

# **German Solar UV Monitoring Network**

## **BTS Array Radiometer Validation for Solar UV Radiation Monitoring and Integration of the Alpine Climate Region**

**S. Lorenz, H. Sandmann, D. Weiskopf**

**12<sup>th</sup> -14<sup>th</sup> September 2018, ECUVM 2018**

**Vienna**

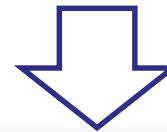
# Introduction



UV Measurement Network June 2017

## 10 spectral measuring stations

- ✓ Rough coverage of the climatic regions in Germany
- Exception: high mountains
- ✓ Requirement "Measurement accuracy" due to scanning double monochromators
- Drawback: i.a. long measurement time



BTS Diode Array Radiometer at the  
Environmental Research Station  
Schneefernerhaus

# Outline



# BTS Diode Array Radiometer

## BTS Validation with a double monochromator

# Environmental Research Station Schneefernerhaus (UFS)

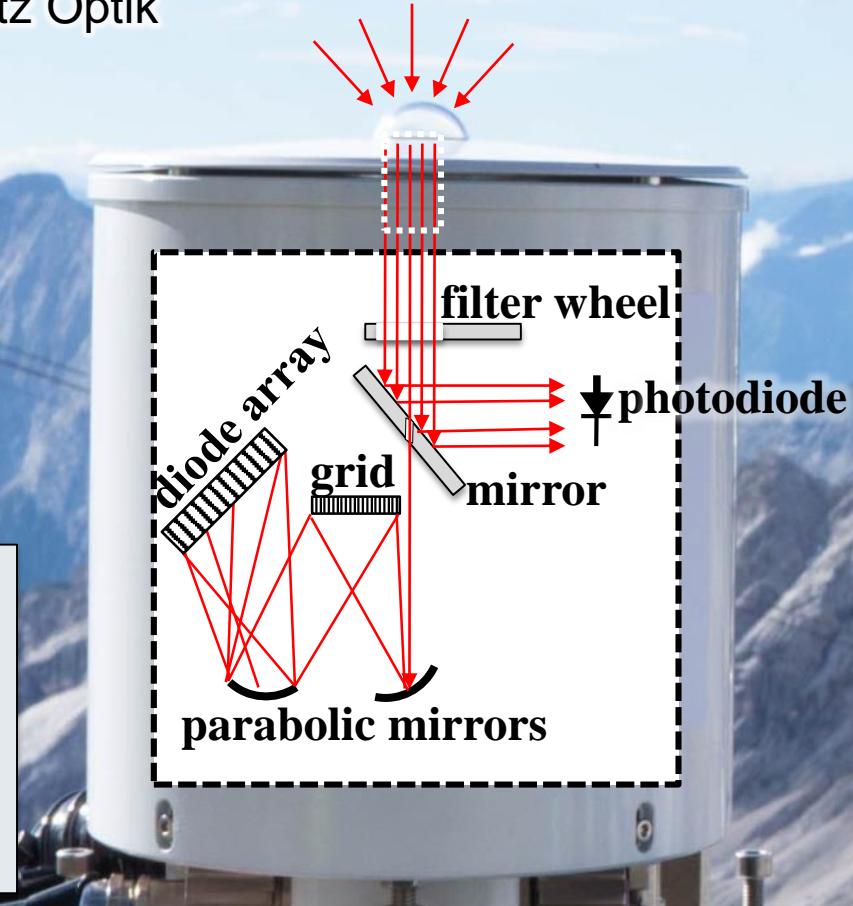
# One Year Measurements at UFS

# BTS Diode Array Radiometer

- Device: BTS2048-UV-S-WP, Gigahertz Optik
  - **BiTechSensor** :  
photodiode (4) und  
diode array radiometer (3,5-7)

In comparison to double monochromator:

- small, lightweight and less expensive
  - Short measurement time with high spectral resolution
  - sufficient dynamic range (4-5 Mag.)



