

# Radiosonde Descent Data: Quality and Next Steps

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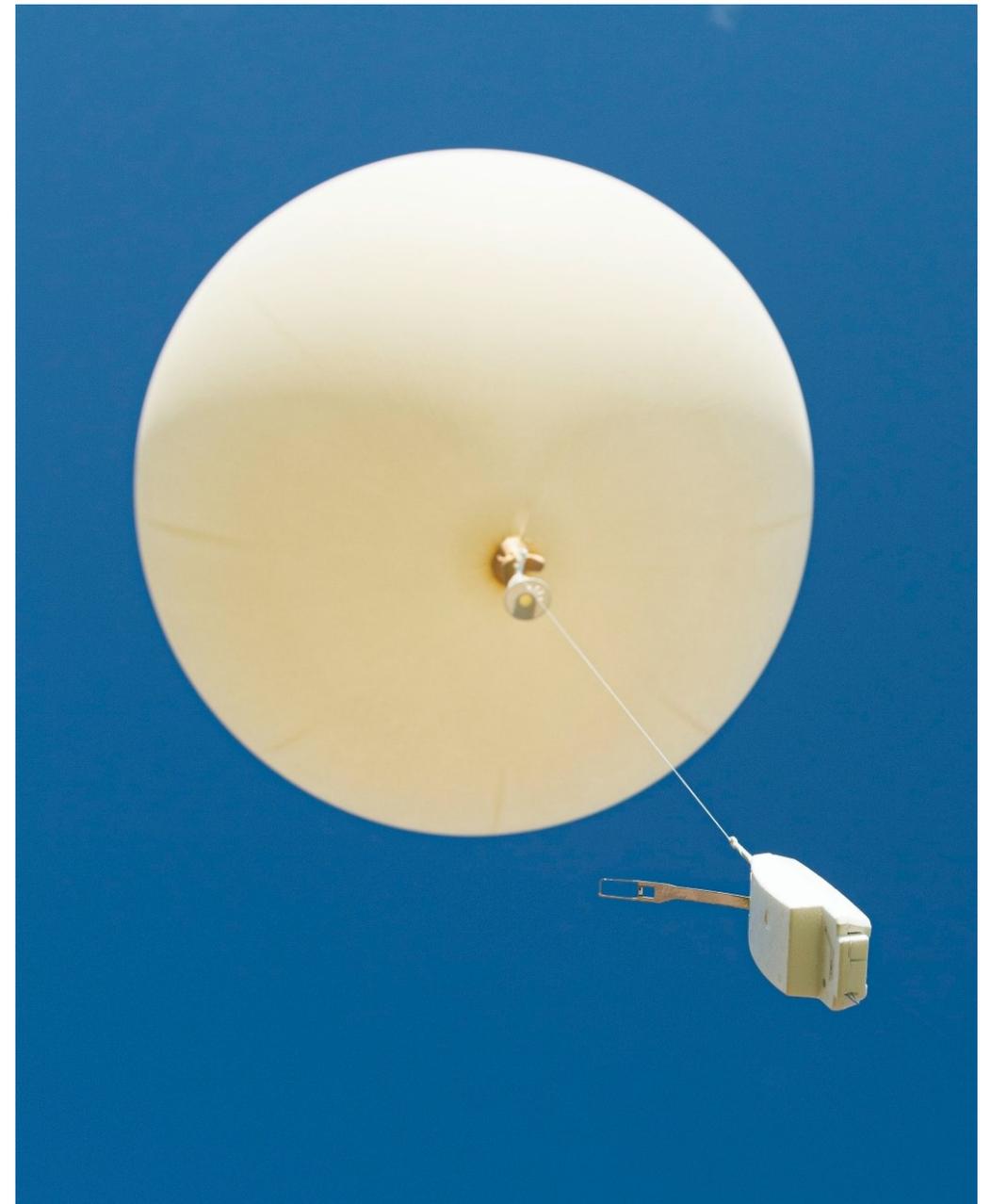
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# Agenda

- Introduction
- Characteristics of ascent and descent radiosonde data
- Data formats
- Comparison between ascent and descent data
- Summary

