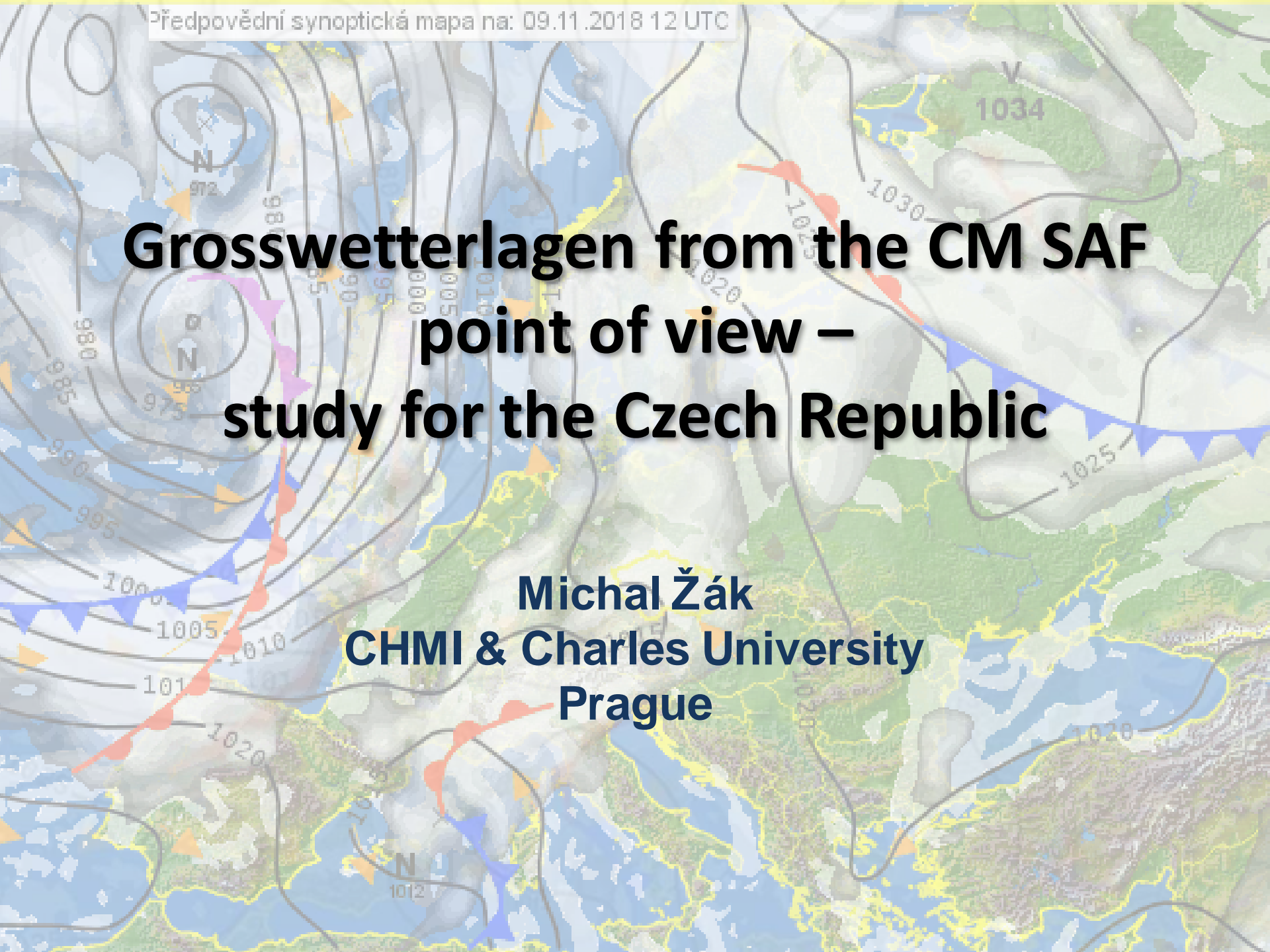


# Grosswetterlagen from the CM SAF point of view – study for the Czech Republic

Michal Žák  
CHMI & Charles University  
Prague



# Typing of synoptic situations

- Long tradition in Czechia
- Started in 1946 (on daily basis)
- For years 1946-1990 for the whole Czechoslovakia
- Since 1991 separately for Czechia and Slovakia
- The typing is prepared and discussed with great attention in April of the following year

# Typing of synoptic situations





# Typing of synoptic situations

- What's taken into account?
  - surface and upper level circulation
  - frontal zone
  - pressure field patterns
  - air masses
- All days are typed ..
- ... but sometimes it's not easy ...

