

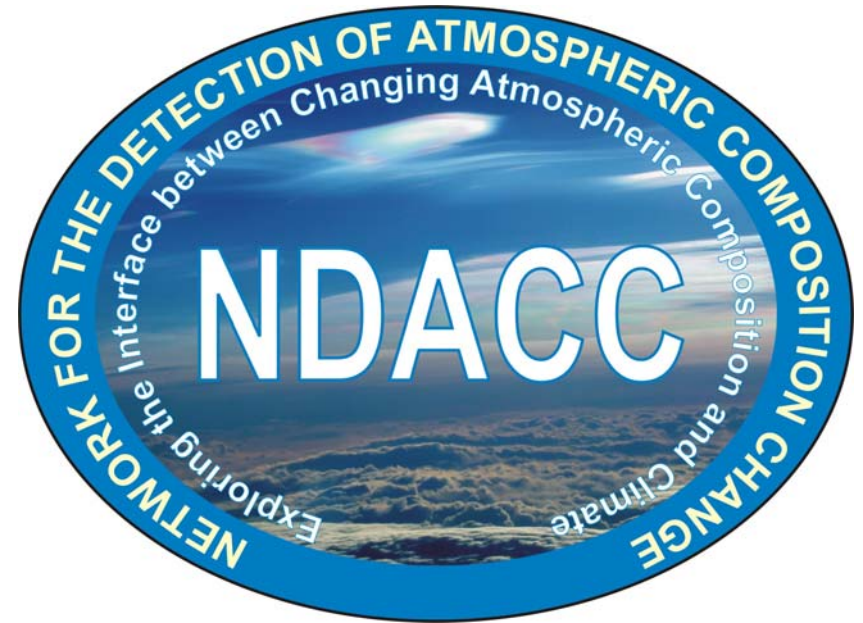
# A new UV spectroradiometer operating at the Arctic primary NDACC site of Ny Ålesund, Svalbard

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# Outline

- NDACC site Ny Ålesund
- UV measurements at Ny Ålesund: history
- Laboratory characterisation
- First results of field operation
- Further steps to NDACC certification



# NDACC primary station Ny Ålesund:



- LIDAR: Altitude profiles of different atmospheric components (e.g. ozone, water vapour, aerosols)
- FTIR-spectrometer: column densities of 20-30 atmospheric trace gases (e.g.  $O_3$ ,  $NO_2$ ,  $HNO_3$ ,  $ClONO_2$ , CFCs)
- RAM (Radiometer for atmospheric measurements): ozone, chlorine monoxide, water vapour
- DOAS: column densities of atmospheric trace gases in the UV and visible
- Ozone sondes: ozone profiles up to ca. 30 km



# NDACC site Ny Ålesund:



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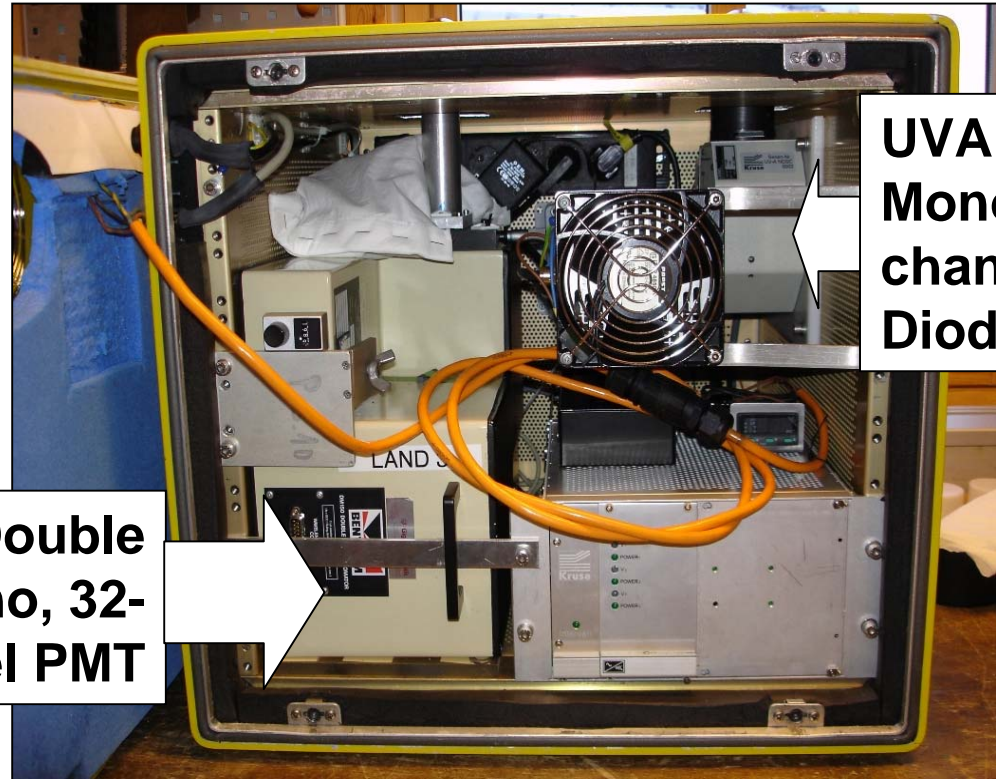