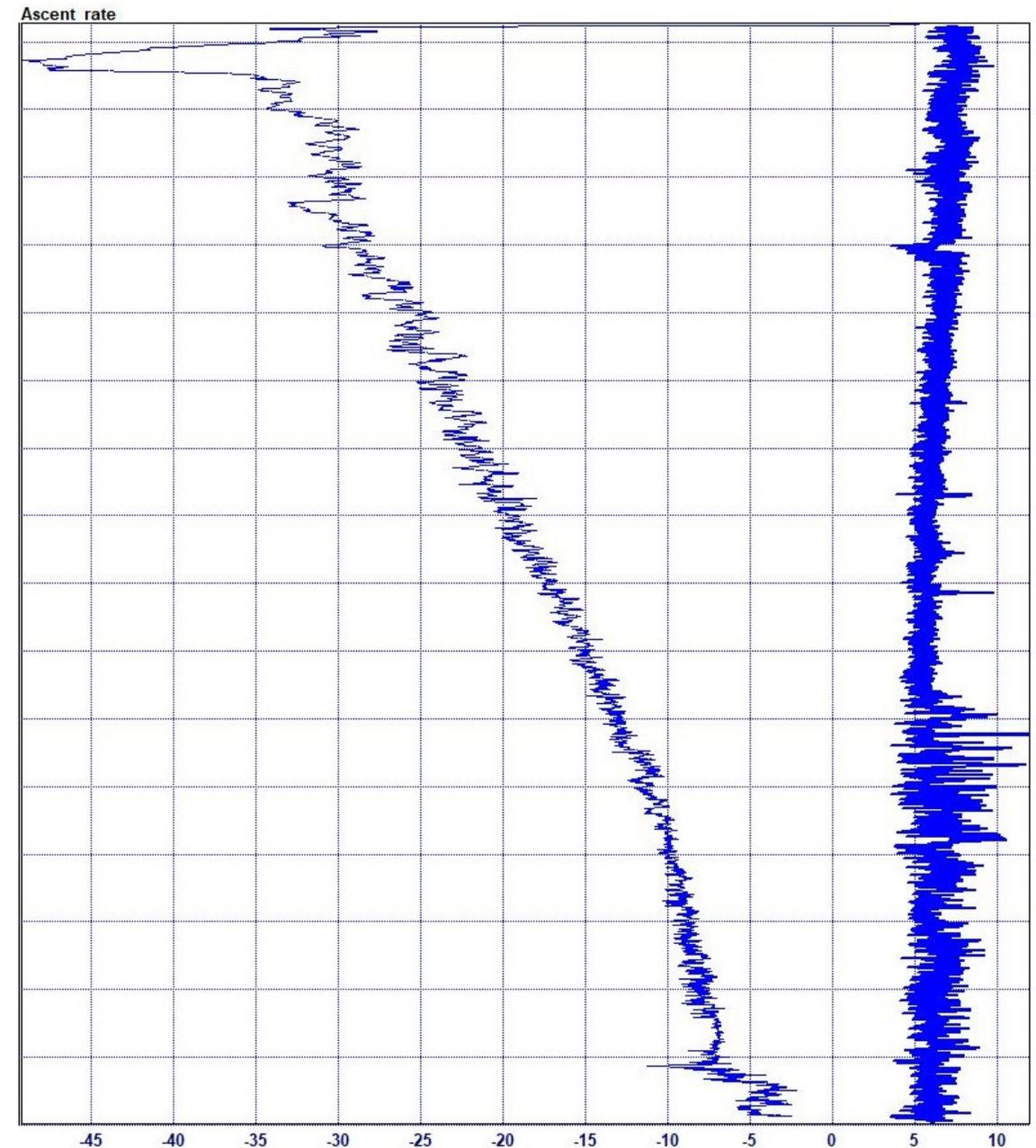
# Ascent Sounding Characteristics

- Manual or automatic launches at 00/12 UTC
- Balloon size 200-1200g
- Ascent rate 5-6 m/s
- Radiosonde connected with a string to a balloon/parachute
  - Periodic pendulum motion
- Can fly up to 38 km altitude and distances up to 350 km