# Outline



# BTS Diode Array Radiometer

## BTS Validation with a double monochromator

# Environmental Research Station Schneefernerhaus (UFS)

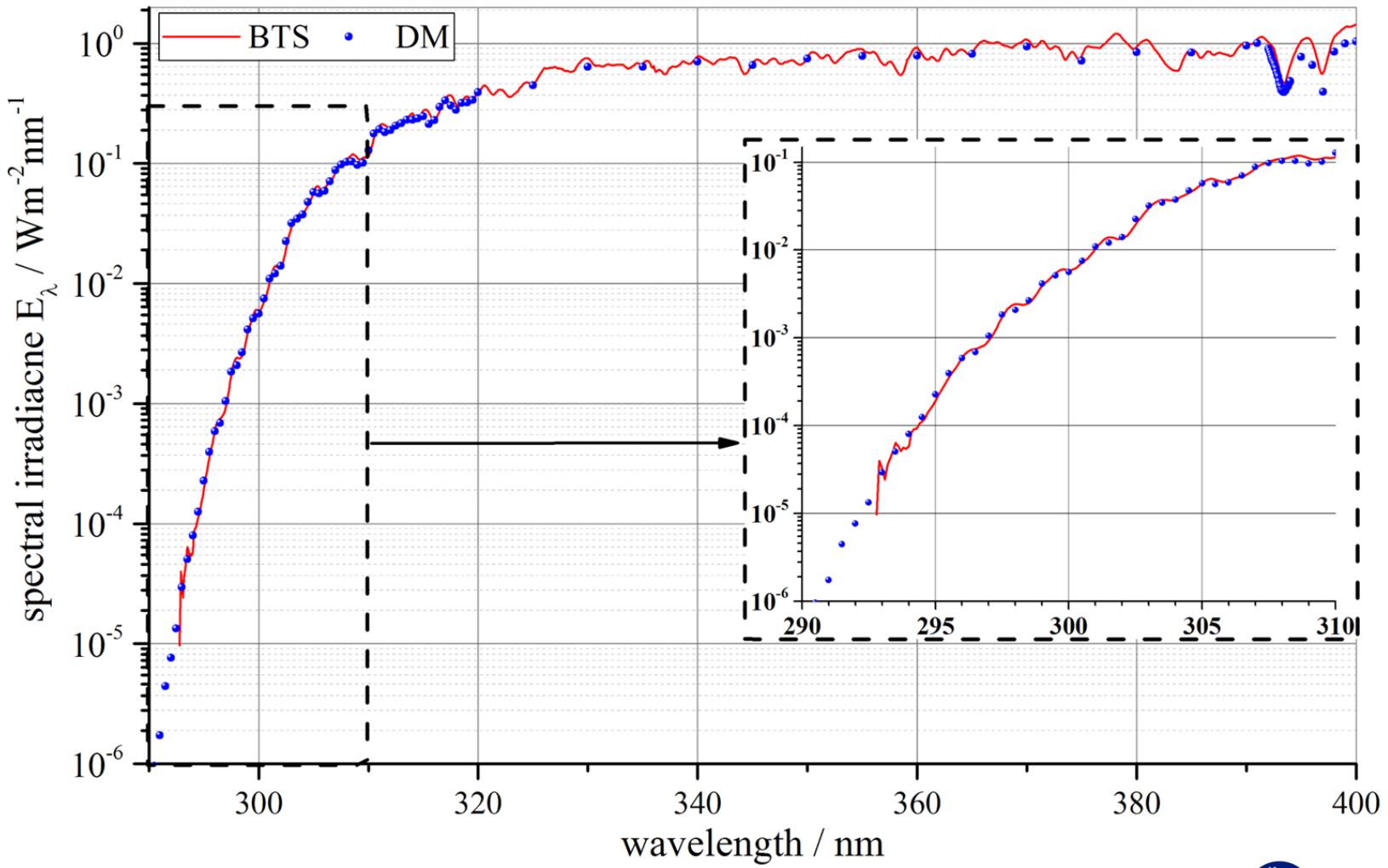
# One Year Measurements at UFS

# BTS Validation with a double monochromator

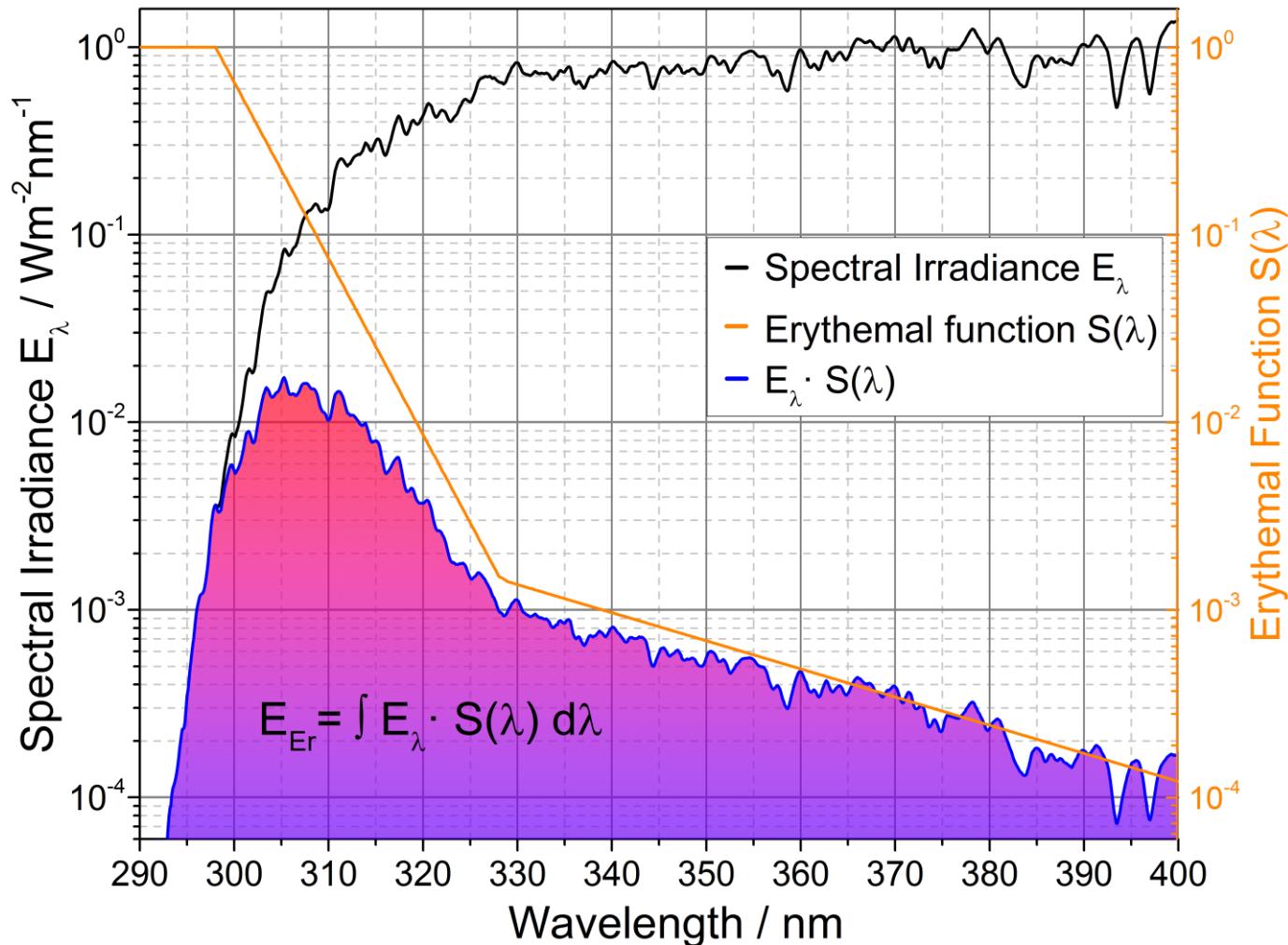
- At measurement station Munich / Neuherberg (monitoring center)



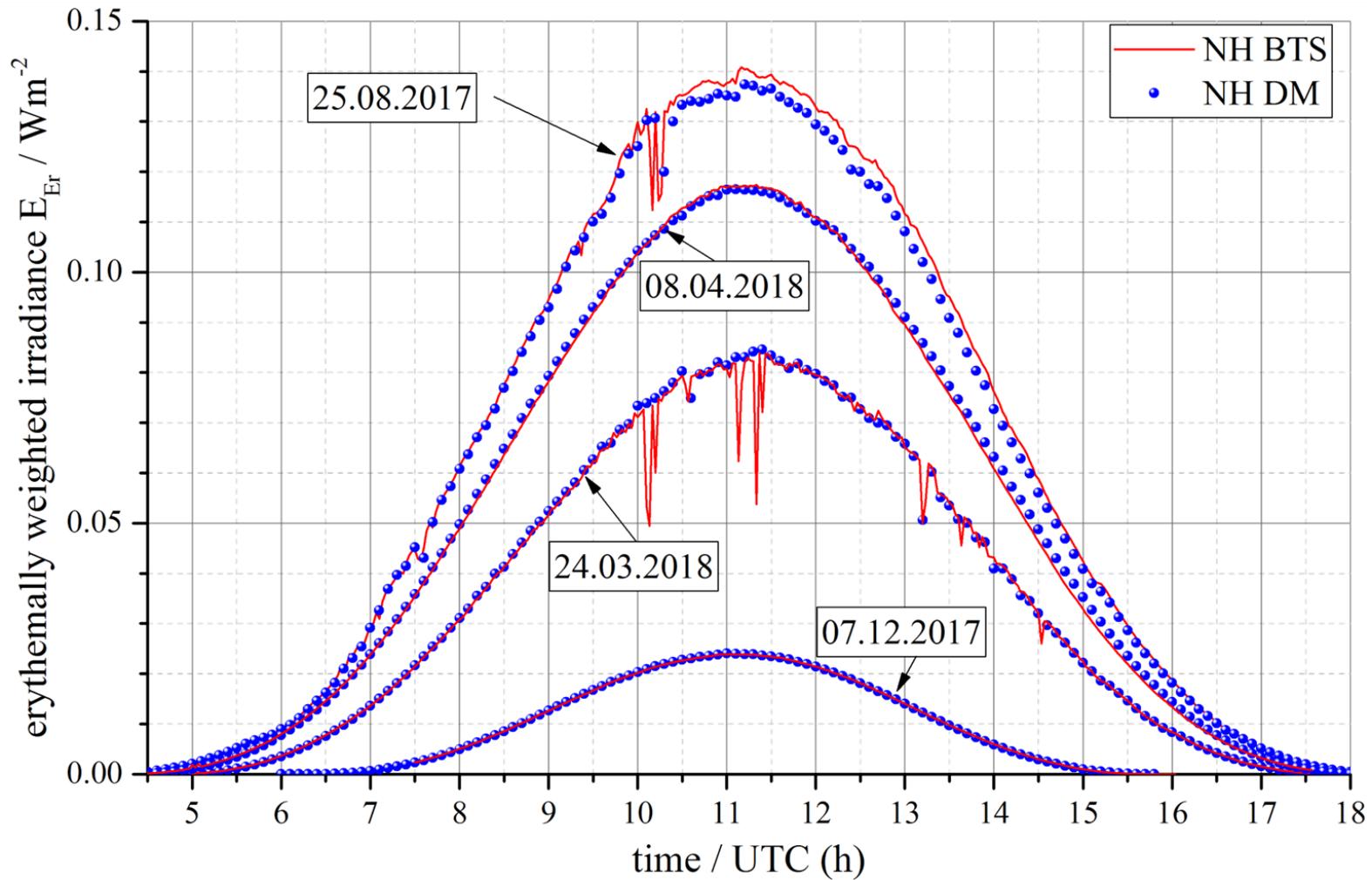
# BTS Validation: Comparison of Solar Spectrum