... and UV irradiance



# UV measurements at Ny Ålesund: history

- UVB irradiance since 1996
- UVA since 1999
- Data used for studies of UV effects on algae
- Does not comply with all NDACC requirements ☹️



**UVA: Single Mono, 256-channel Diode**

**UVB: Double Mono, 32-channel PMT**

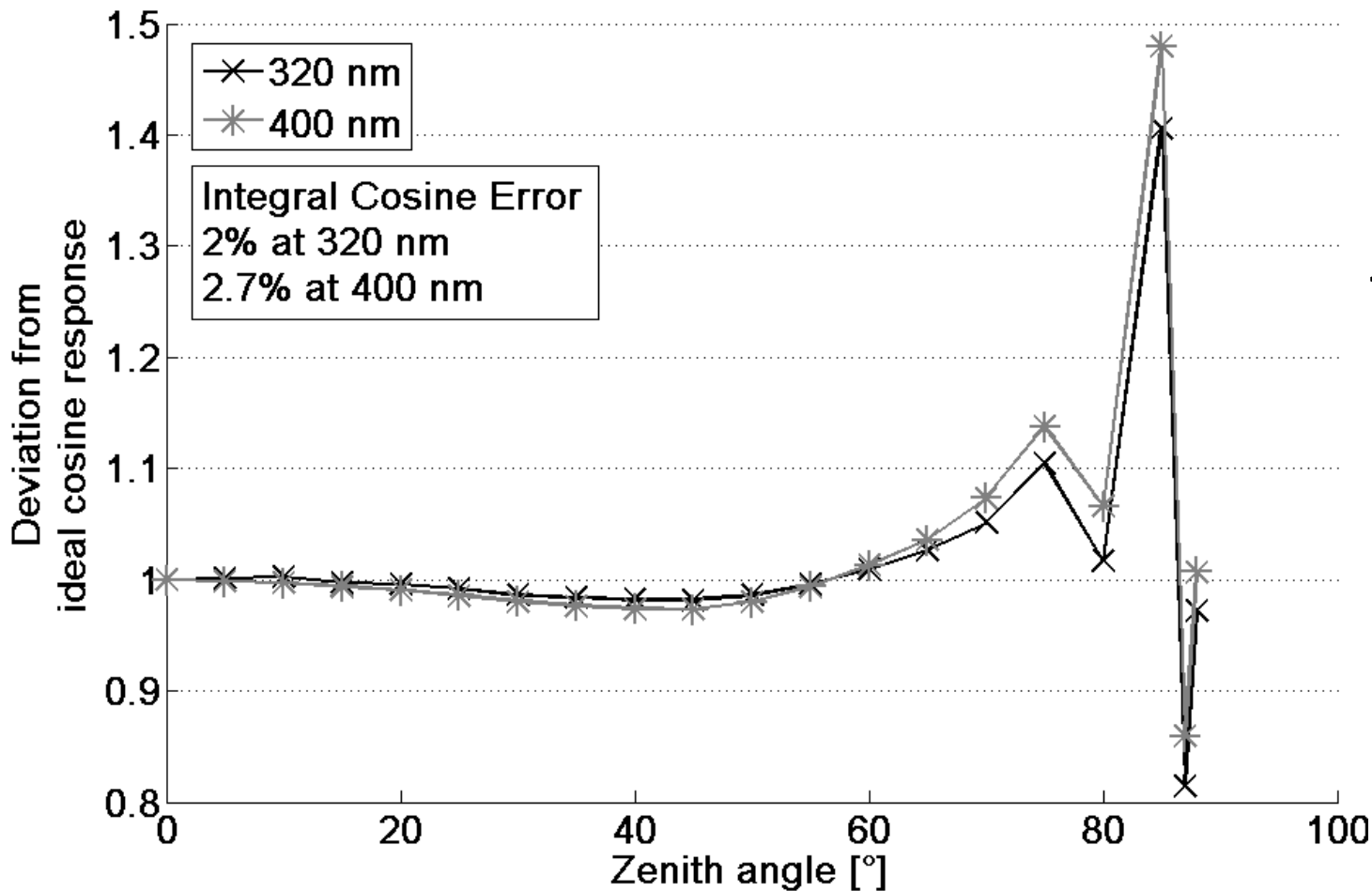


# New UV spectroradiometer

- Bentham DMc150
- Entrance and exit slit 0.56 mm, middle slit 1.48 mm
- Holographic reflection gratings with 2400 l/mm
- Entrance optics from CMS-Schreder, heated to 27°C
- Bi-alkali end window PMT
- Temperature stabilised to 20° C