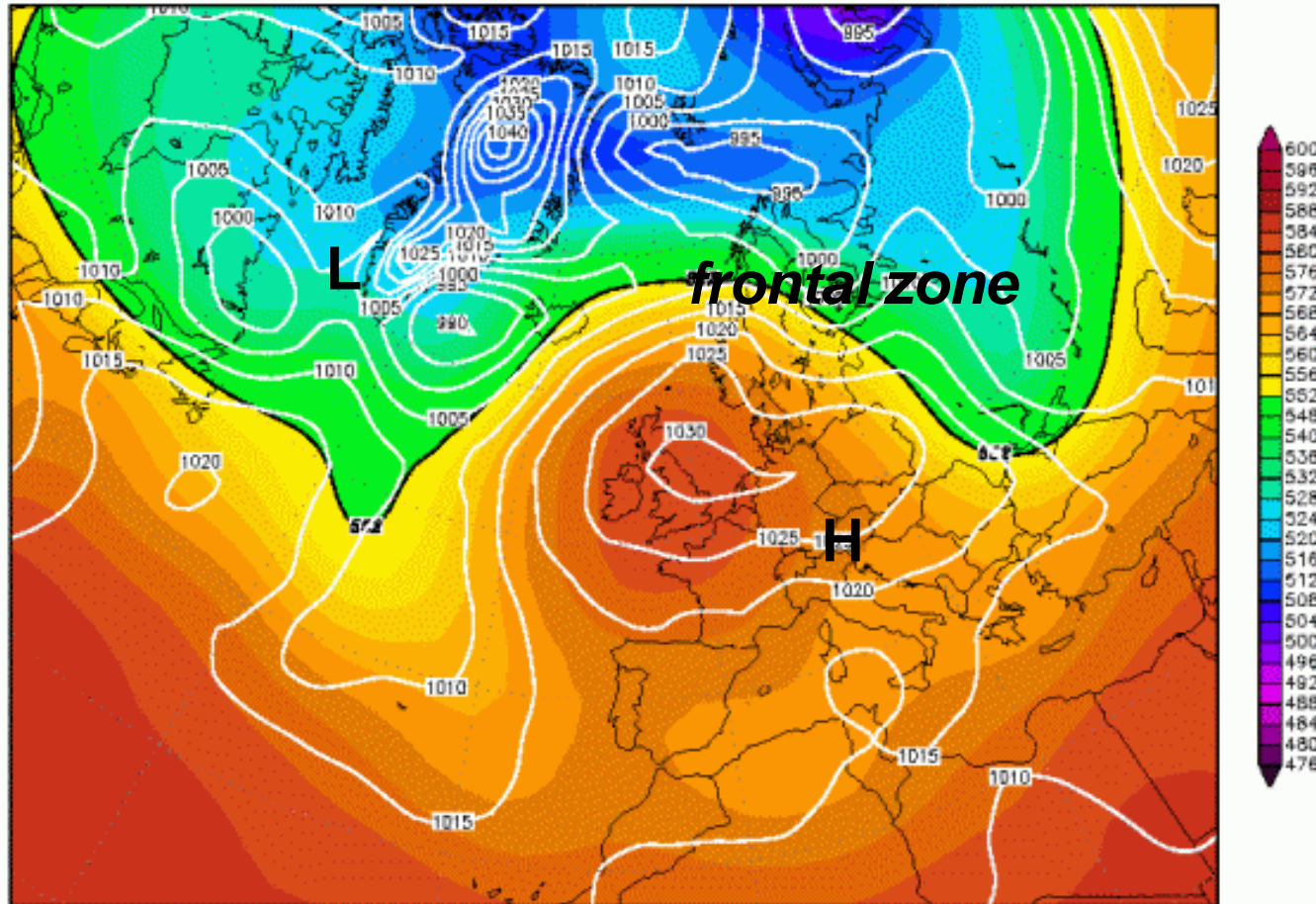
- 28 types

GWL_Nr	abbreviation	description
1	A	Anticyclone over CE
2	Ap1	Travelling anticyclone (type1)
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26	Wal	Western anticyclonic (summer type)
27	Wc	Western cyclonic
28	Wcs	Western cyclonic (with southerly trajectory)