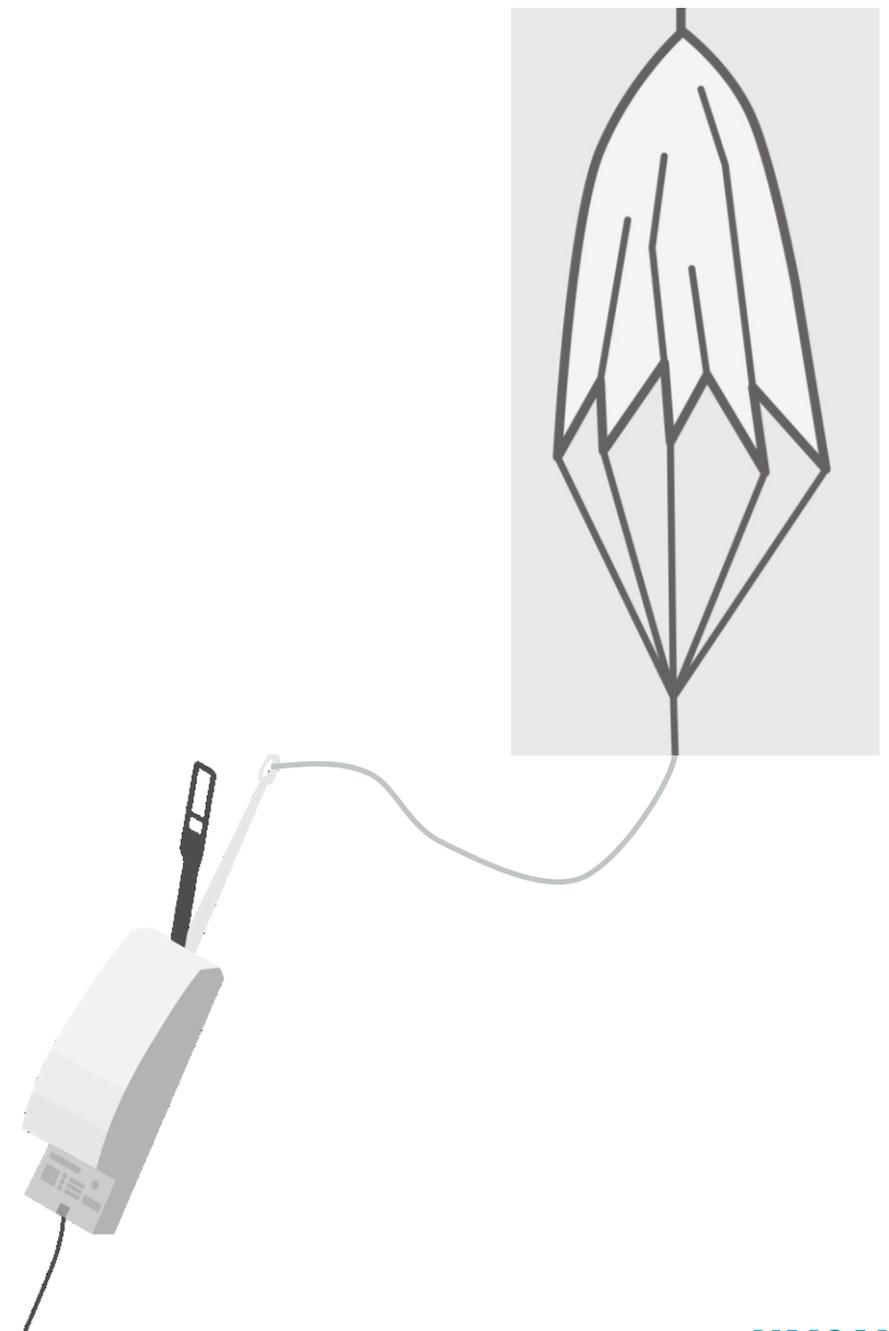
# Descent Sounding Characteristics

- Variable descent rate
  - 50-100 m/s at the balloon burst
  - Slows down to  $\sim 5$ /m near the surface with a parachute
- Balloon remains can still be attached
- Less periodic motion



# Descent Sounding Characteristics

- Data is available ~2 hours after the launch
  - Little or no additional effort needed
- Despite the differences, the data is expected to provide a positive impact



# Available Data Formats

- Ascent
  - FM34 TEMP
  - FM94 BUFR reports 3'09'052 and 3'09'057
- Descent
  - FM94 BUFR report 3'09'053
    - Sequence for representation of TEMP DROP observation type data
  - FM94 BUFR report 3'09'056
    - Sequence for representation of radiosonde descent data

3 09 056

3 01 150  
 3 01 111  
  
 3 01 128  
 3 01 113  
 0 08 091  
 3 01 021  
 0 07 007

(Sequence for representation of radiosonde descent data)

WIGOS identifier

Identification of launch site and instrumentation for P, T, U and wind measurements

Additional information on radiosonde ascent

Date/time of launch

Coordinates significance

Latitude/longitude (high accuracy)

Height

Coordinates significance

Delayed replication of 1 descriptor

Extended delayed descriptor replication factor

Temperature, dewpoint and wind data at a pressure level with radiosonde position and higher precision of pressure and geopotential height