# Lab characterization: Cosine response error

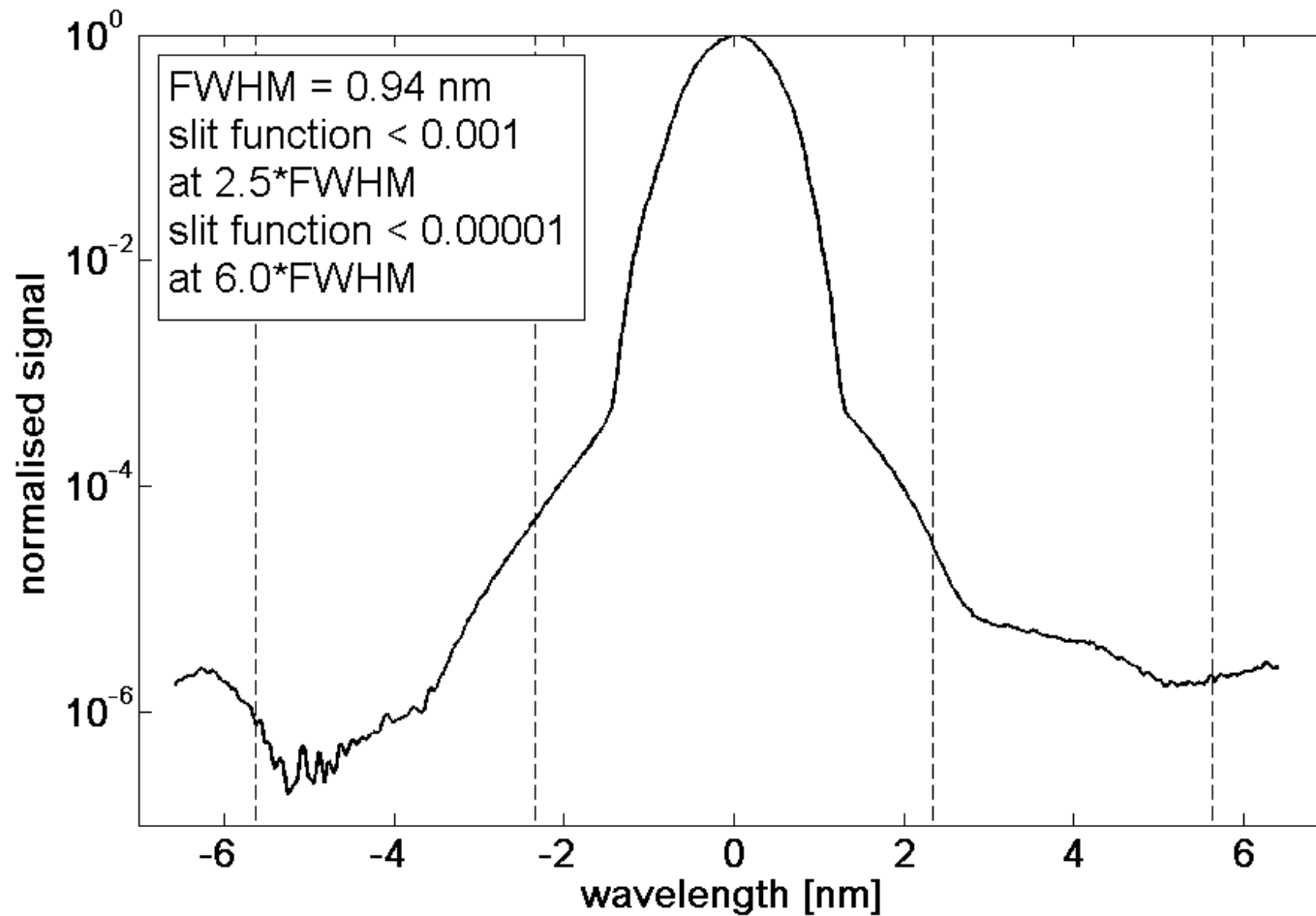


NDACC  
requirement:  
<  $\pm 5\%$  to isotropic  
irradiance, and  
for all angles  
<  $60^\circ$  from the  
zenith.