# Example: type A

Sun, 21 OCT 1962 00Z

500 hPa Geopotential (gpm) und Bodendruck (hPa)



Daten: Reanalysis des NCEP  
Wetterzentrale Karlsruhe  
Top Karten : <http://www.wetterzentrale.de/topkarten/>



# Typing of synoptic situations – why?

- Forecast purposes (typical weather for the circulation type)
- Long-term forecast based on analogues approach
- Dynamic climatology for different purposes
- Mostly, for analyses/forecasts of temperature and precipitation parameters

# GWL and CMSAF motivation

- No analyses of cloudiness / sunshine duration (radiation) for this typing has been done so far
- What are the typical spatial fields for different types / groups of types?
- Are there any temporal changes/trends?



# CM SAF data

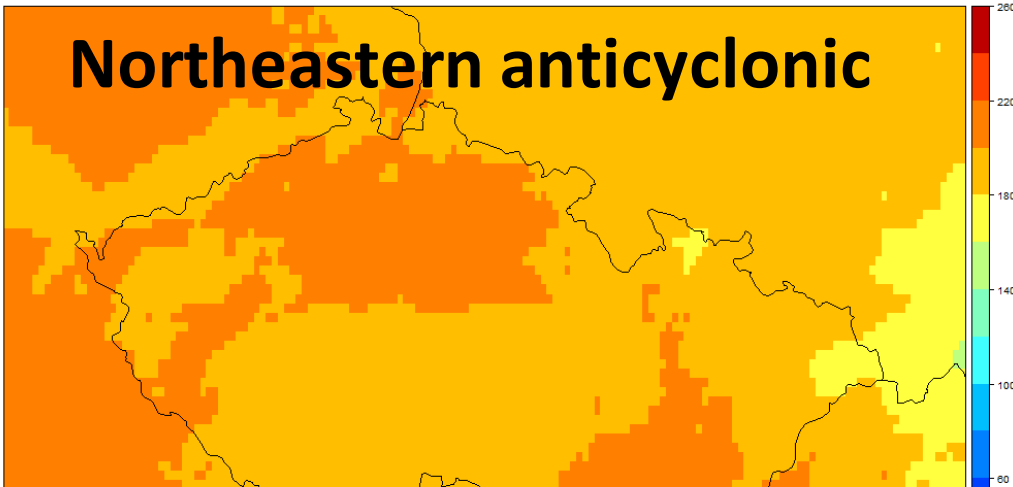
- cloudiness CFC (daily means):
  - COMET (res.  $0.05^\circ \times 0.05^\circ$ ), 1991-2015
  - *CLARA (res.  $0.25^\circ \times 0.25^\circ$ ) 1983-2015 (for trend analysis)*
- radiation SIS (daily means)
  - SARAH (res.  $0.05^\circ \times 0.05^\circ$ ), 1983-2015
- sunshine duration SDU (daily sums)
  - SARAH (res.  $0.05^\circ \times 0.05^\circ$ ), 1983-2015

# Global radiation (SIS, W/m<sup>2</sup>)

- When we have **highest** SIS (annual mean)?

