

# N<sub>2</sub>O- and CO-measurements during DEEPWAVE 2014

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# The instrument - UMAQS



**Time resolution : 3 Hz**

**Assumption:**

Groundspeed of aircraft: 200 m/s

UMAQS can resolve atmospheric gradients on a scale  $< 66$  m

# The instrument - UMAQS



## Noise:

N<sub>2</sub>O: ~ 0.28 ppbv

CO: ~ 1.04 ppbv

## Drift:

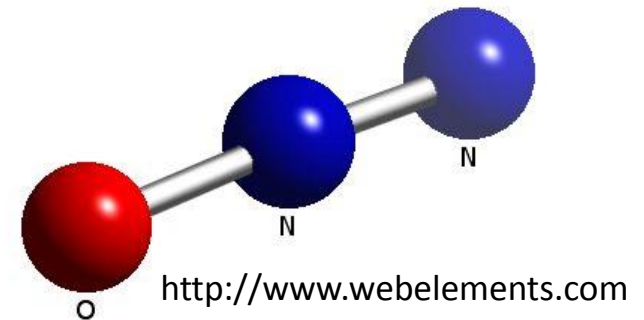
N<sub>2</sub>O: ~ 0.18 ppbv

CO: ~ 0.55 ppbv

## N<sub>2</sub>O:

- Sources in the troposphere (e.g. soils, wetlands, biomass burning, industrial exhausts).
- Sink in the stratosphere (photolysis and reaction with electronically-excited oxygen atoms O(1D) in the stratosphere)
- Lifetime in the stratosphere  $\approx$  100 years

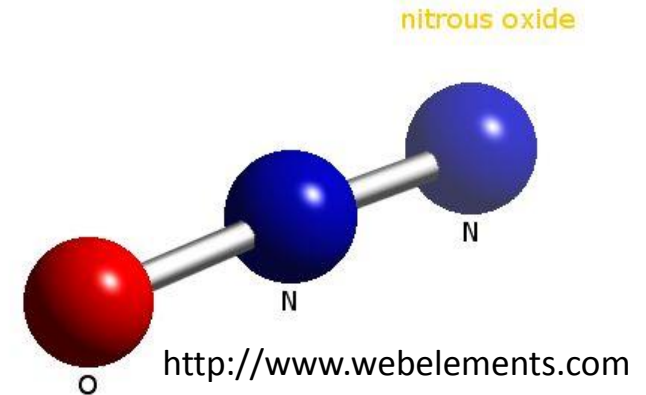
nitrous oxide



# N<sub>2</sub>O / CO - measurements

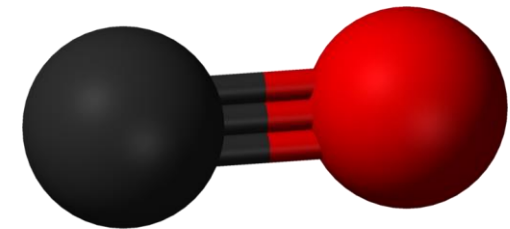
## N<sub>2</sub>O:

- Sources in the troposphere (e.g. soils, wetlands, biomass burning, industrial exhausts).
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- Lifetime in the stratosphere  $\approx$  100 years



## CO:

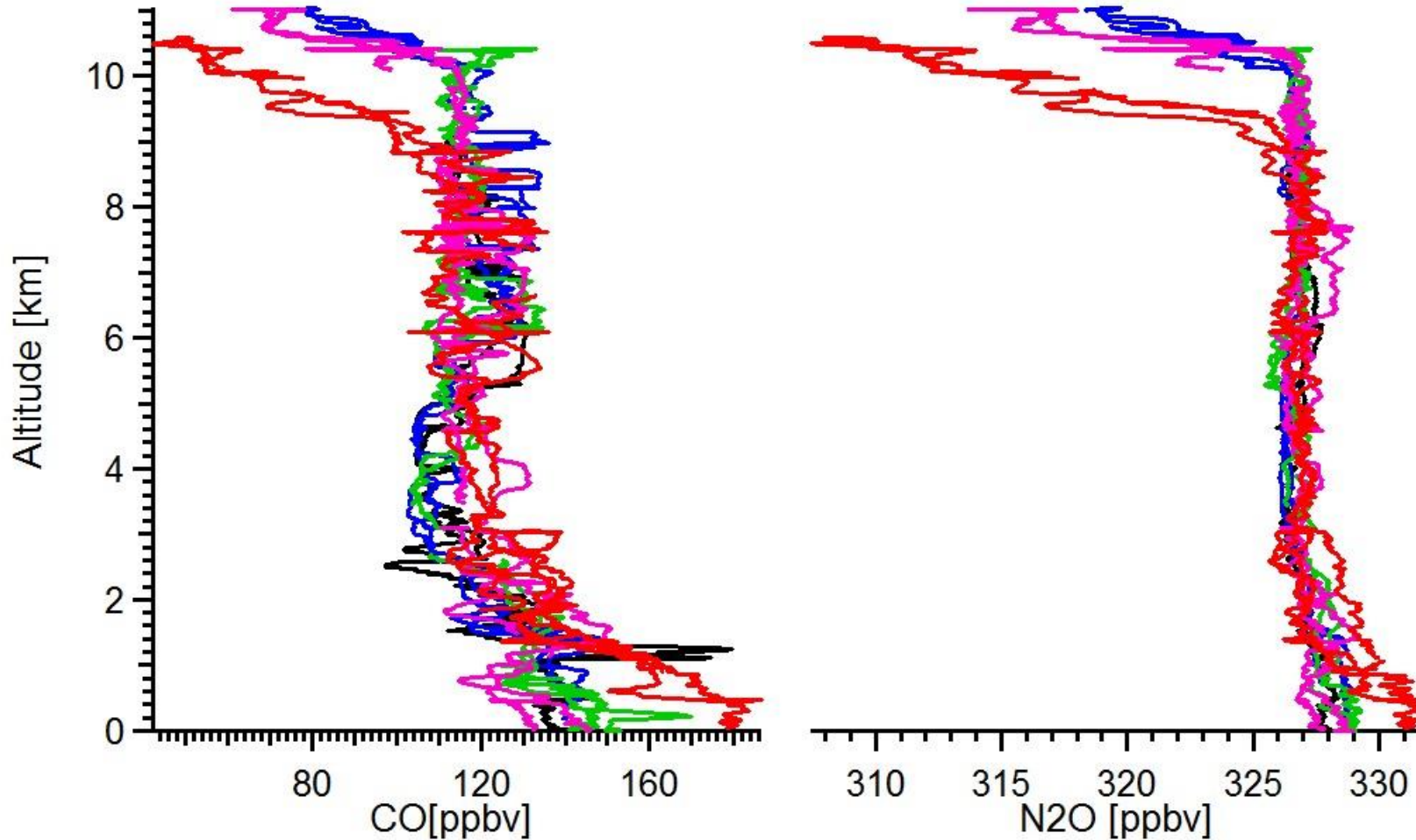
- Sources in the troposphere are (mainly) combustion processes and the oxidation of methane and higher hydrocarbons
- Sink: Reaction of CO with OH. Source in the stratosphere: Oxidation of methane by OH.
- In the stratosphere sink way more effective than source!
- Lifetime: weeks to months