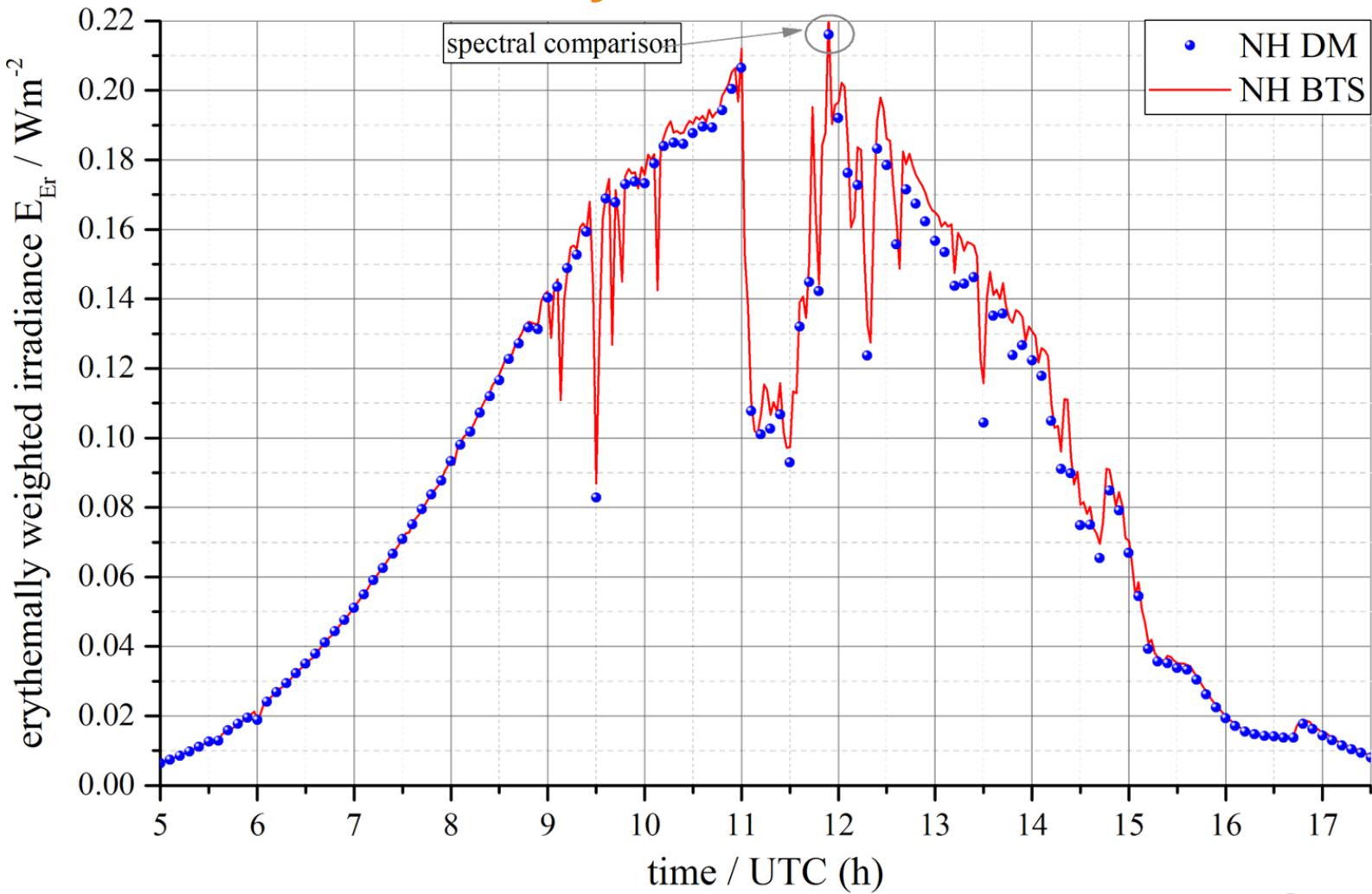
# Erythemally weighted spectral irradiance $E_{Er}$



# BTS Validation: Daily Course of the Measurements



# BTS Validation: Daily Course of the Measurements



# Outline



# BTS Diode Array Radiometer

## BTS Validation with a double monochromator

# Environmental Research Station Schneefernerhaus (UFS)

# One Year Measurements at UFS

# Environmental Research Station Schneefernerhaus (UFS)



- 2666 m above sea level
- Highly pure air
- Looking to the south



# Environmental Research Station Schneefernerhaus (UFS)



| Verantwortung für Mensch und Umwelt |



S. Lorenz, ECUVM 2018, Vienna, 12th -14th September 2018

# Outline





# BTS Diode Array Radiometer

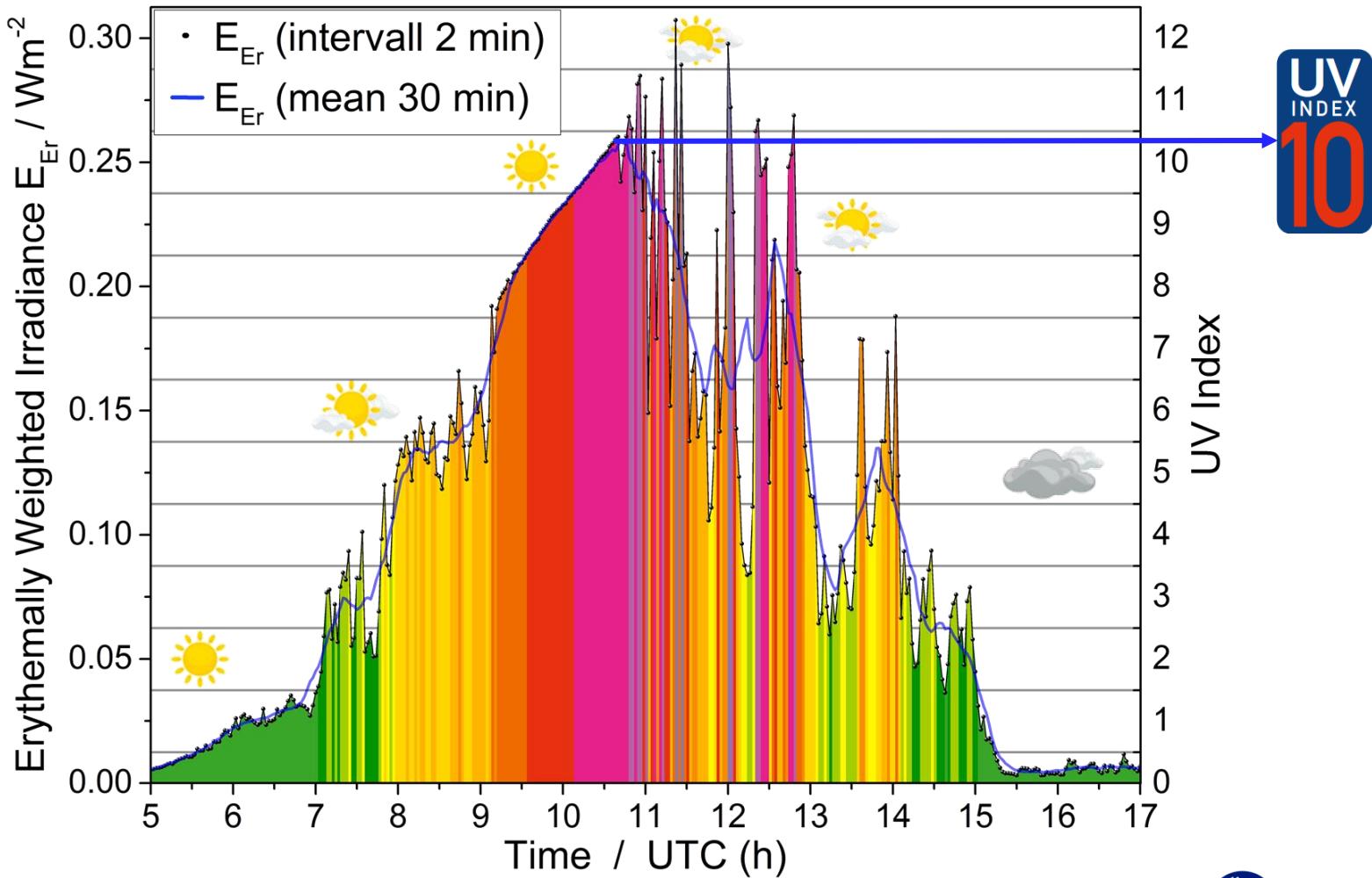
## BTS Validation with a double monochromator

