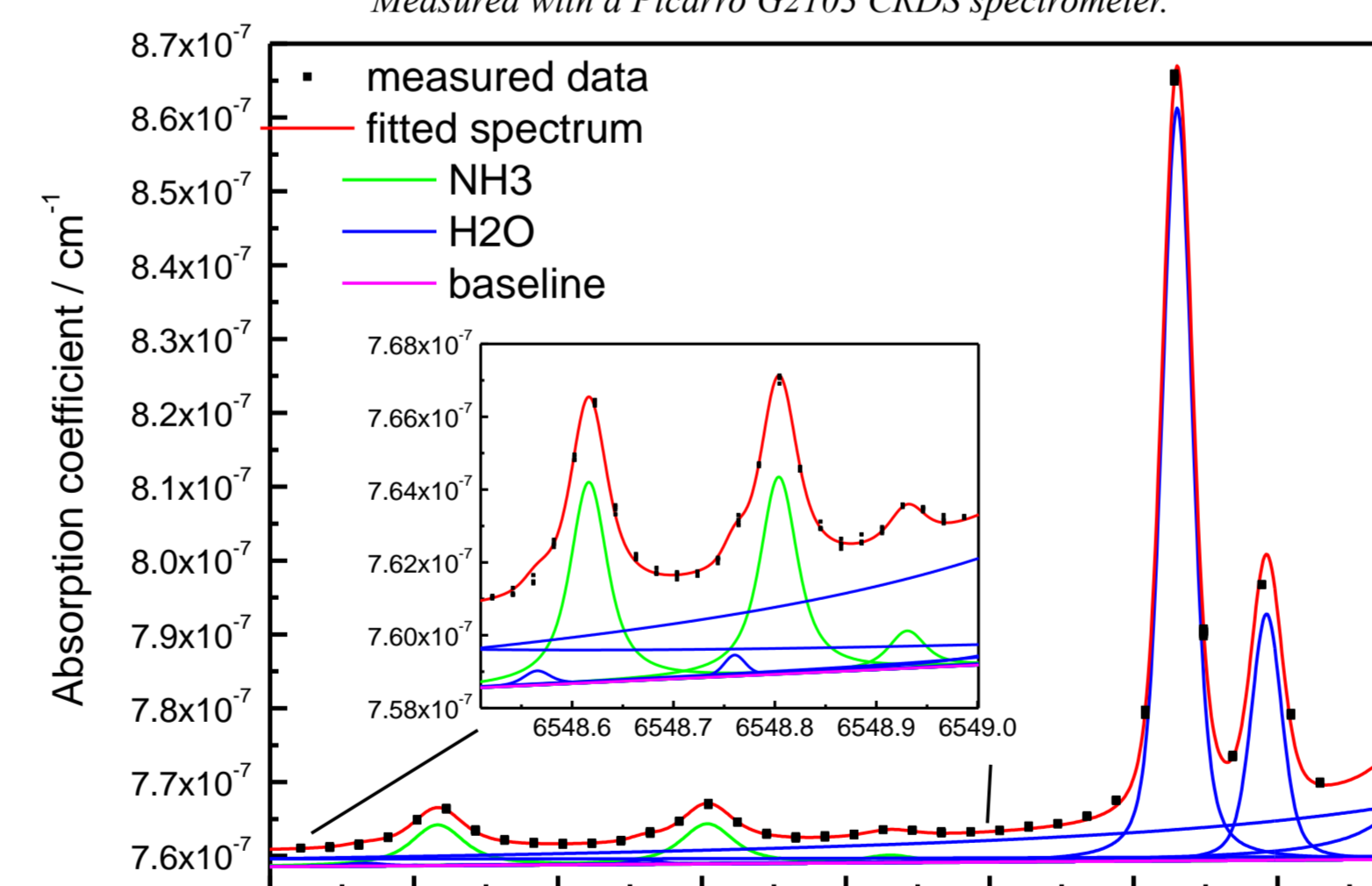
- Partners BAM and METAS have started working on two mobile generators for the dynamic generation of reference gas mixtures. These devices will generate & dilute NH₃ 0.5-500 ppb.
- Research on the adsorption of NH₃ on various material surfaces will commence involving the partners VSL and METAS together with CEH and UH