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# N<sub>2</sub>O / CO - measurements

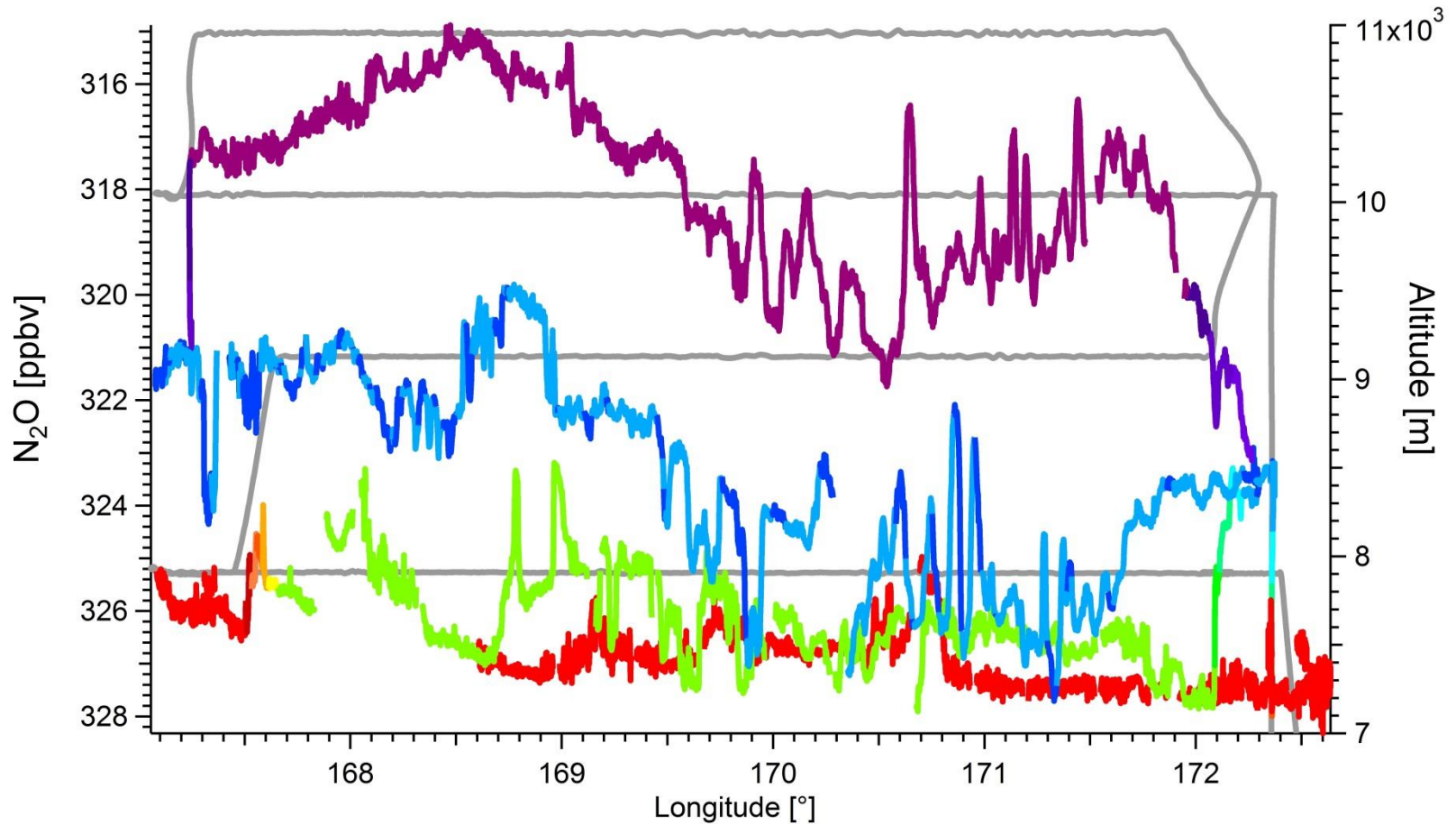
N<sub>2</sub>O- and CO-Profiles during AIRTROSS 2013