# Environmental Research Station Schneefernerhaus (UFS)

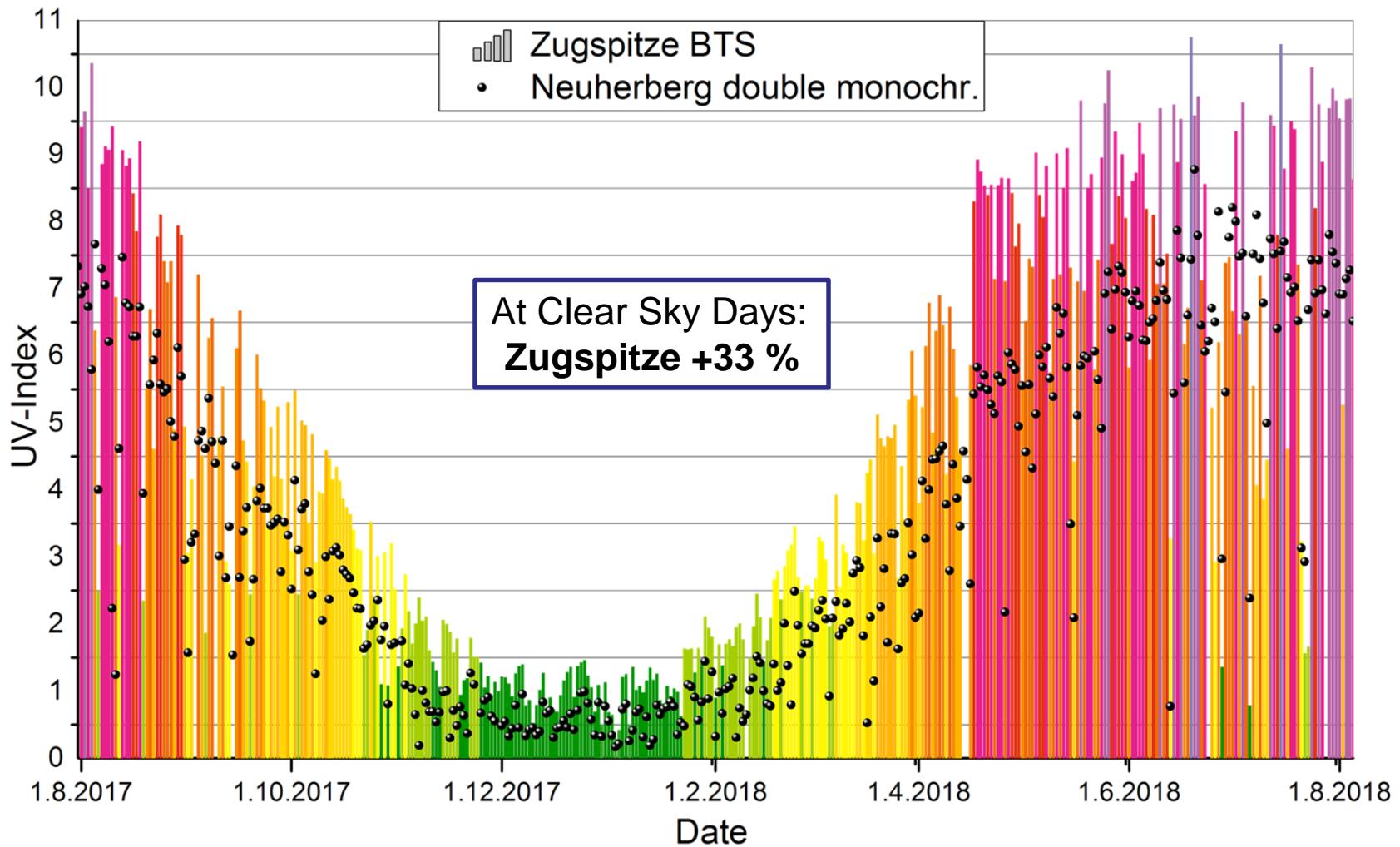


# One Year Measurements at UFS

# Results: Daily Course of the Measurements

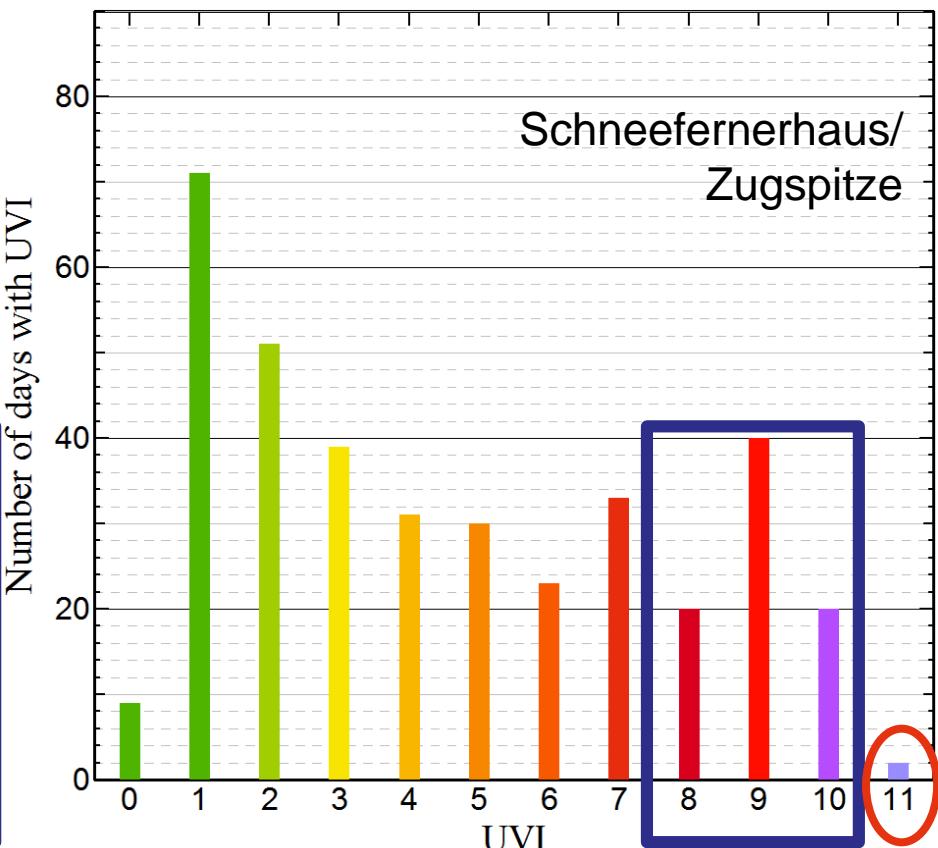
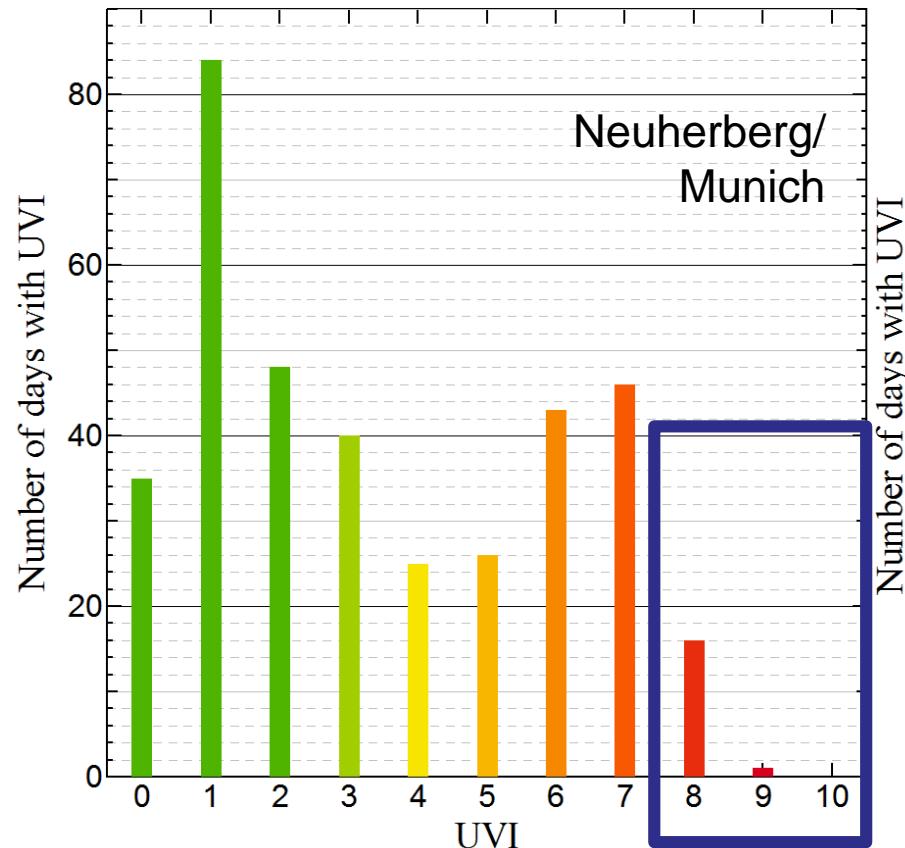