➤ **fulfilled**



# Lab characterization: Slit function



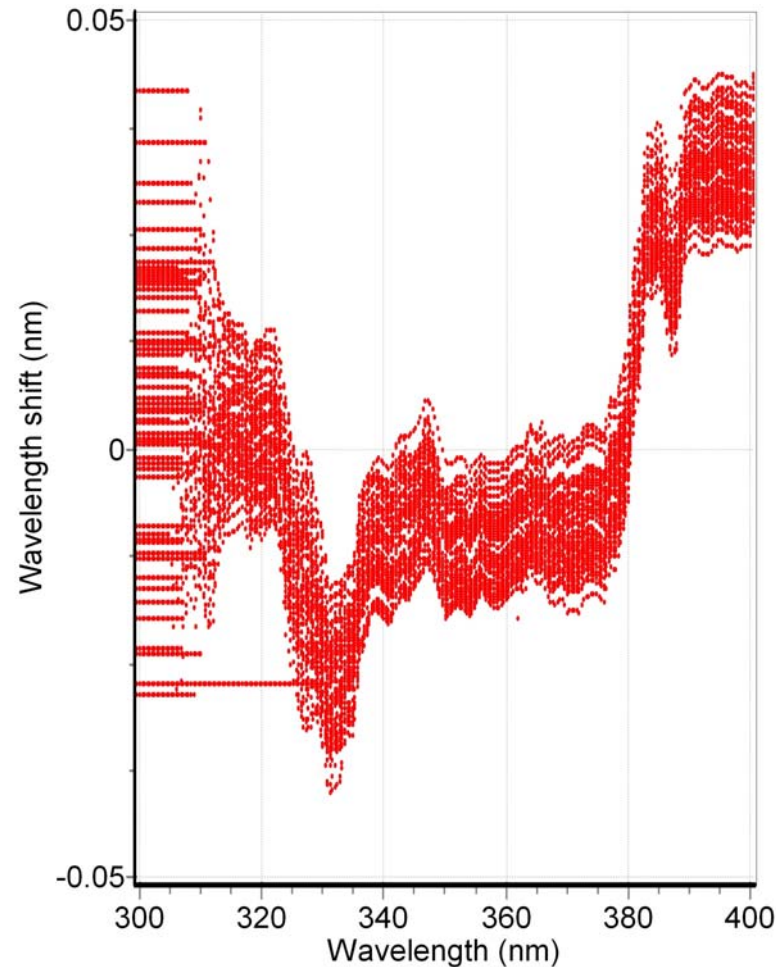
Measured line of a  
He-Cd laser  
NDACC

requirement:

- FWHM < 1 nm, **fulfilled**
- Stray light rejection: **fulfilled**



# Field characterization: Wavelength alignment

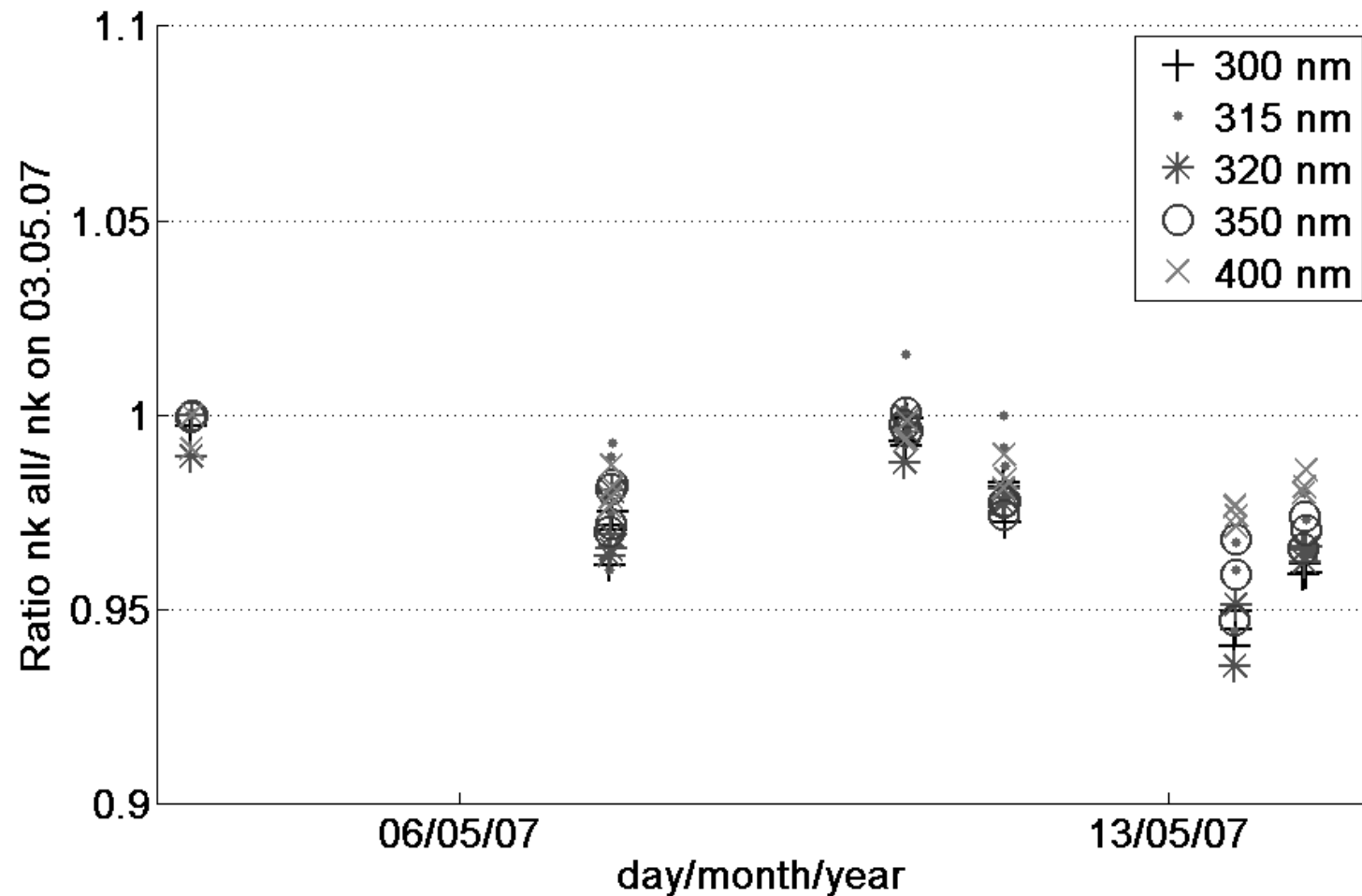


Spectral wavelength shift on 9 May 07

- Requirement of wavelength precision  $< \pm 0.03$  nm is **fulfilled**
- Requirement of absolute wavelength accuracy  $< \pm 0.05$  nm is **fulfilled**



# Field characterization: Radiometric stability



Within +2%  
and -7%  
for all  
wavelengths



## NDACC specifications: overview

Quantity	Quality	fulfilled
Cosine response error	< $\pm 5\%$ to isotropic irradiance, and for all angles < $60^\circ$ from the zenith	yes
Minimum spectral range	> 290 – 400 nm	yes
Band width (FWHM)	< 1 nm	yes
Wavelength alignment	< $\pm 0.03$ nm (precision) < $\pm 0.05$ nm (absolute accuracy)	yes
Slit function	< $10^{-3}$ of max 2.5 x FWHM from line centre < $10^{-5}$ of max 6.0 x FWHM from line centre	yes
Saturation threshold	> $1.5 \text{ W m}^{-2} \text{ nm}^{-1}$ (noon max at 400 nm)	yes
Sampling step interval	< 0.5 x FWHM	yes
Detection threshold	< $10^{-6} \text{ W m}^{-2} \text{ nm}^{-1}$ (for S/N =1 at 1 nm FWHM)	to do
Scan time	< 10 minutes	yes
Overall calibration accuracy	< 5% unless limited by threshold	to do
Stray light	As defined by detection threshold	yes
Temperature	Monitored, & with stability sufficient to maintain overall stability (typical T-stability < $\pm 2$ K)	yes
Scan date and time	Recorded with each spectrum (so that timing is known to within $\pm 10$ s at each wavelength)	yes
Diffuse/direct measurements	Capability of distinguishing each component	yes

# Simultaneous measurements



➤ Old and new spectroradiometer are operating simultaneously

➤ Detailed comparison: planned for 2008



# Progress

- Mai 2007: Beginn of maternal leave
- Filomena born on 15 June 2007 ☺
- Only little progress since then due to other duties...
- Planned to get back to work in May 2008, then...



# Remaining tasks



- Routine operation of UV spectroradiometer at Ny Ålesund
- Automation of QC routines
- Intercomparison to a NDACC certified instrument



New UV spectroradiometer at NDACC site Ny Ålesund, Sigrid Wuttke, 18 Sep 2007

Thank you