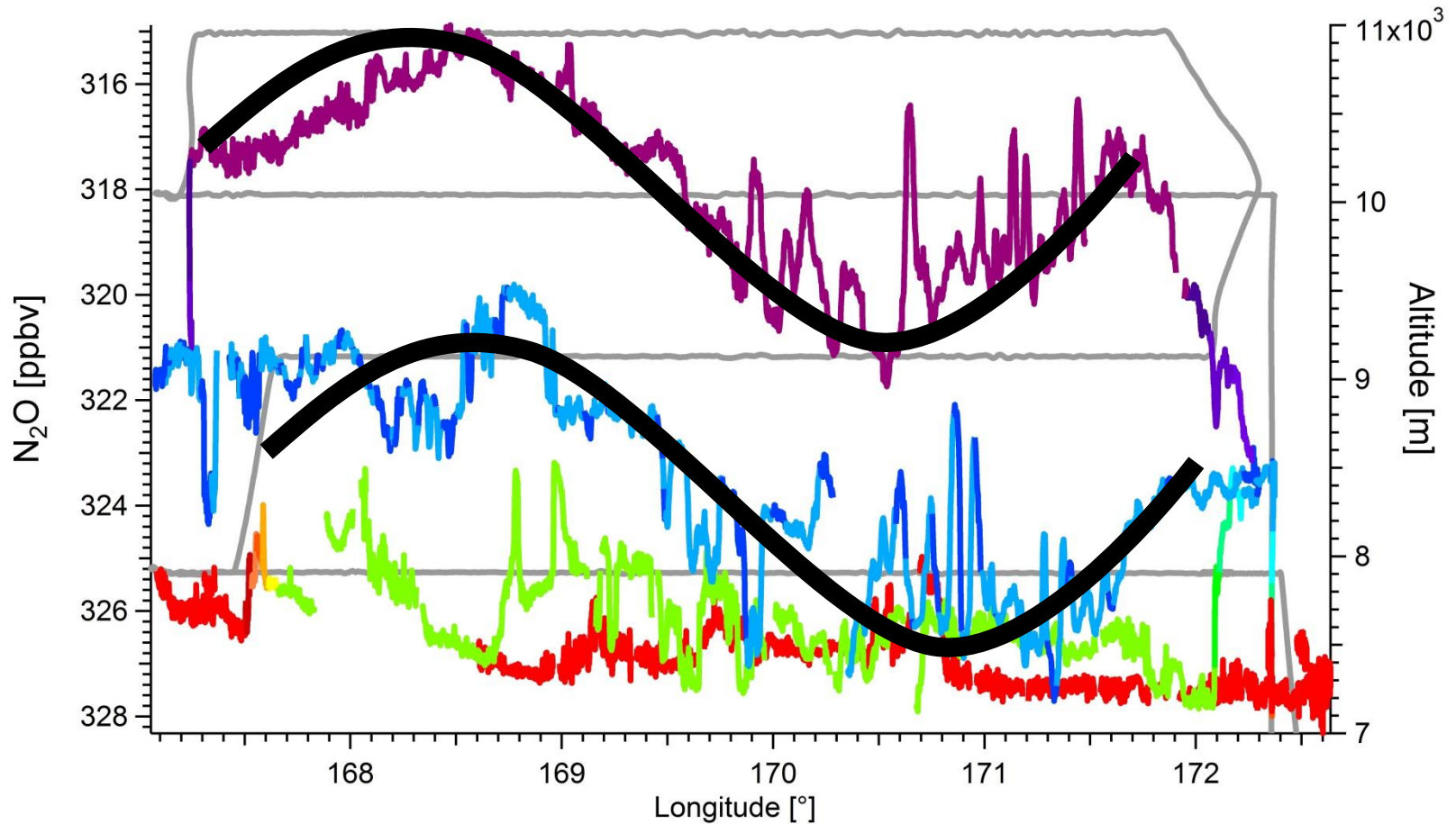


## RF-F-01



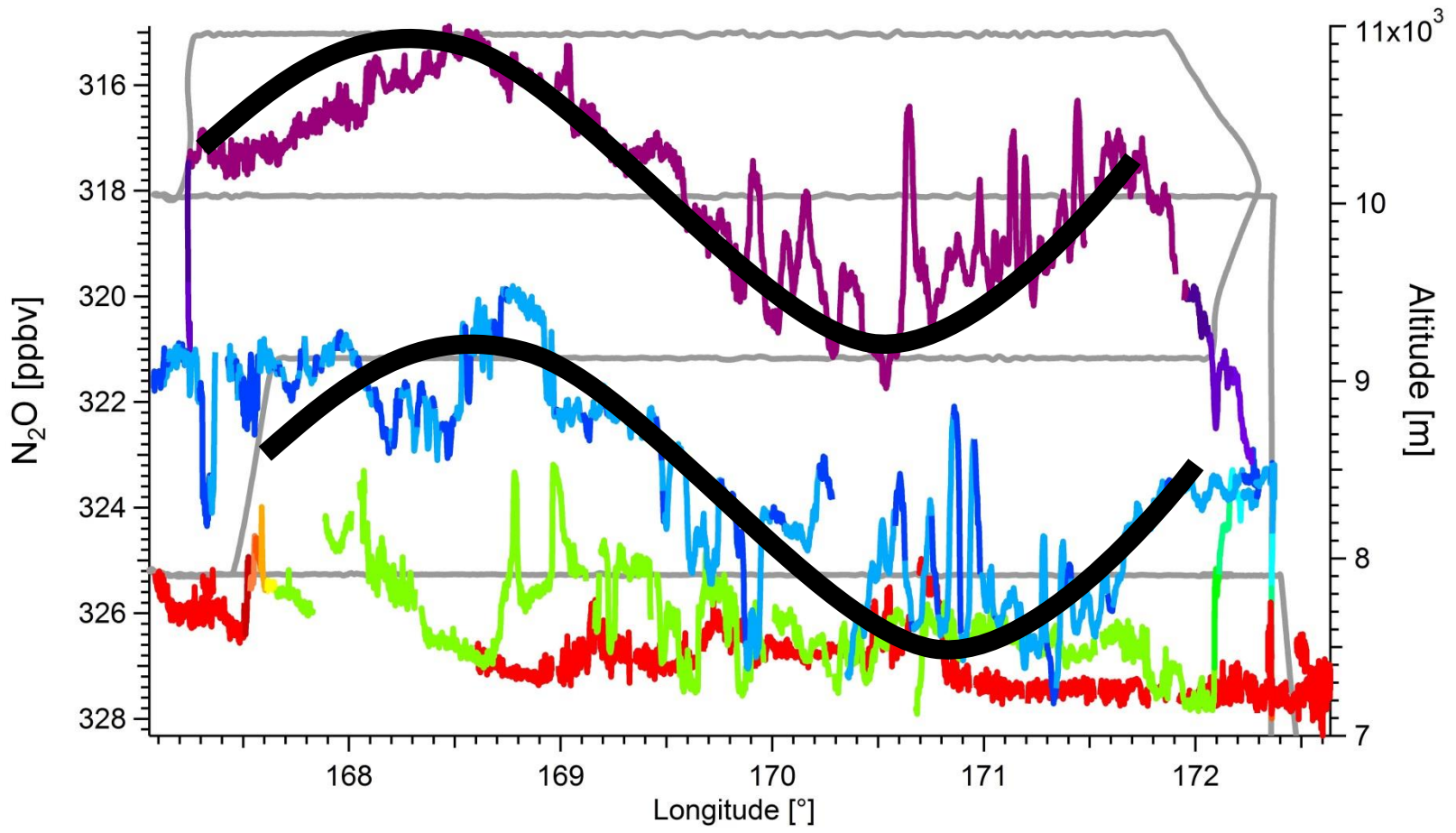


## RF-F-01



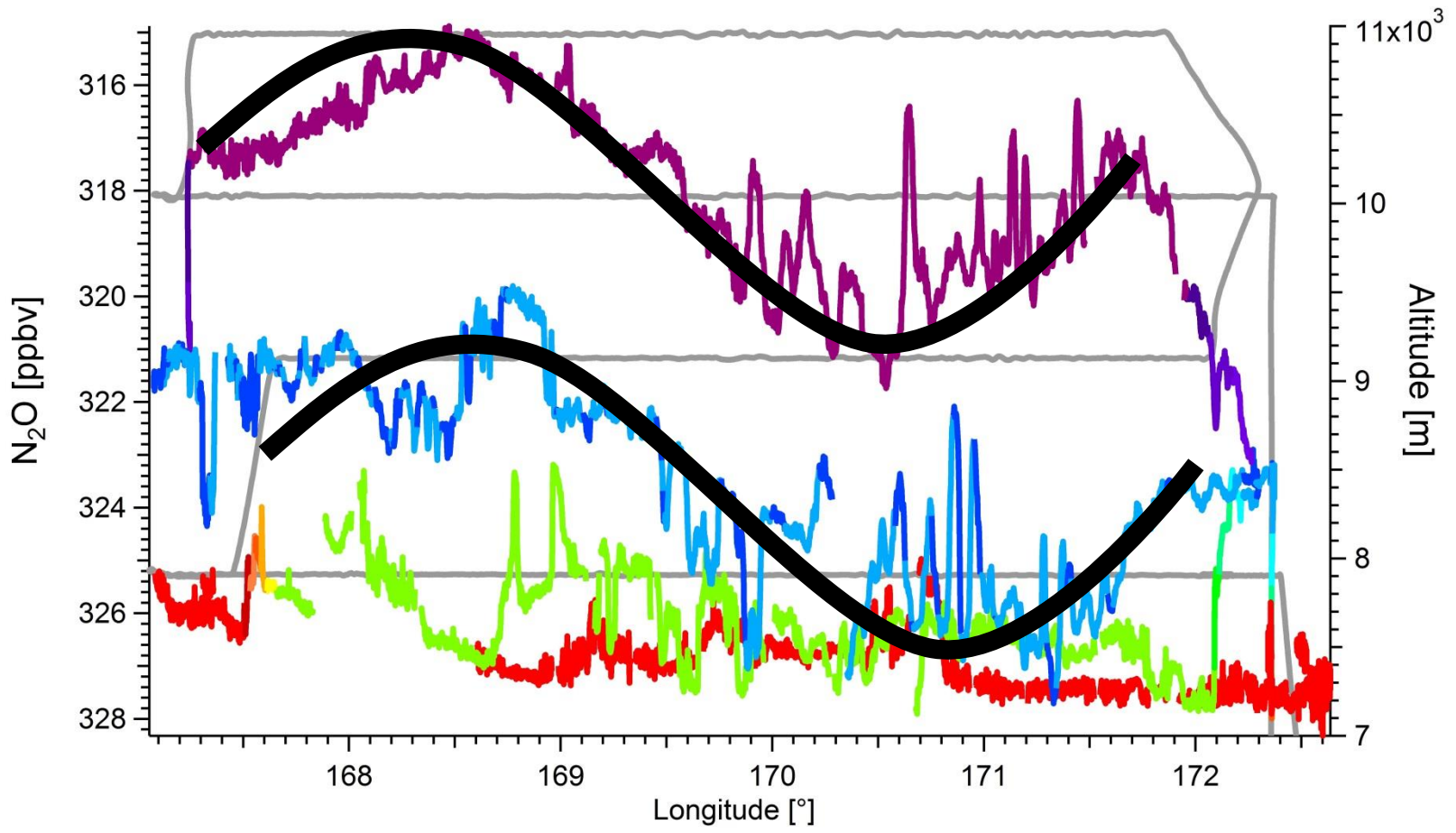