## Results: Yearly course of daily maximum value

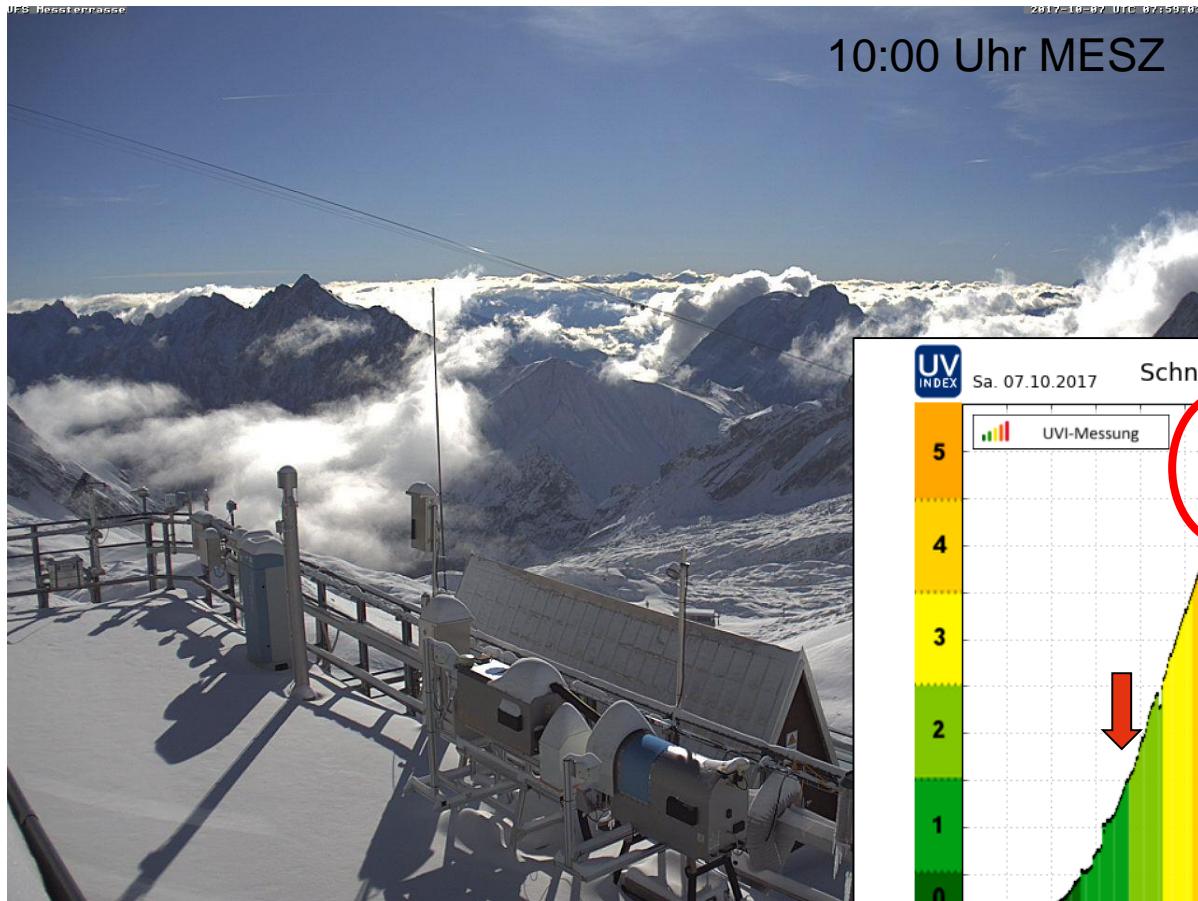


# Results: UV Index Frequency

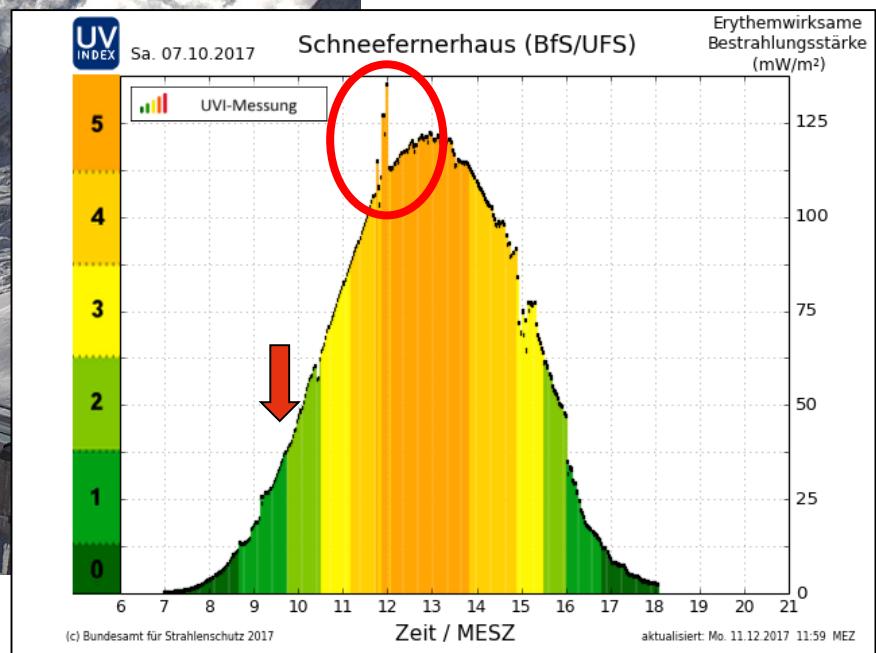
- UV Index (daily maximum value) between **August 2017** and **July 2018**