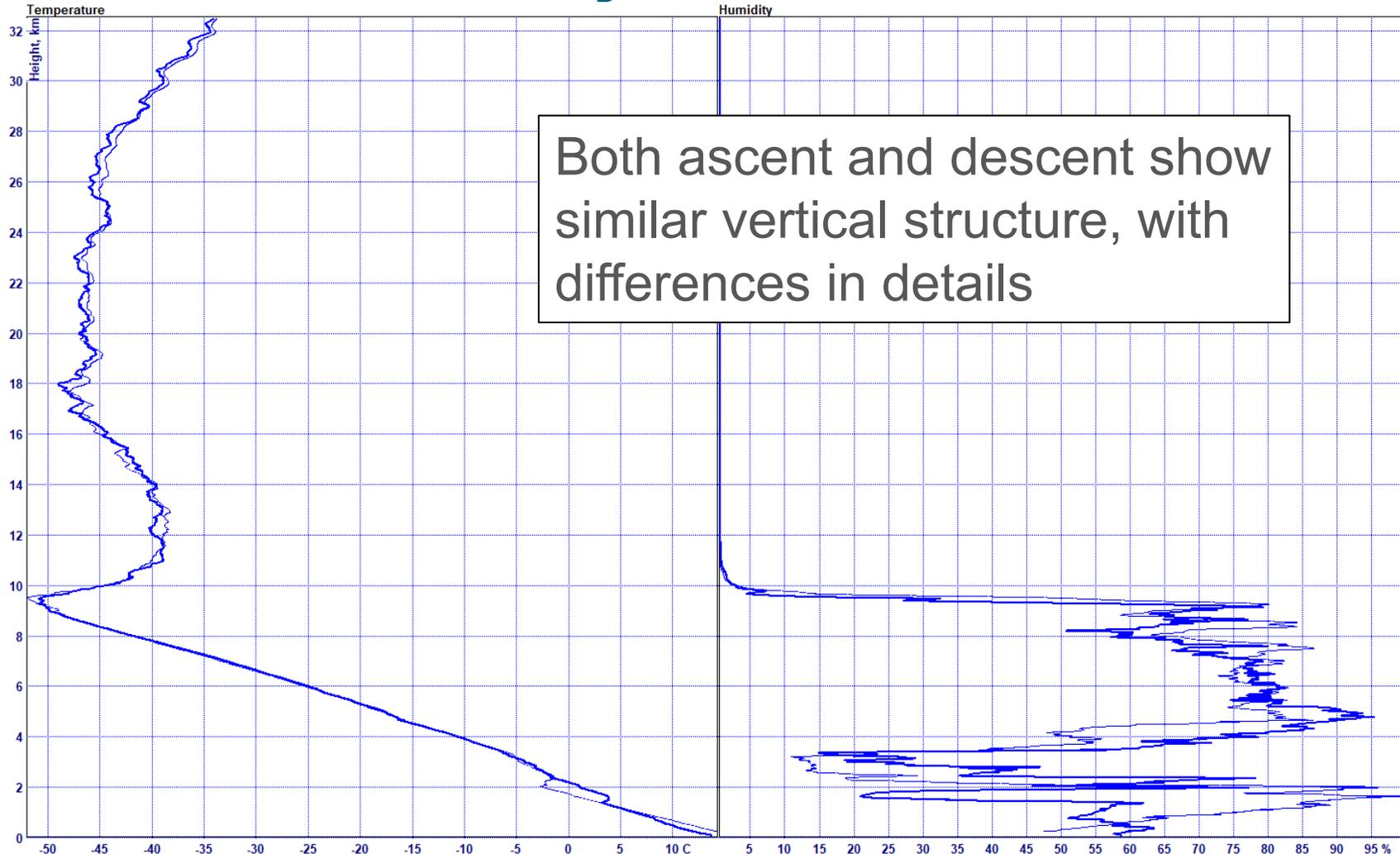
Delayed replication of 1 descriptor

Delayed descriptor replication factor

Wind shear data at a pressure level with radiosonde position

0 08 091  
 1 01 000  
 0 31 002  
 3 03 056  
  
 1 01 000  
 0 31 001  
 3 03 051

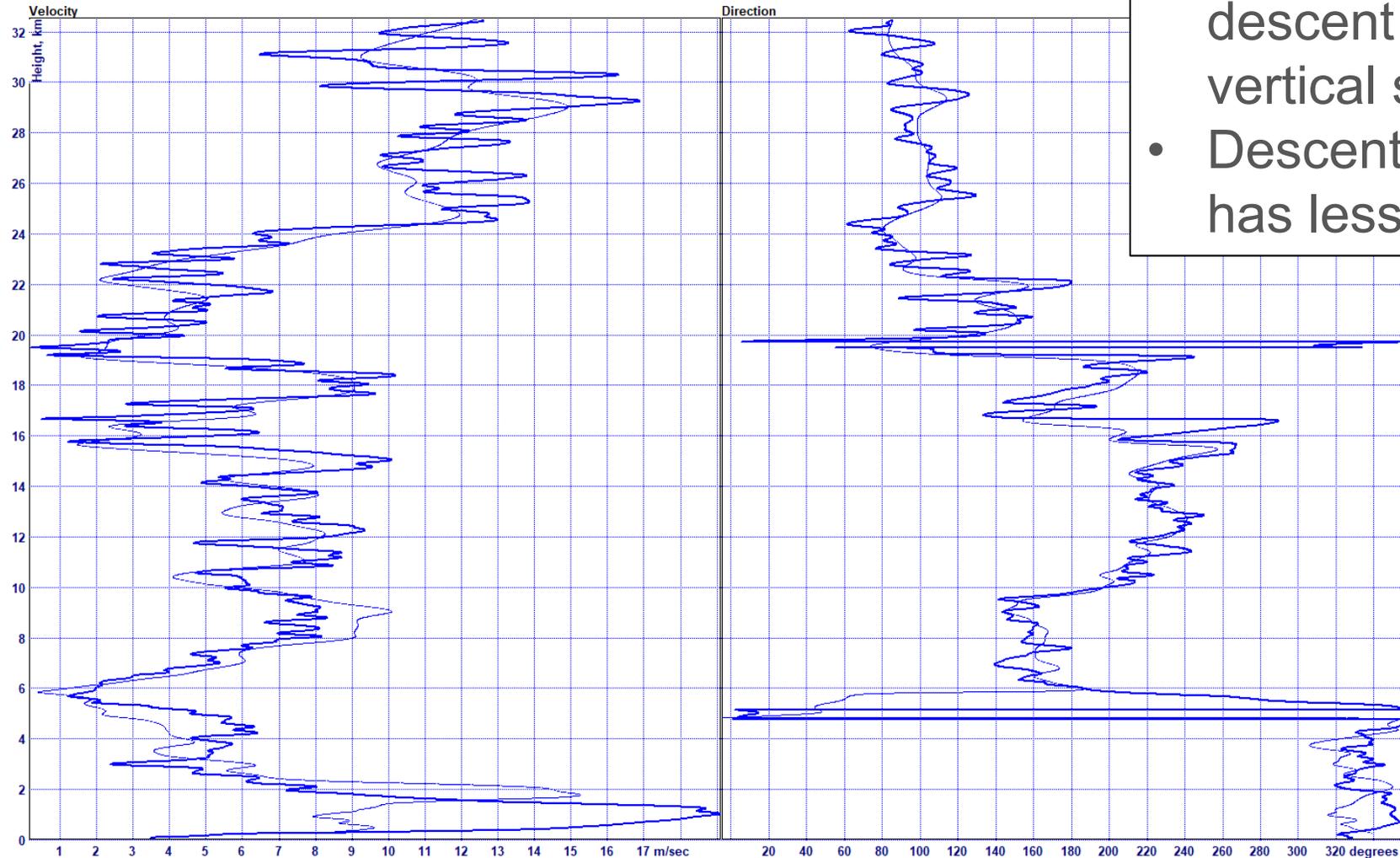
# Comparison of Ascent and Descent Data Temperature and Humidity