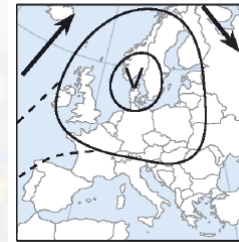
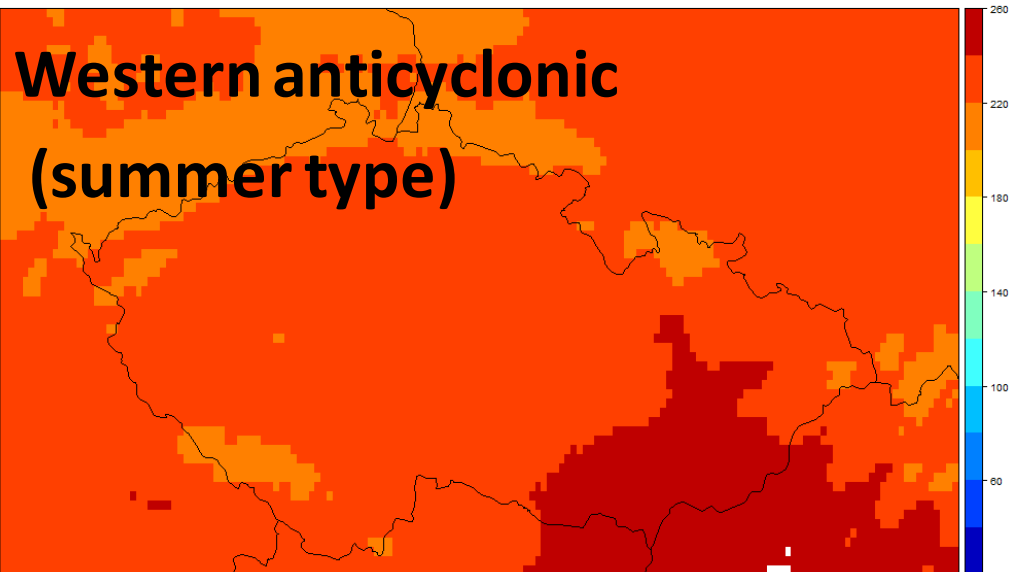
Grosswetterlage 13 - SIS, Mean annual 1983 - 2015, CM SAF, (W/m2)

## Northeastern anticyclonic

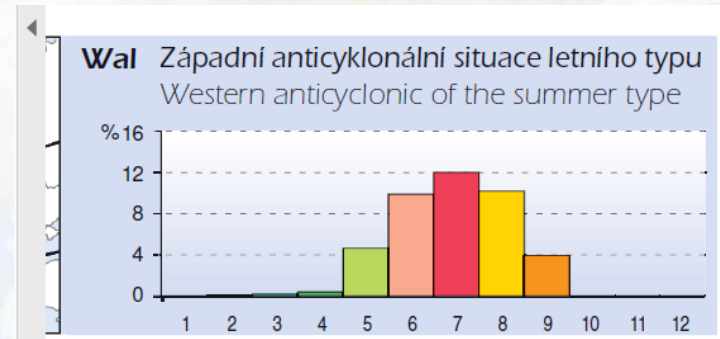
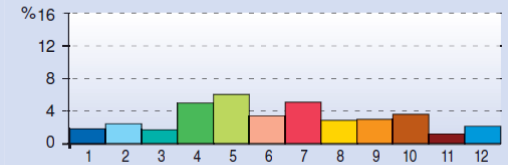


Grosswetterlage 26 - SIS, Mean annual 1983 - 2015, CM SAF, (W/m2)