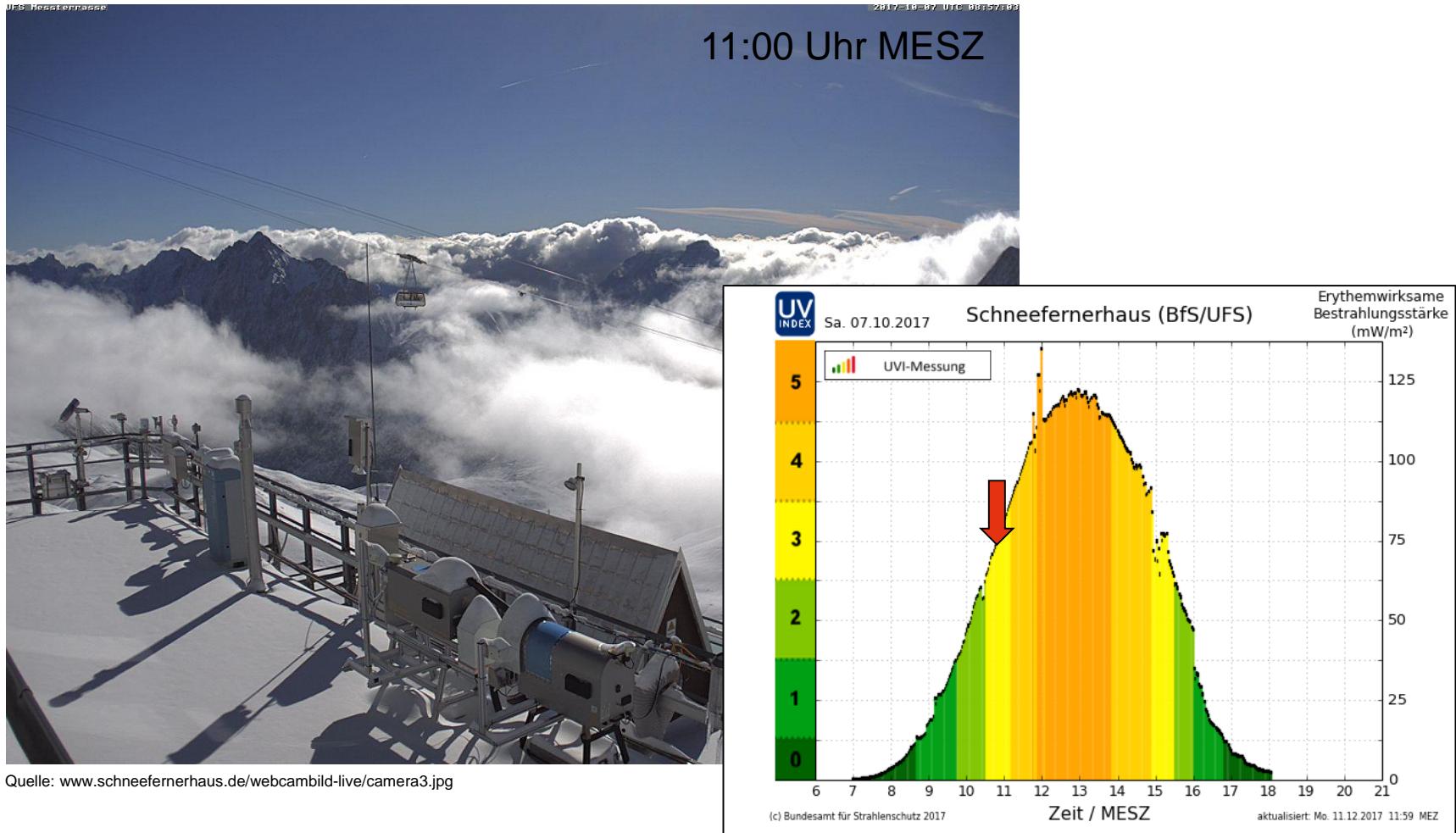
# Radiation Peaks caused by clouds



Quelle: [www.schneefernerhaus.de/webcambild-live/camera3.jpg](http://www.schneefernerhaus.de/webcambild-live/camera3.jpg)