Descent data  
- thin line

# Comparison of Ascent and Descent Data Wind Speed and Direction

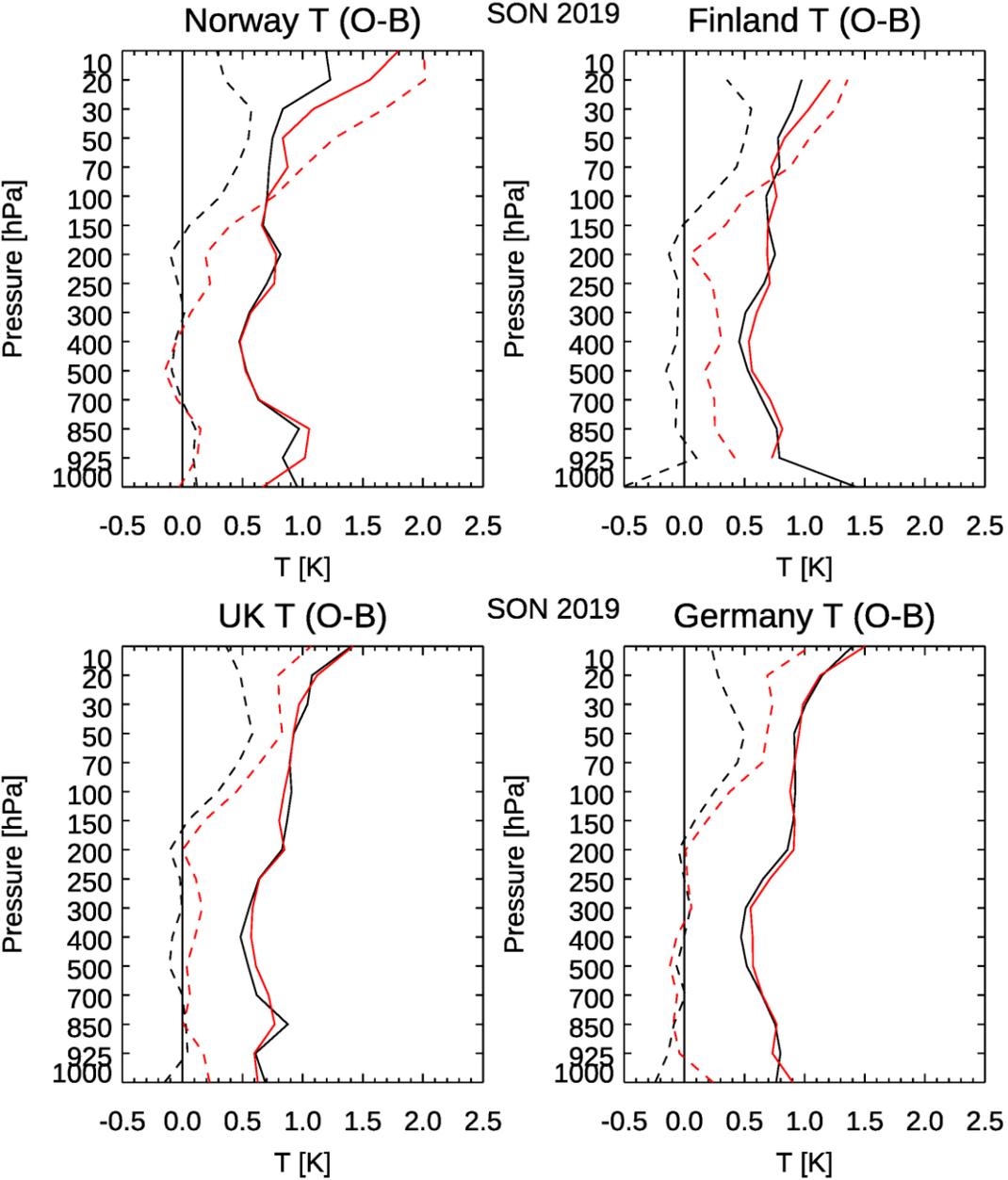
- Both ascent and descent show similar vertical structure
- Descent wind profile has less details



Descent data  
- thin line

# ECMWF Comparison Between Different Countries

- Site-dependent differences in temperature observations
- Observed bias against ECMWF model in stratosphere/troposphere