## RF-F-01

## Wavelength $\approx 500$ km

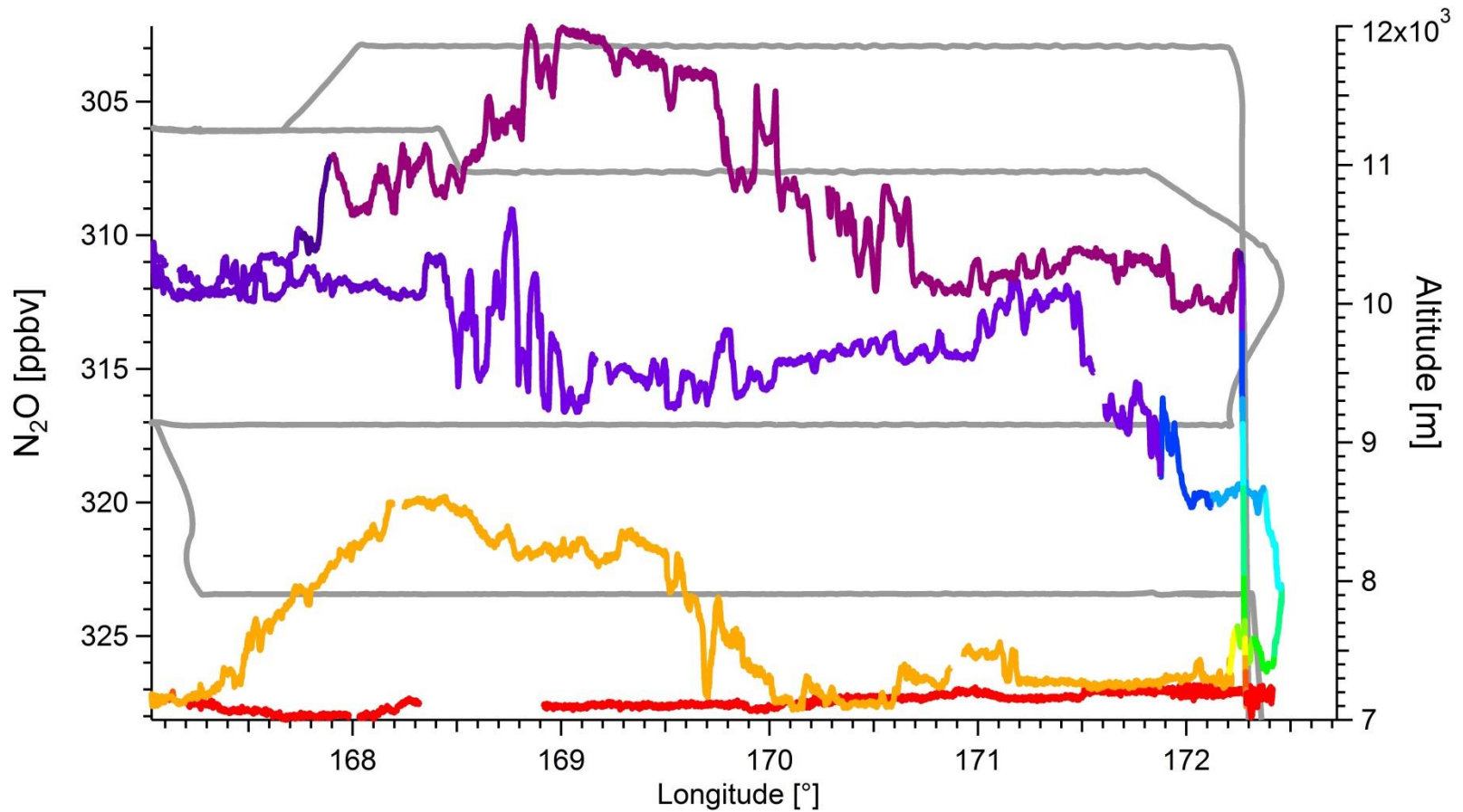


## RF-F-01

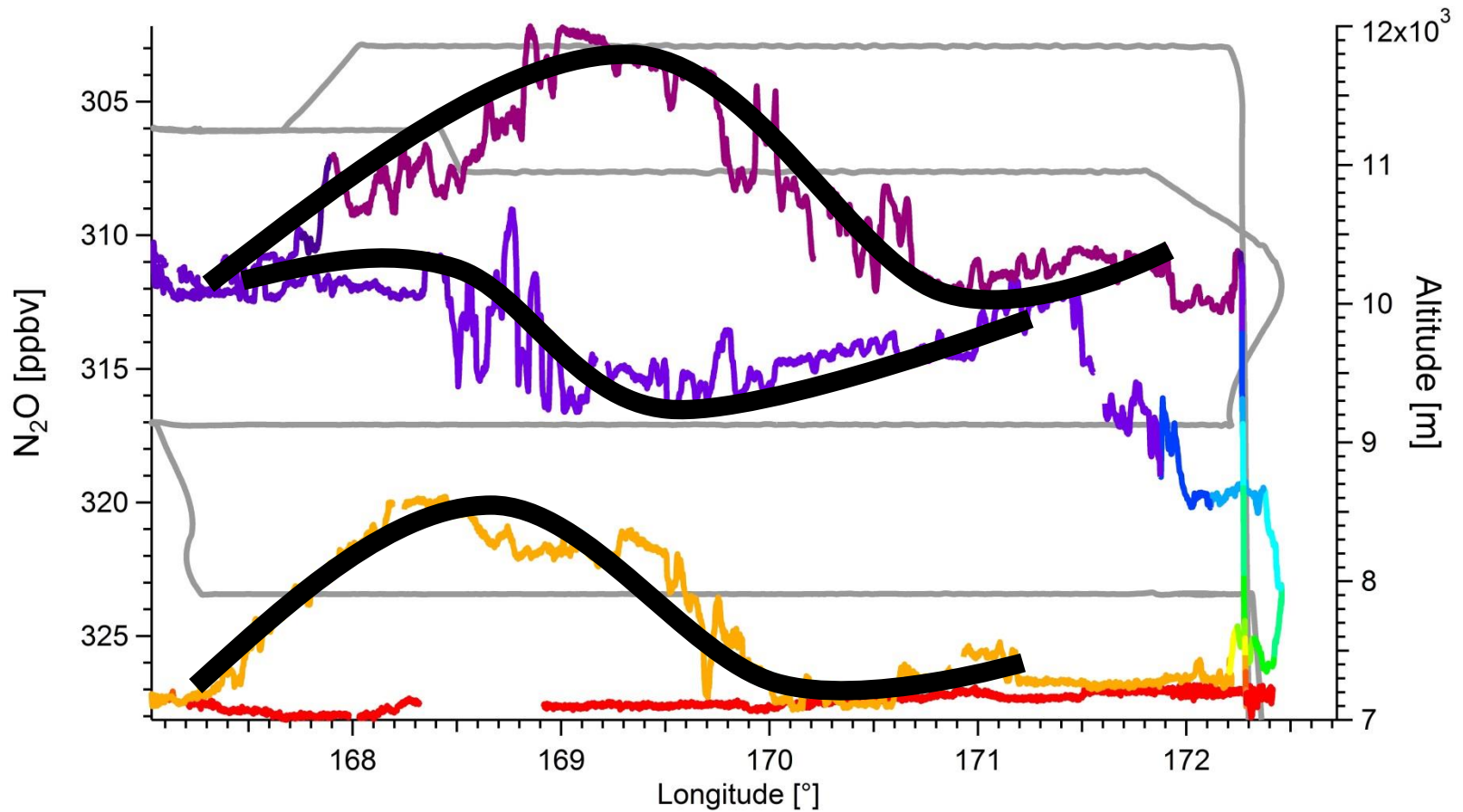
## Amplitude $\approx 500$ m



## RF-F-02



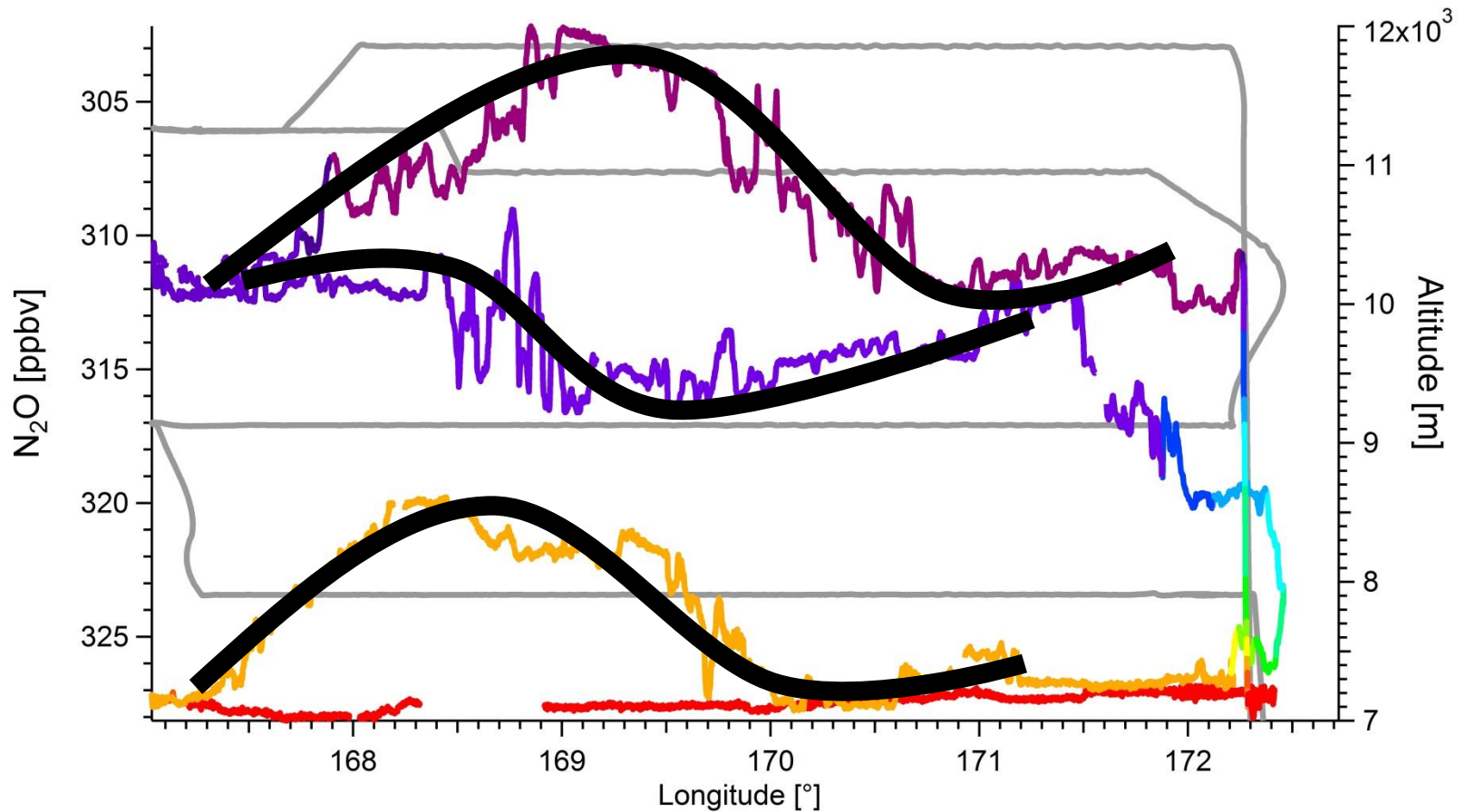
## RF-F-02





## RF-F-02

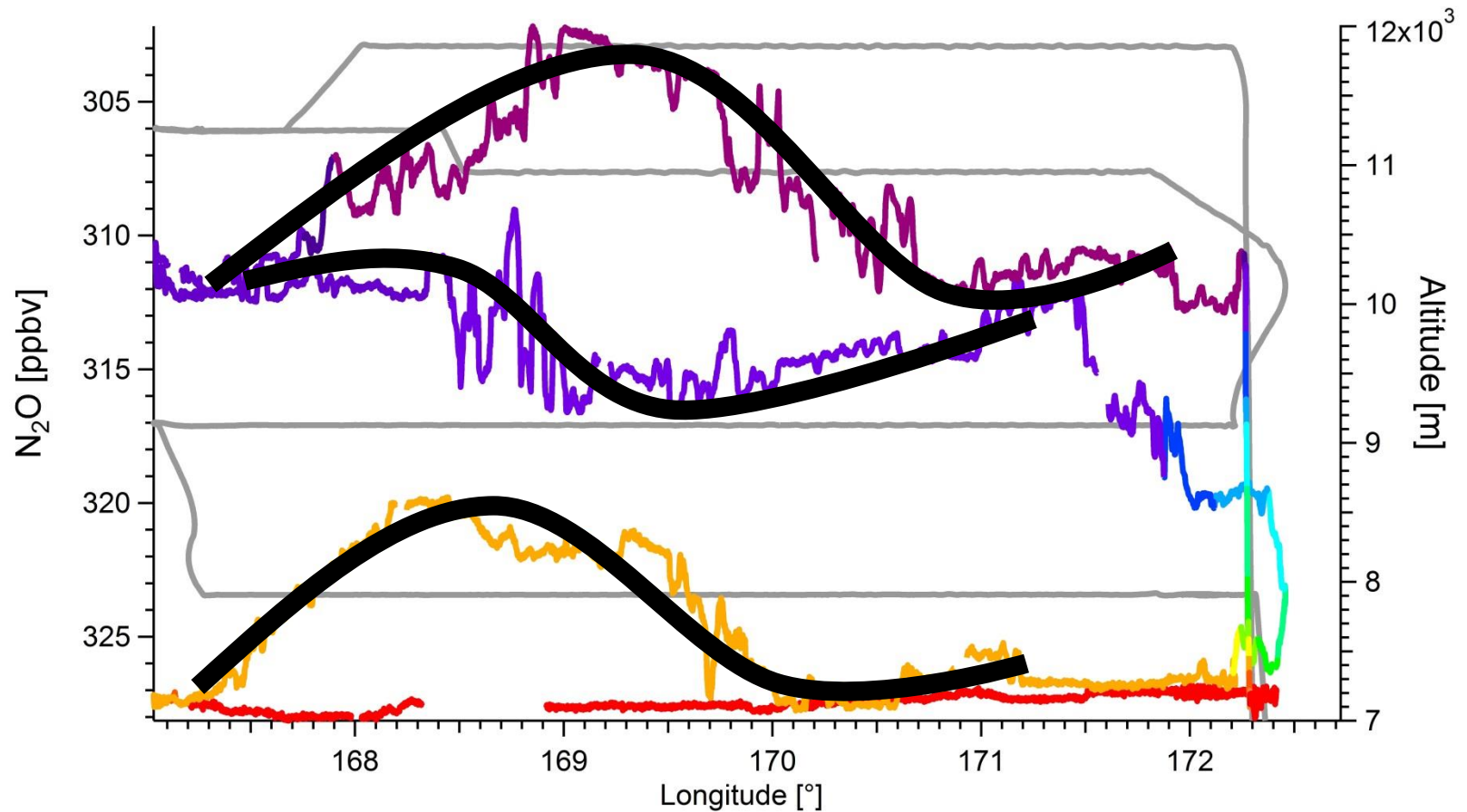
## Wavelength $\approx 500$ km





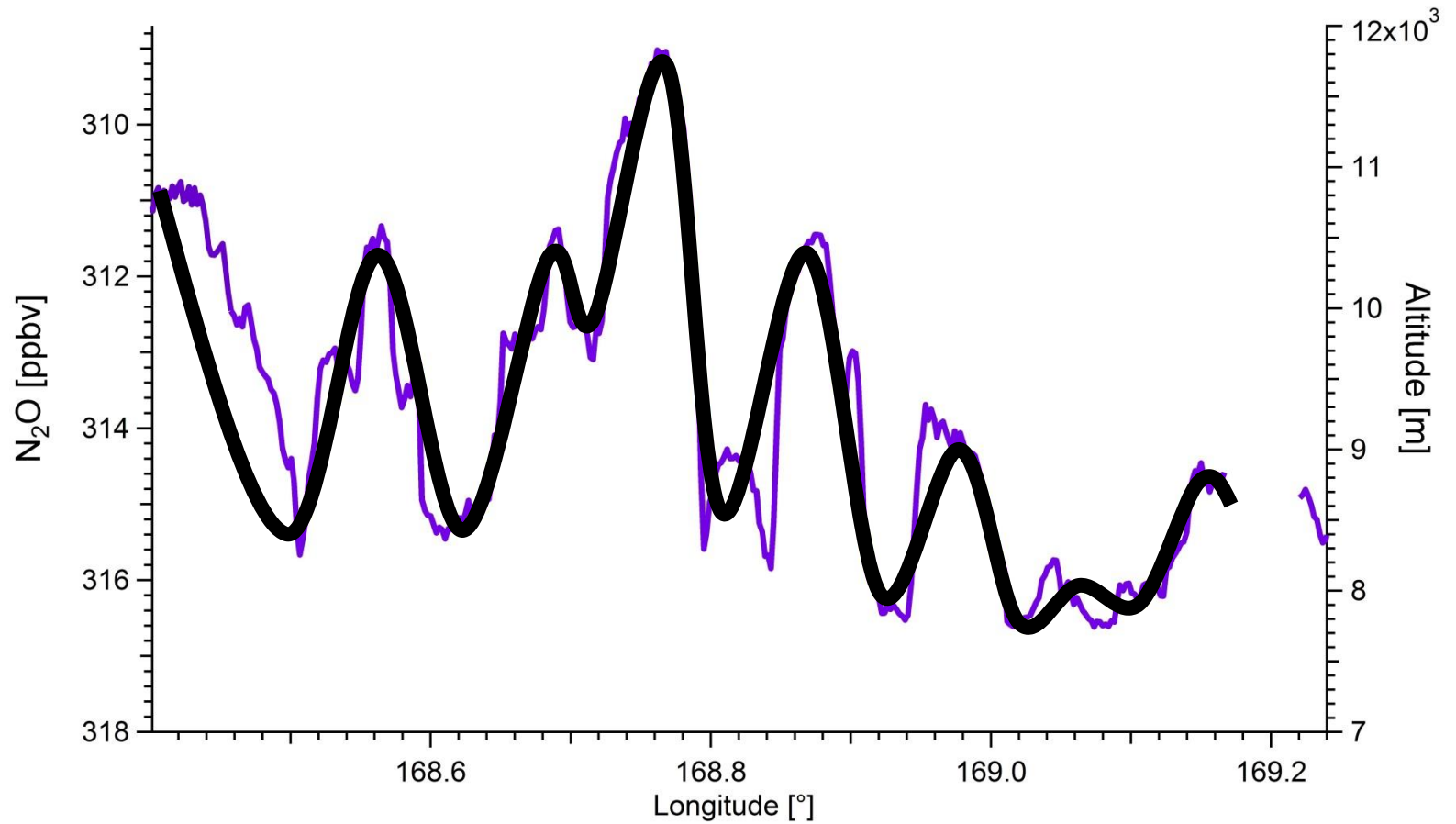
## RF-F-02

## Amplitude $\approx 500$ m

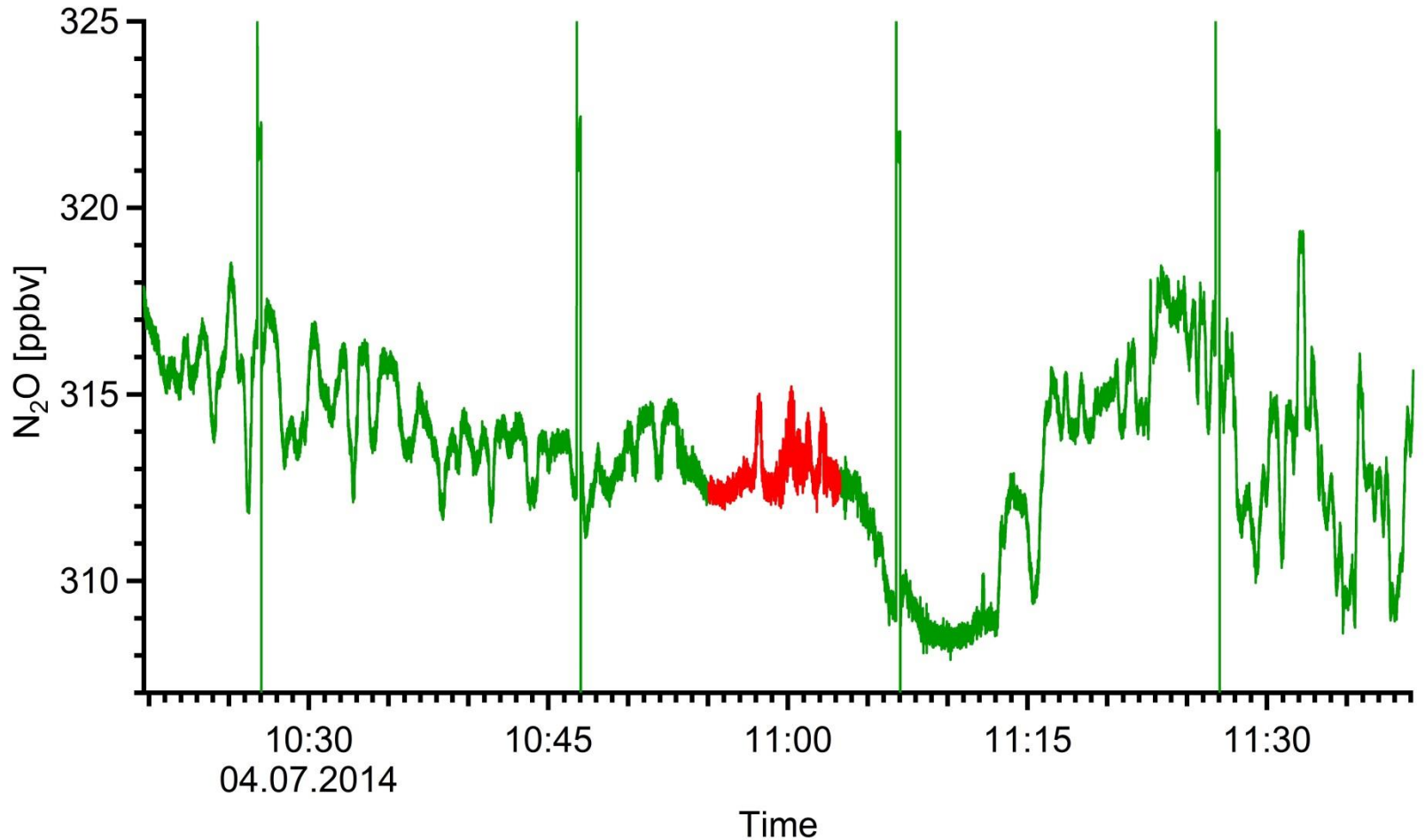


## RF-F-02

## Wavelength $\approx 12$ km

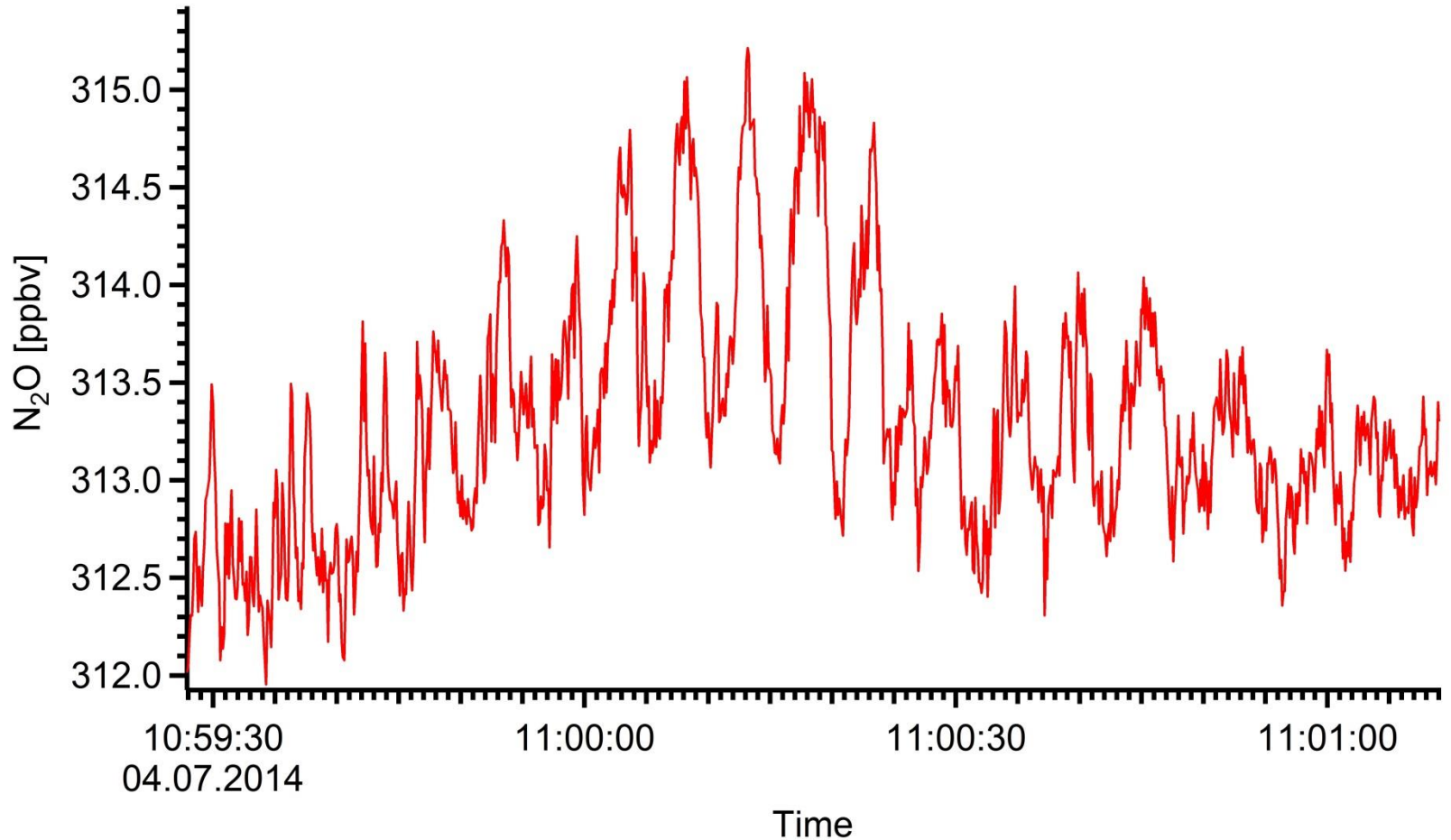


## RF-F-04



## RF-F-04

## Wavelength $\approx 800$ m



## Scientific issues:

- **Amplitudes and wavelengths**
- **Orographic vs. jetstream induced GW**
- **Phase relation of vertical wind and trace gases**
- **Trace gas „fluxes“ / mixing**
- **Turbulence**