## Western anticyclonic (summer type)

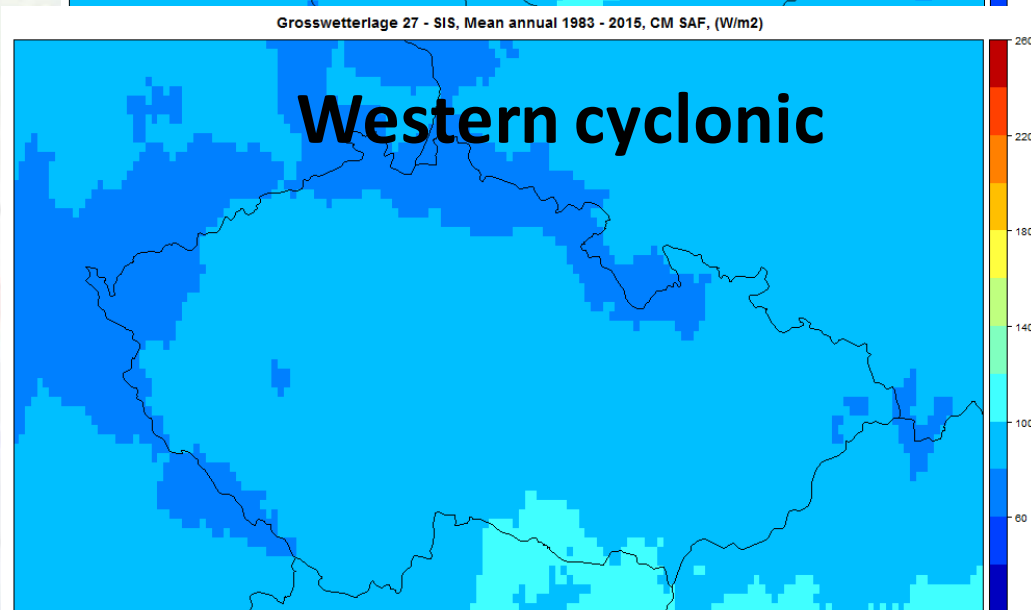
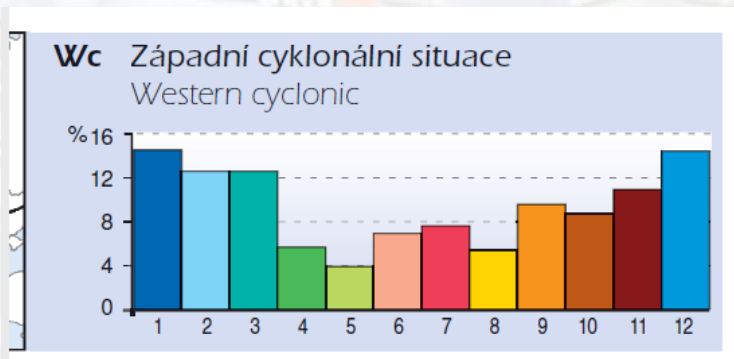
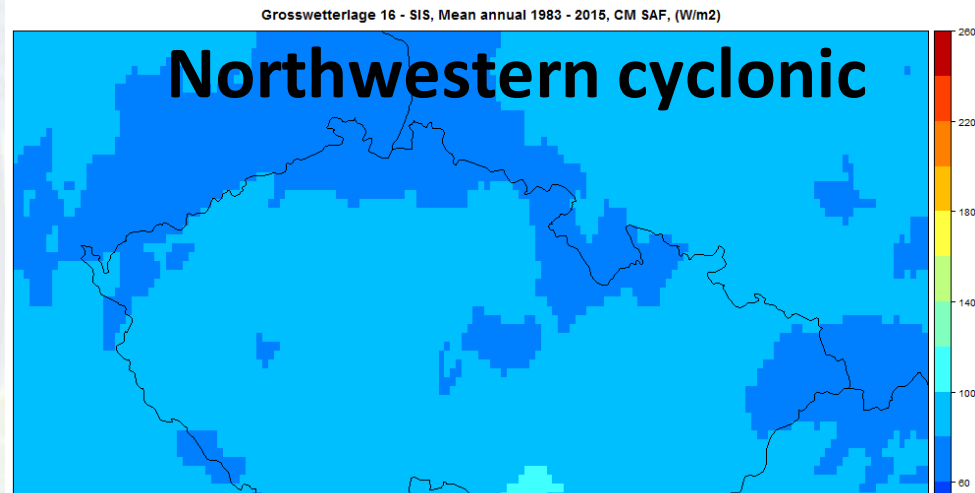
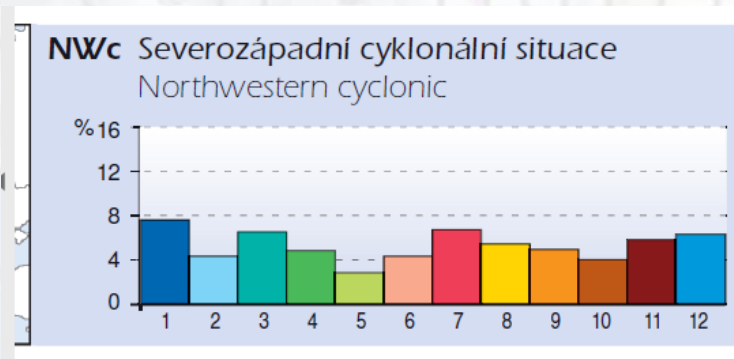


NEa Severovýchodní anticyklonální situace  
Northeastern anticyclonic



# Global radiation (SIS, W/m<sup>2</sup>)

- When we have **lowest** SIS (annual mean)?