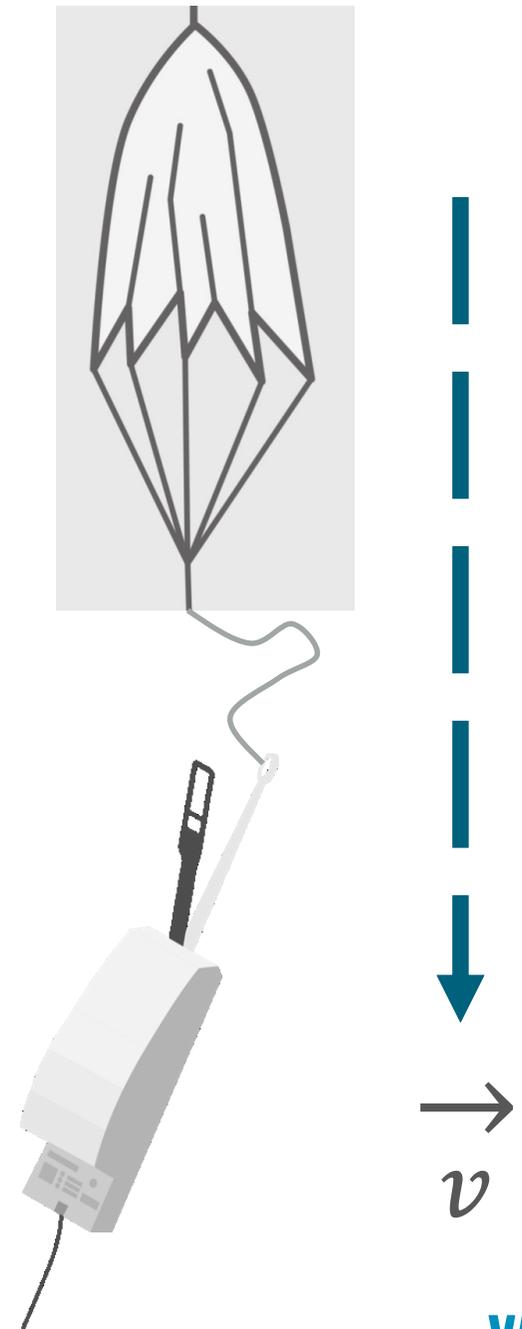


Source: Bruce Ingleby, ECMWF



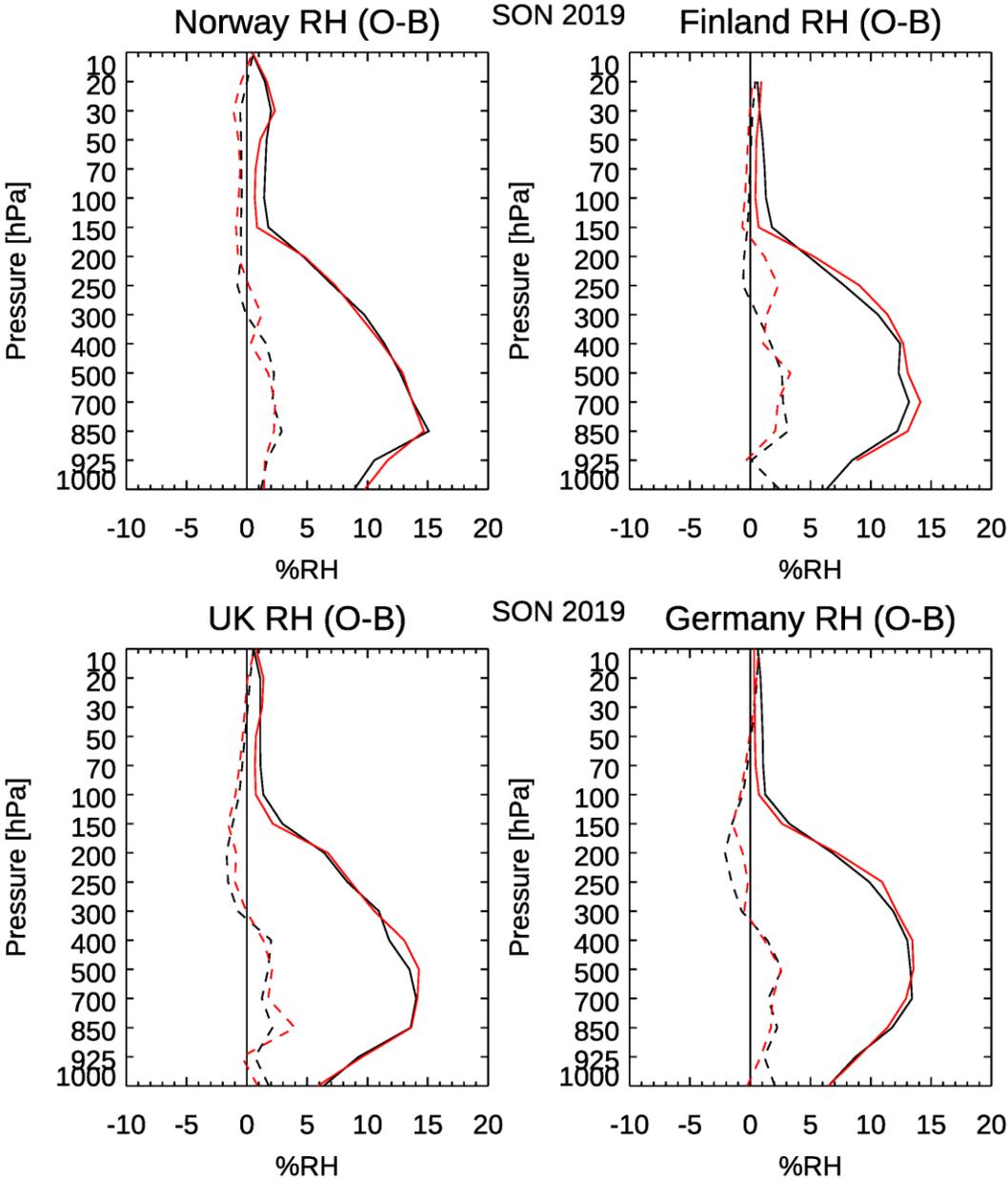
# Temperature Difference

- Current understanding is that the temperature difference is due to the **high descent rate** after the balloon burst
  - Faster descent without a parachute
- Correction for the descent rate not yet taken into account