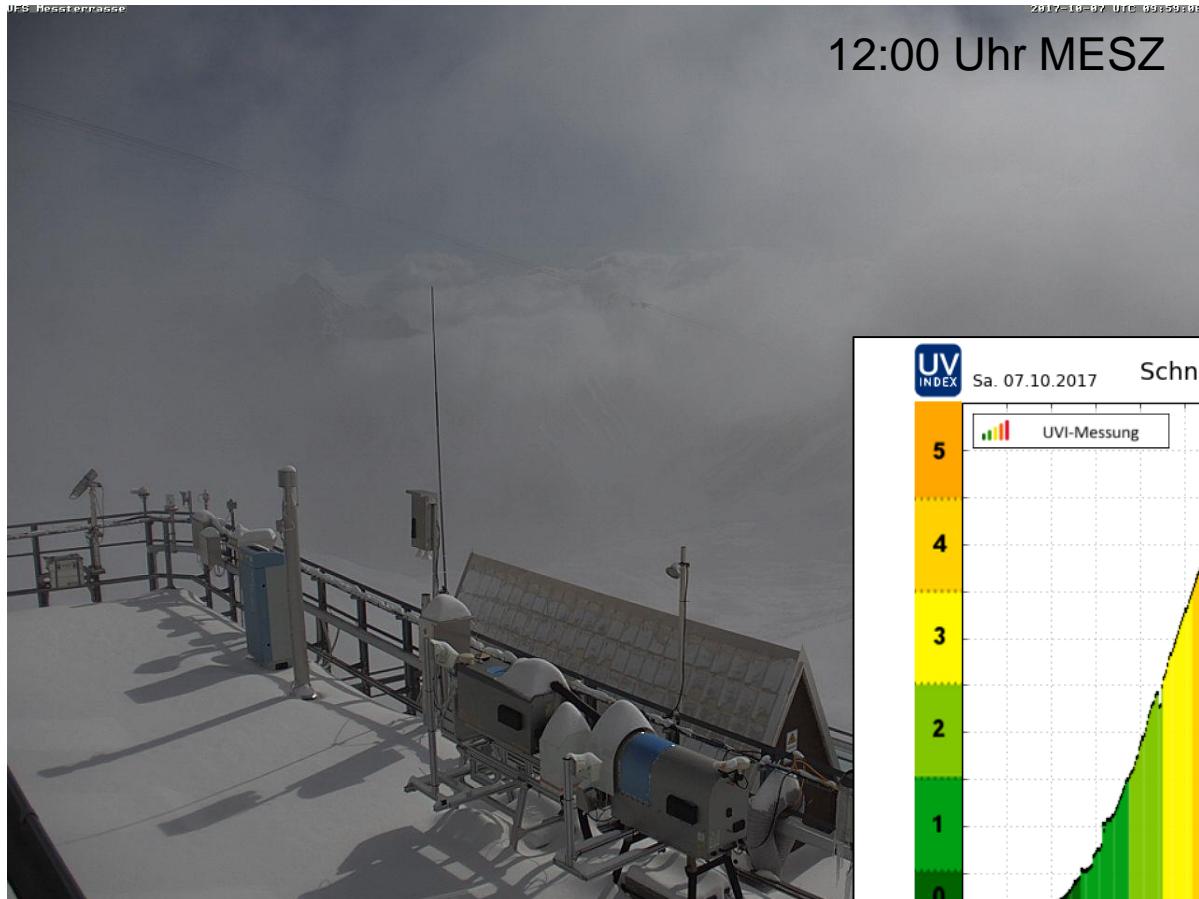


# Radiation Peaks caused by clouds

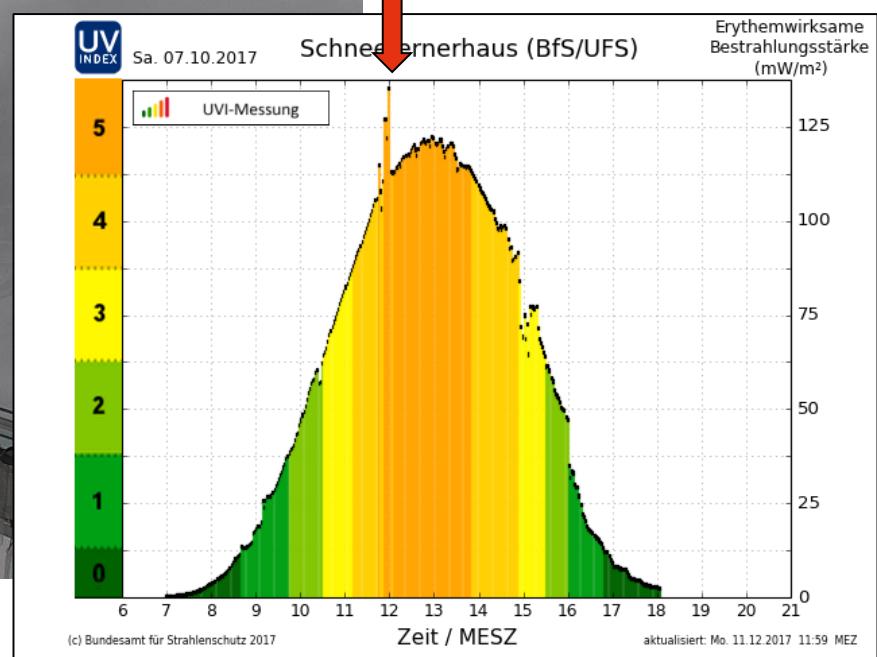


Quelle: [www.schneefernerhaus.de/webcambild-live/camera3.jpg](http://www.schneefernerhaus.de/webcambild-live/camera3.jpg)

# Radiation Peaks caused by clouds

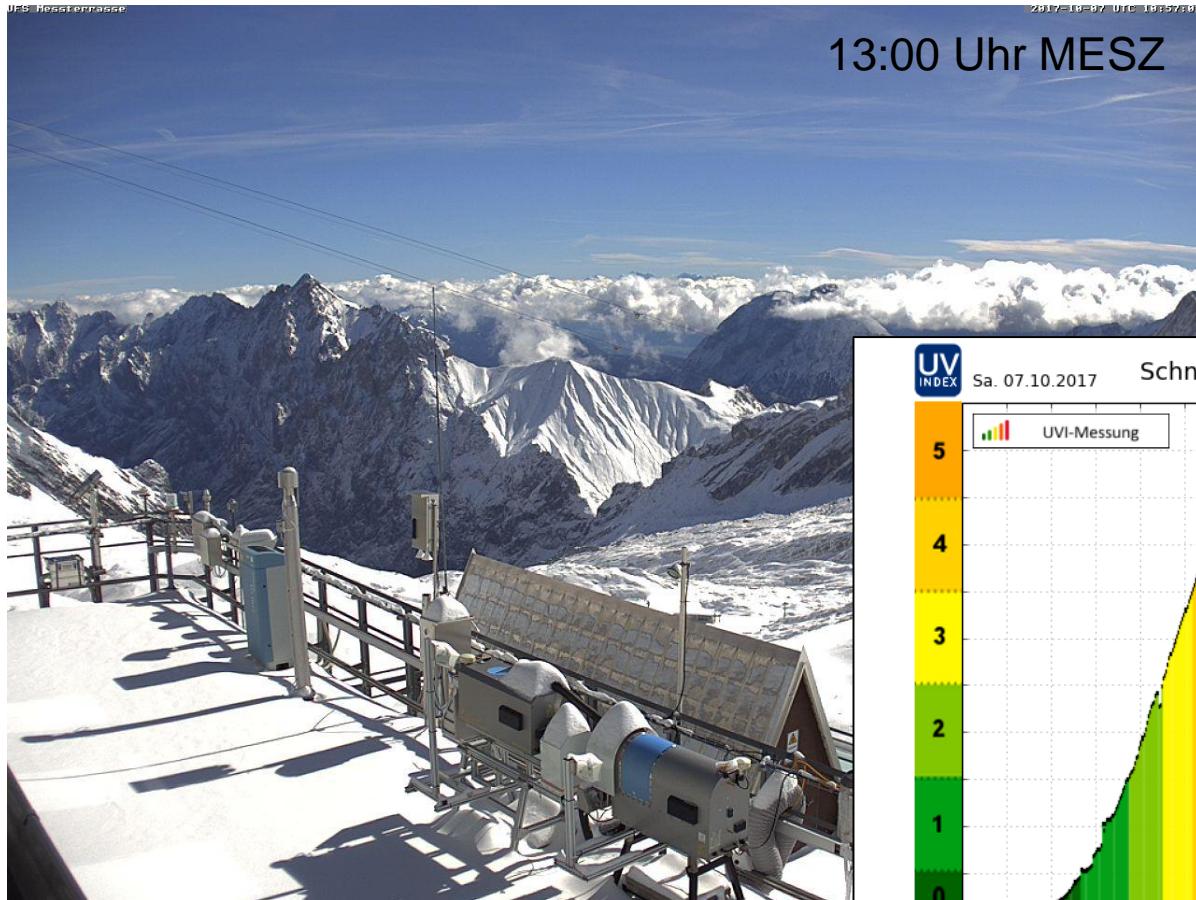


12:00 Uhr MESZ

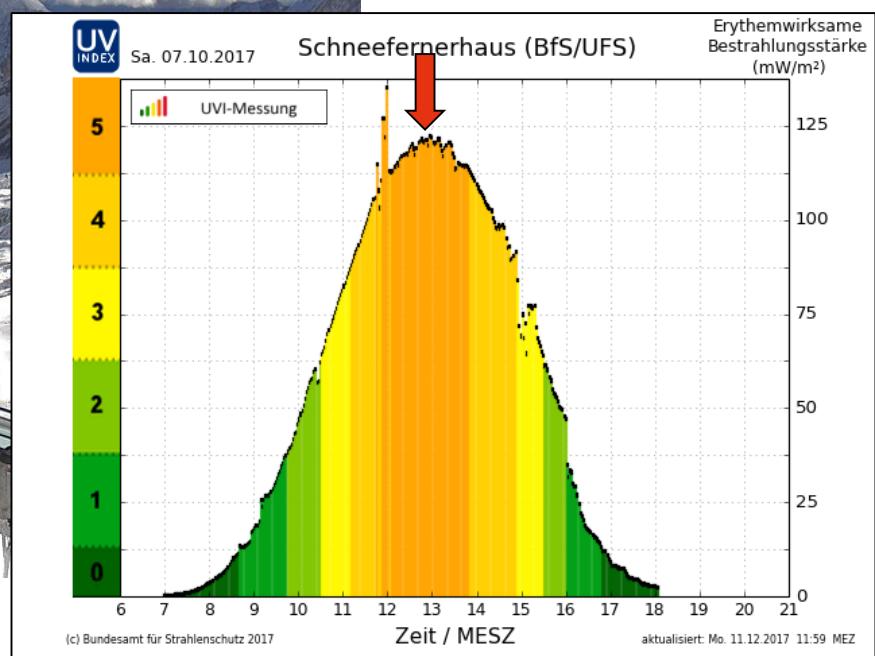


Quelle: [www.schneefernerhaus.de/webcambild-live/camera3.jpg](http://www.schneefernerhaus.de/webcambild-live/camera3.jpg)