2. Optical spectrometric standards.

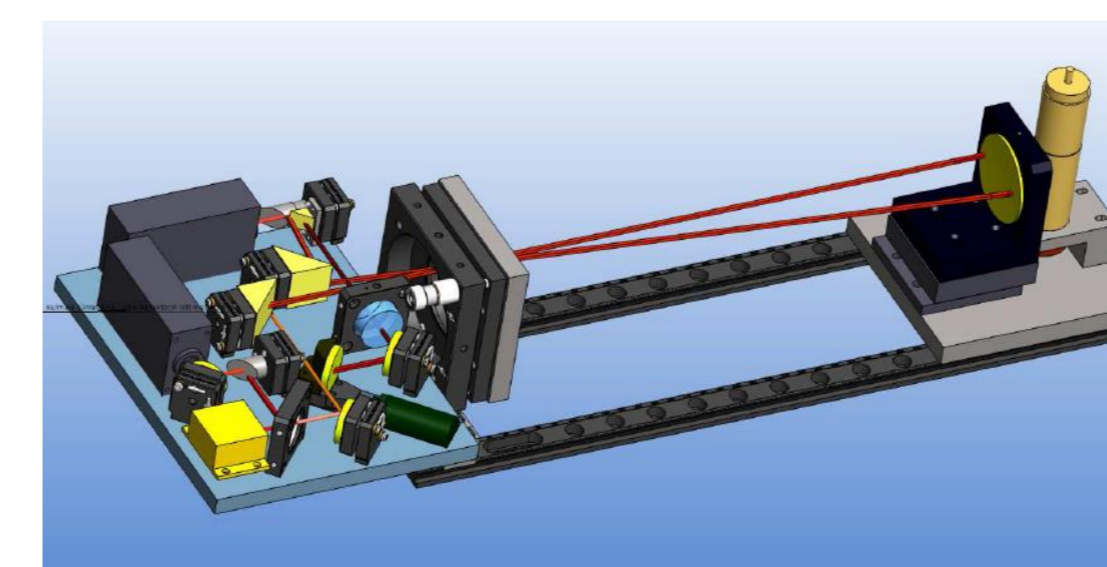
- Instrument technologies available include cavity ring-down, MIR quantum cascade laser, photoacoustic spectrometers
- Extractive cavity ring-down spectrometers (CRDS) from Picarro Inc. are being evaluated
- PTB and DFM began to evaluate the possibility of absolute operation of the spectrometers.

Measured and fitted spectrum and residuals in 100 nmol/mol NH₃ and 2% H₂O in synthetic air. Measured with a Picarro G2103 CRDS spectrometer.