# ECMWF comparison between different countries

- Humidity measurements seem to be of good quality

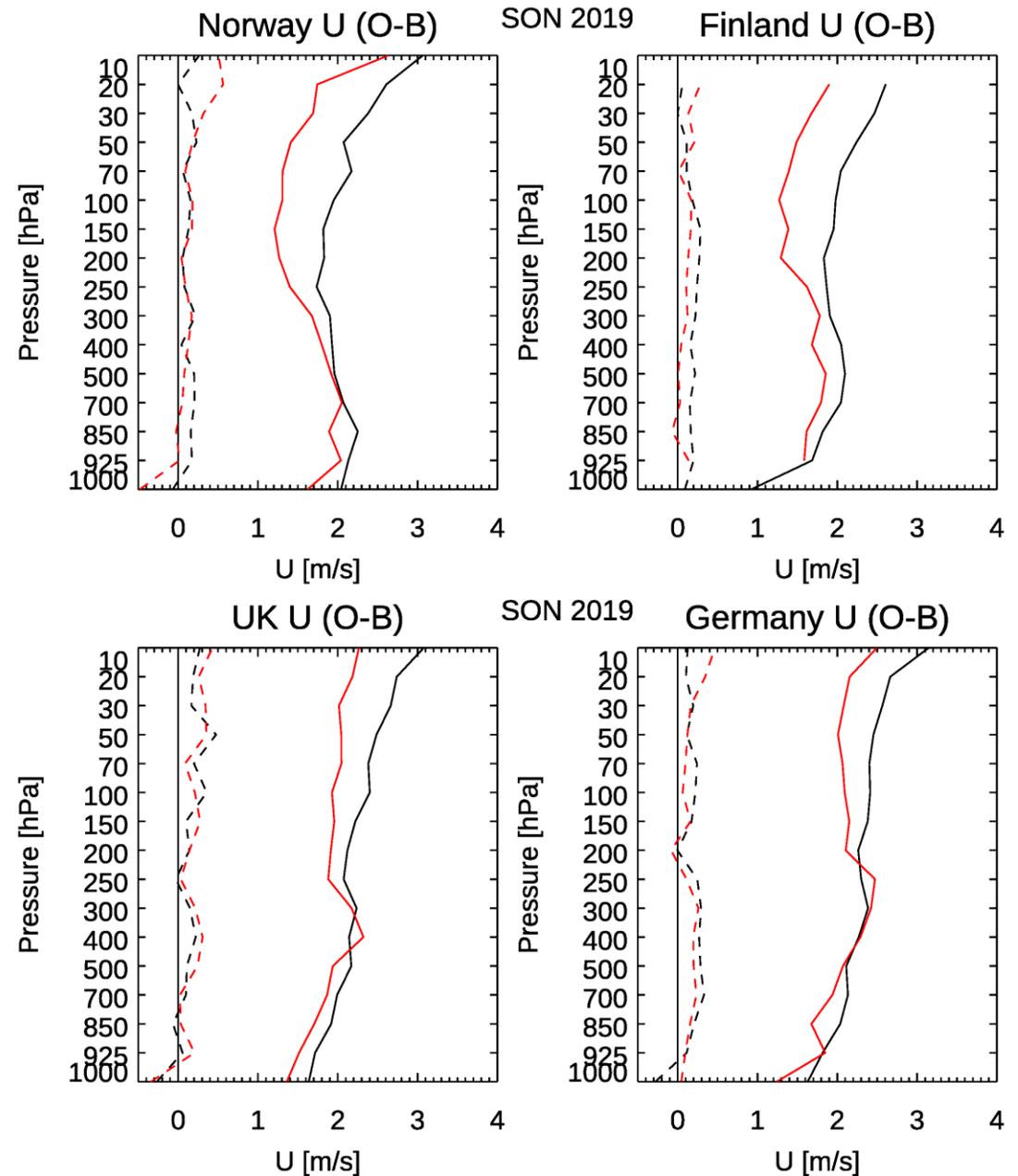


Source: Bruce Ingleby, ECMWF



# ECMWF comparison between different countries

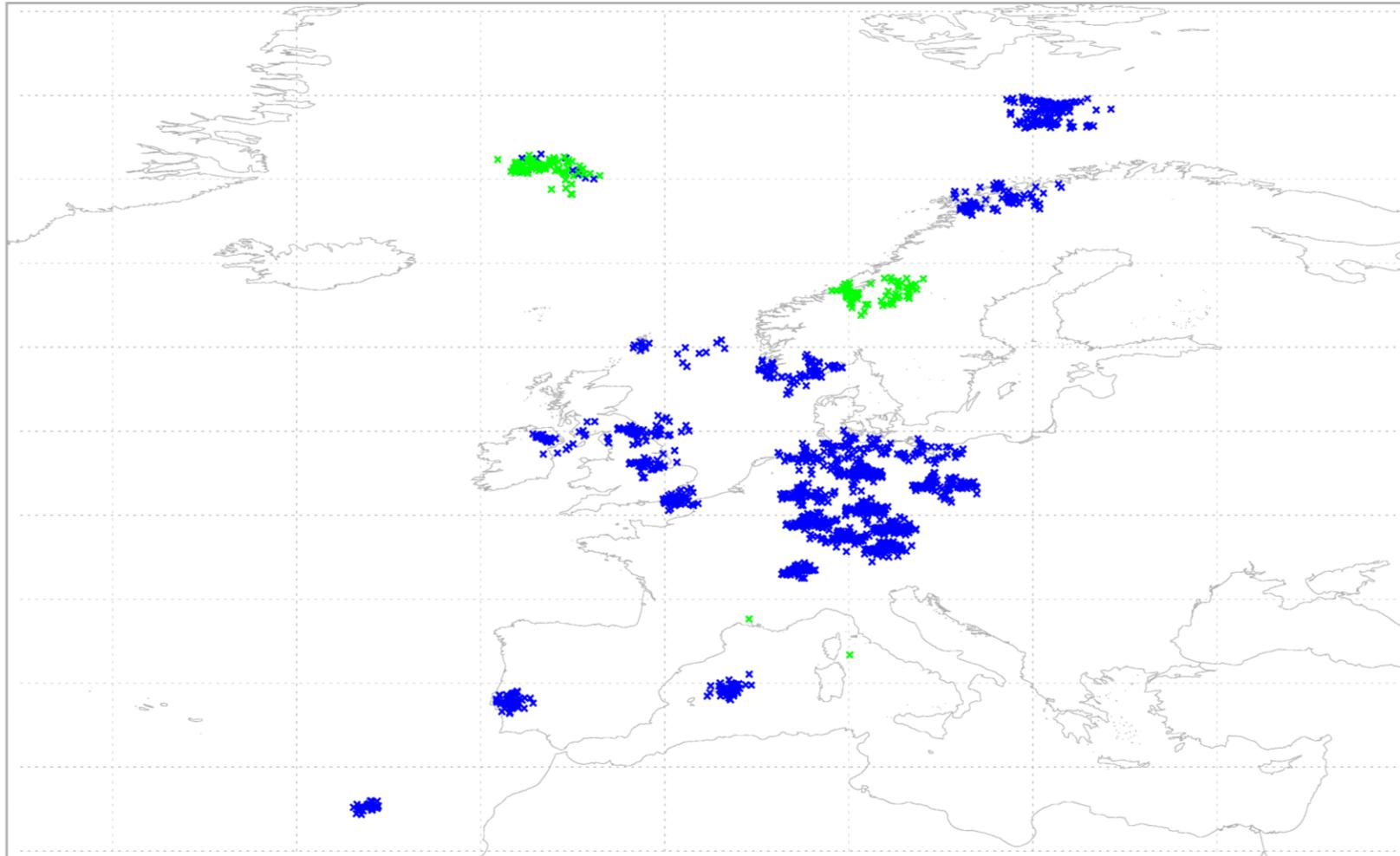
- Descent winds are generally good quality
  - Closer to the background than the ascent winds, especially at upper levels
- Processing of wind data ascent vs descent soundings under investigation