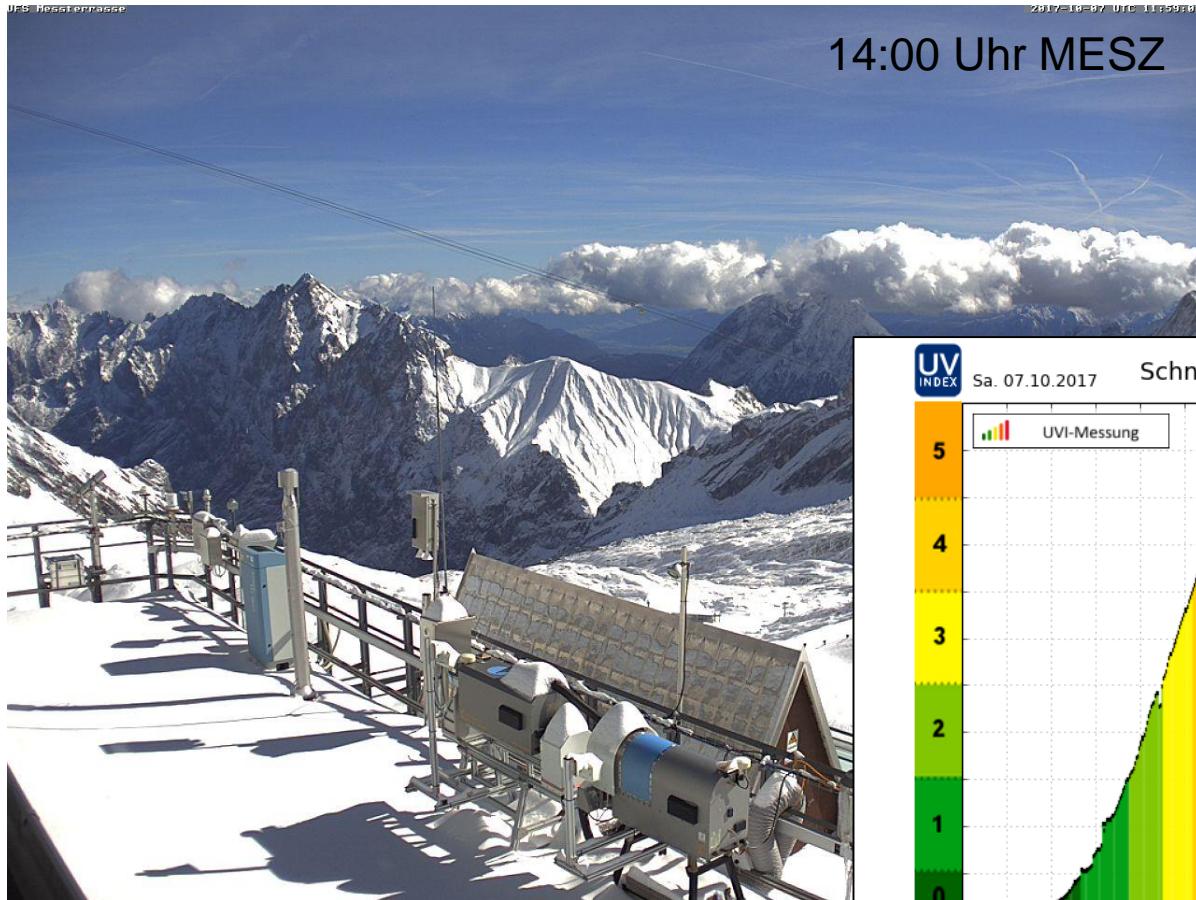
# Radiation Peaks caused by clouds



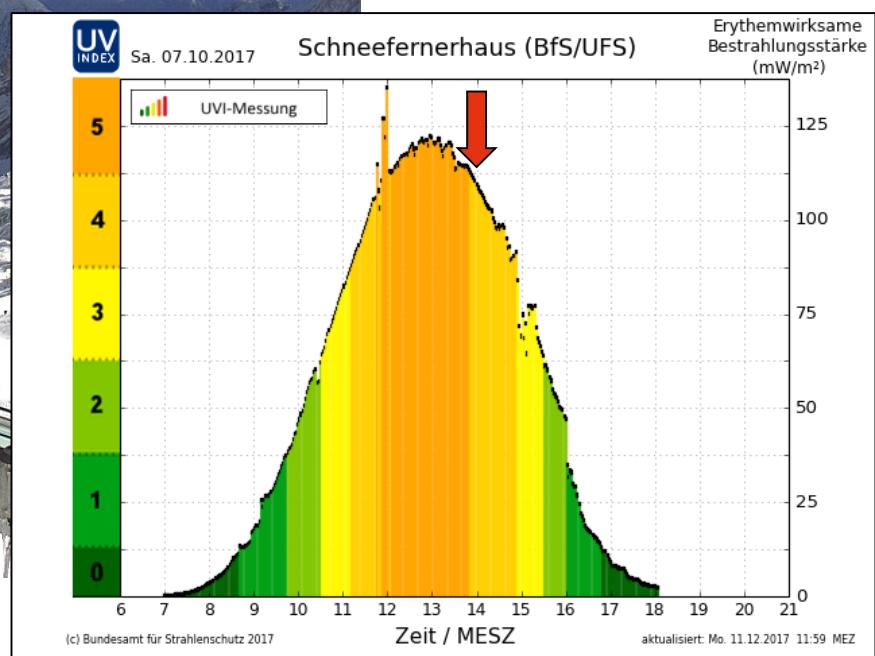
Quelle: [www.schneefernerhaus.de/webcambild-live/camera3.jpg](http://www.schneefernerhaus.de/webcambild-live/camera3.jpg)



# Radiation Peaks caused by clouds



14:00 Uhr MESZ



Quelle: [www.schneefernerhaus.de/webcambild-live/camera3.jpg](http://www.schneefernerhaus.de/webcambild-live/camera3.jpg)

| Verantwortung für Mensch und Umwelt |



S. Lorenz, ECUVM 2018, Vienna, 12th -14th September 2018



Bundesamt für Strahlenschutz

# Summary

- **Implementation Measuring Station at the Schneefernerhaus / Zugspitze**
  - ✓ climatic region high mountains
- **Validation und Use of BTS Diode Array Radiometer**
  - ✓ Good Alternative to expensive double monochromator systems
  - ✓ Accurate measurements at fast changing cloud conditions
- **Results Schneefernerhaus (1 year Measurements)**
  - Better daily courses of the measurements at fast changing cloud conditions
  - In Comparison to Munich/Neuherberg:
    - substantially higher UV Index values (up to 11)
    - nearly 33% higher weighted UV irradiance (without influence of snow)

Thank you for your attention.



| Verantwortung für Mensch und Umwelt |



S. Lorenz, ECUVM 2018, Vienna, 12th -14th September 2018



Bundesamt für Strahlenschutz

# Further Questions?

Contact:  
Dr. Sebastian Lorenz  
[slorenz@bfs.de](mailto:slorenz@bfs.de)