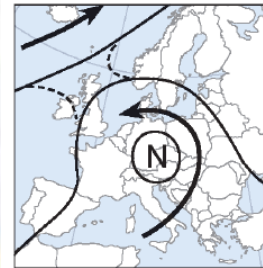


# Cloudiness (CFC, %)

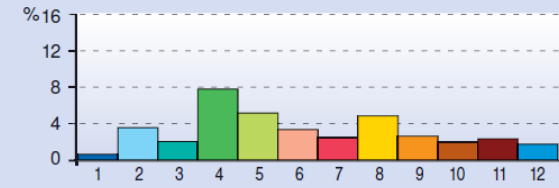
- When we have most / least cloudiness (annual mean)?

Grosswetterlage 8 - CFC, Mean annual 1991 - 2015, CM SAF (%)

## Cyclone over CE

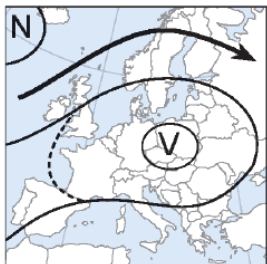
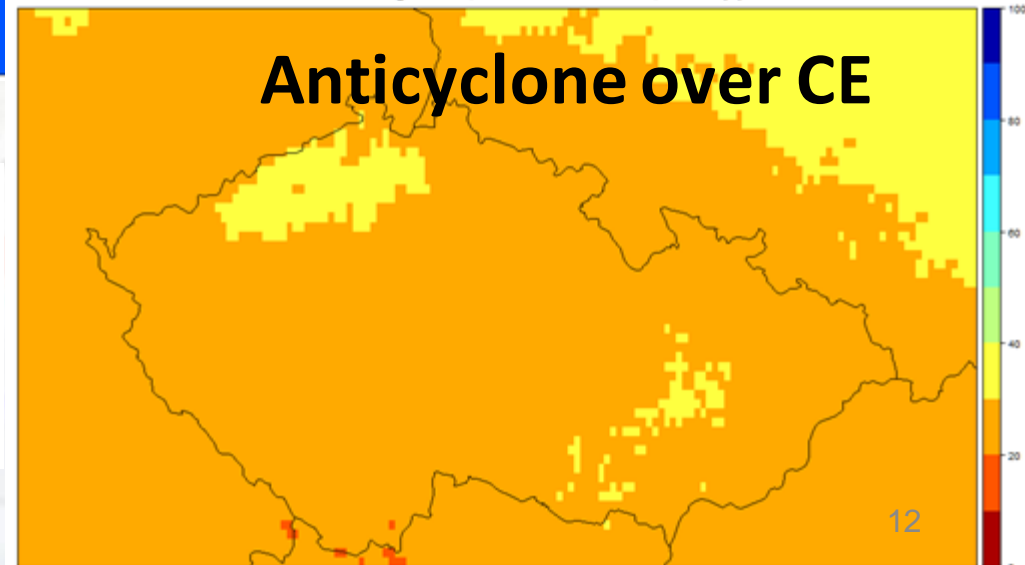


C Cyklóna nad střední Evropou  
Cyclone over Central Europe

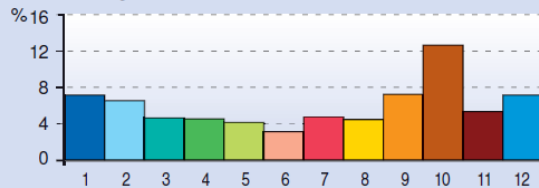


Grosswetterlage 1 - CFC, Mean annual 1991 - 2015, CM SAF (%)