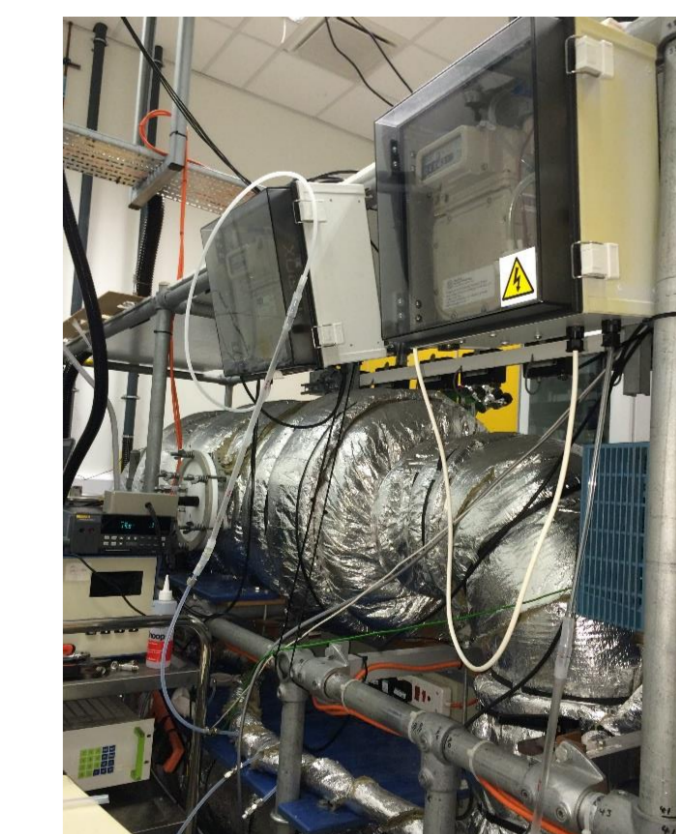
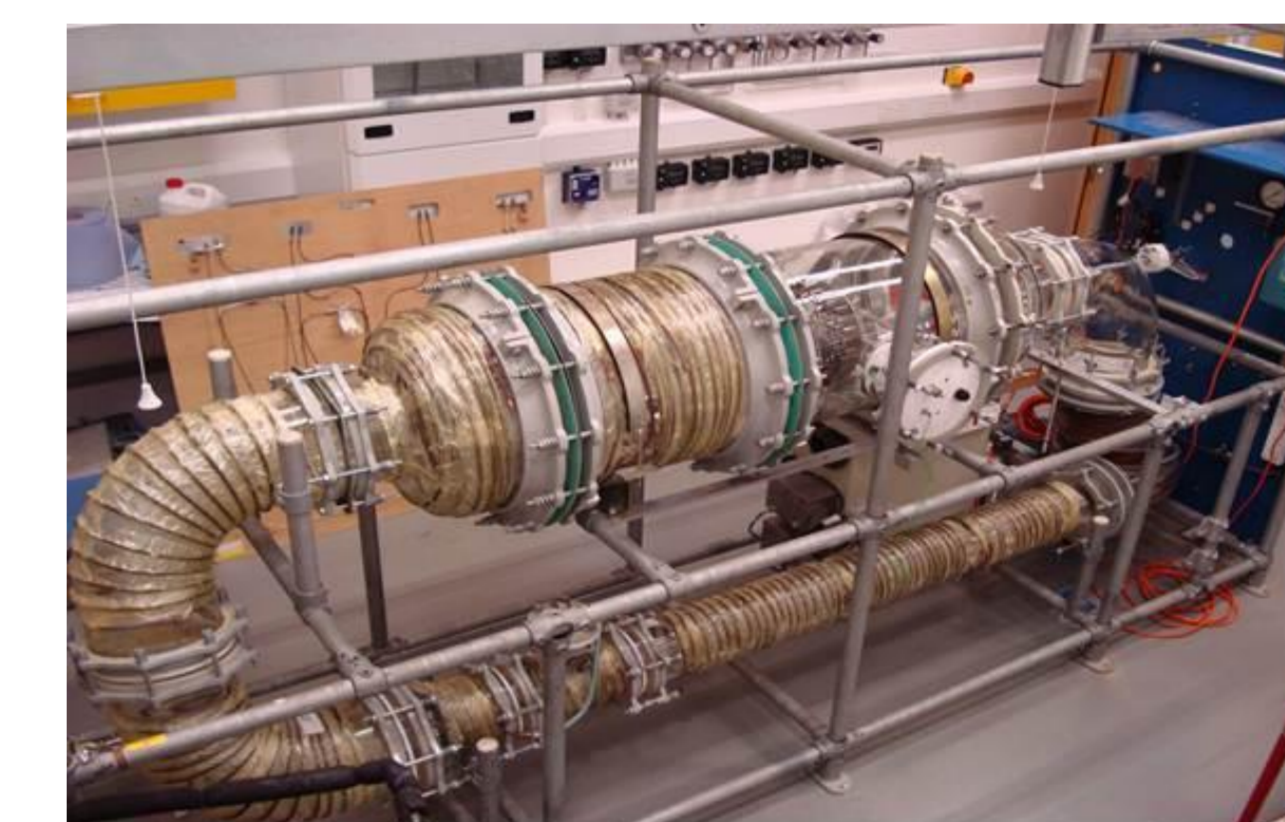
- H₂O, CO₂ and O₃ are potential spectrally interfering components
- the optimal wavelength range selected based on HITRAN2012 & the literature
- Testing of CRD instruments has started. Initial results show that water correction is challenging

- Design and assembly of a sampling-free spectrometer based on an open multiple-pass cell and a QCL has been started at MIKES.



3. Validation/Dissemination to field measurement techniques

- Development of two facilities has been started in order to characterise different ammonia analysers as well as passive samplers and denuders.
- The NPL Controlled Atmosphere Test Facility (CATFAC) is being tested for generating stable NH₃ concentration, under controlled T, RH and wind speed.
- the first ammonia test measurements and testing of a CRDS to minimise cross interference effects by water vapour.
- Testing of different designs of passive samplers and denuders is underway



- UBA has started the characterization of a Proficiency Test Facility for ammonia measurements.
- The proficiency test facility will be capable of providing 12 individual working places with well characterized test gas mixtures containing ammonia and common atmospheric trace gases with intercomparison planned for 2016
- NERC CEH is researching inlets for NH₃ and designing a mobile instrument-response testing system.

- Field intercomparison planned for Scotland in summer/autumn 2016.
- Contact chri2@ceh.ac.uk or sail@ceh.ac.uk if interested in participating