Source: Bruce Ingleby, ECMWF

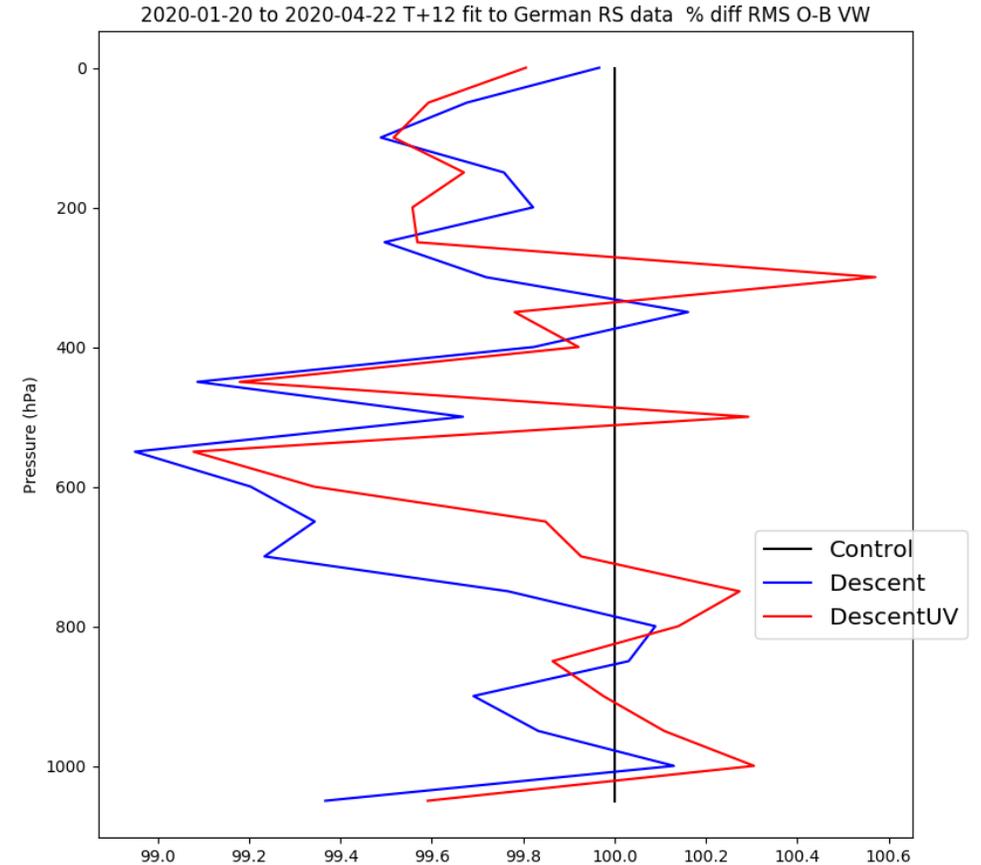
# Availability of Descent Radiosonde Data

April 2020: Descent data BUFR availability/type



# Impact

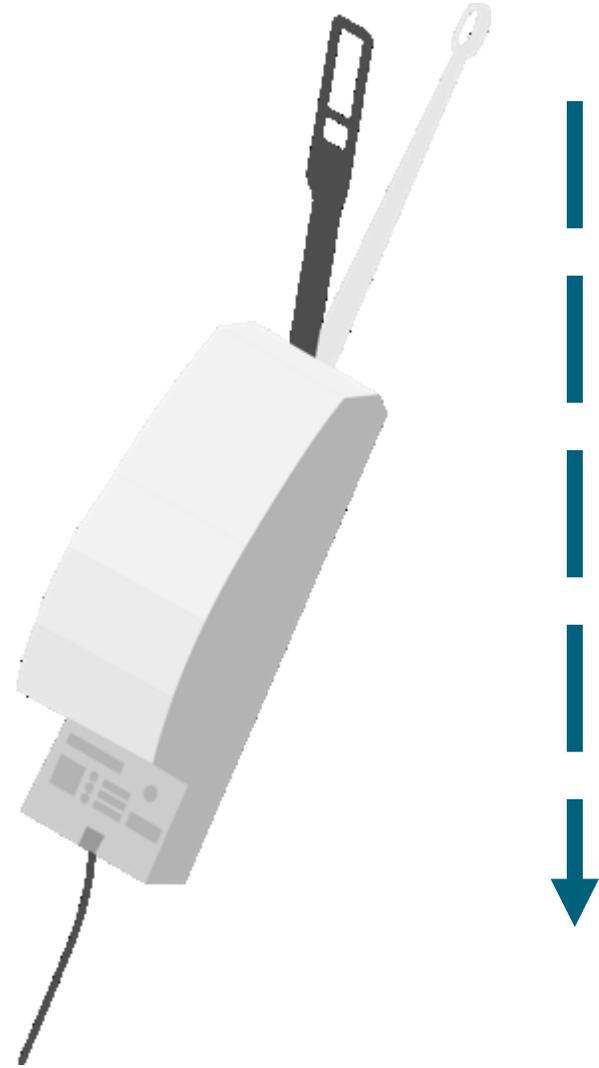
- Impact assessment in early phase
- Compared to German radiosonde data, the wind forecast is slightly improved



Credit: Bruce Ingleby, ECMWF

# Summary

- Descent data is readily available and usable for evaluation
- BUFR format for disseminating the data
- Descent data needs further studies and possibly revised processing
- Expectation for a positive impact



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