## Anticyclone over CE

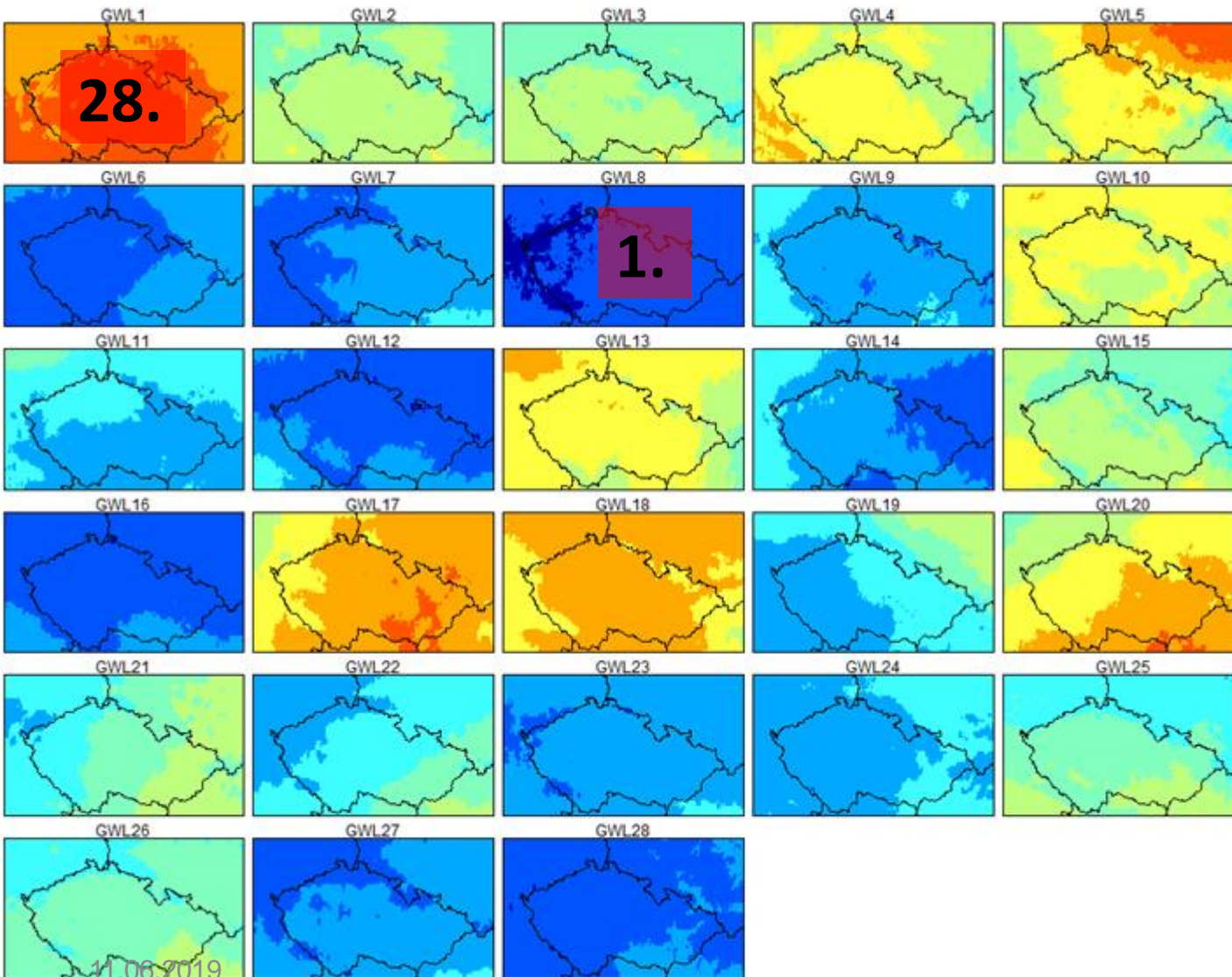


A Anticyklóna nad střední Evropou  
Anticyclone over Central Europe



# Cloudiness (CFC, %)

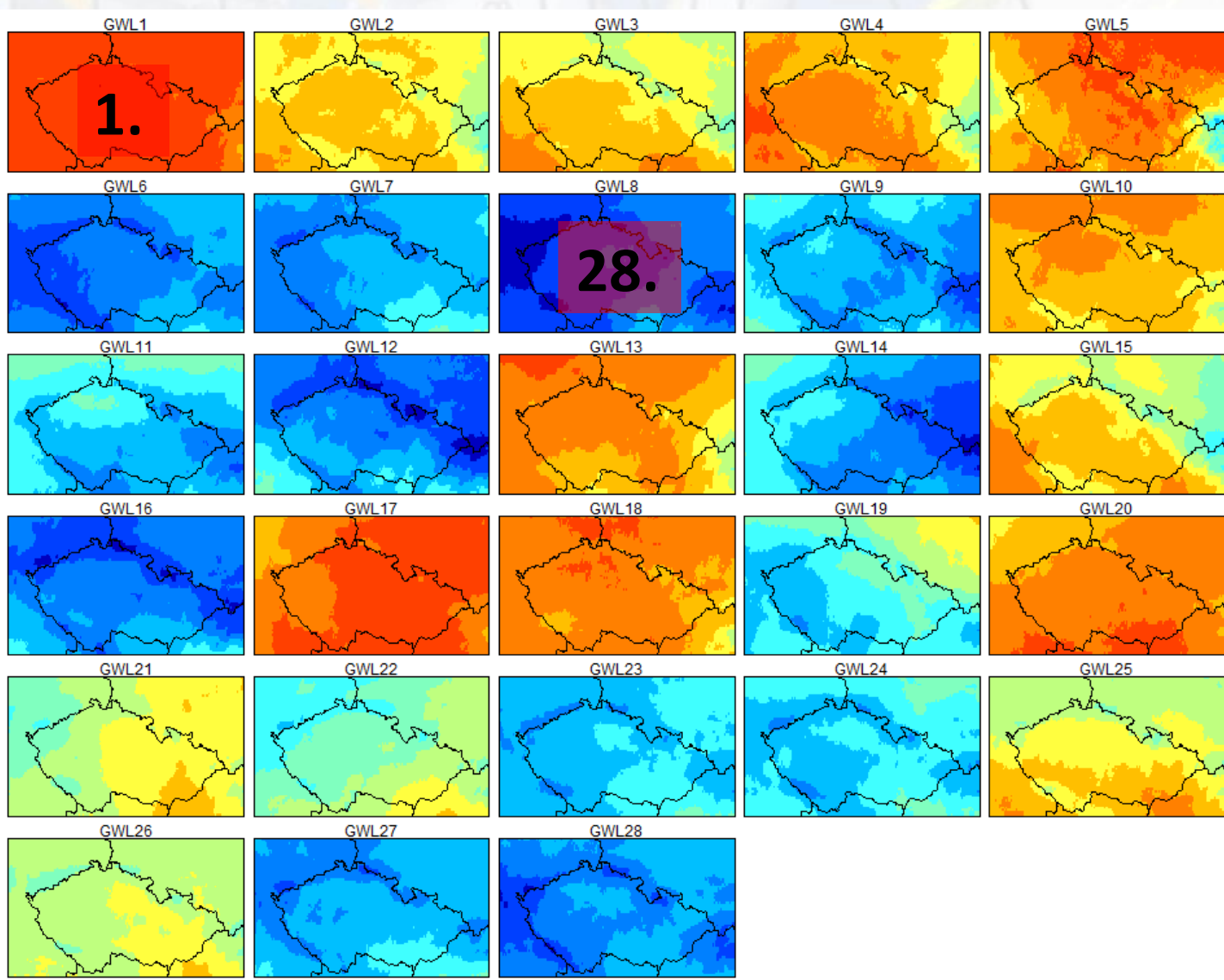
## Summer season (May-August)



GWL_NR	abbreviation	description
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5	Ap4	Travelling anticyclone (type4)
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27	Wc	Western cyclonic
28	Wcs	Western cyclonic (with southerly trajectory)

# Sunshine duration (SDU, h)

## Summer season (May-August)

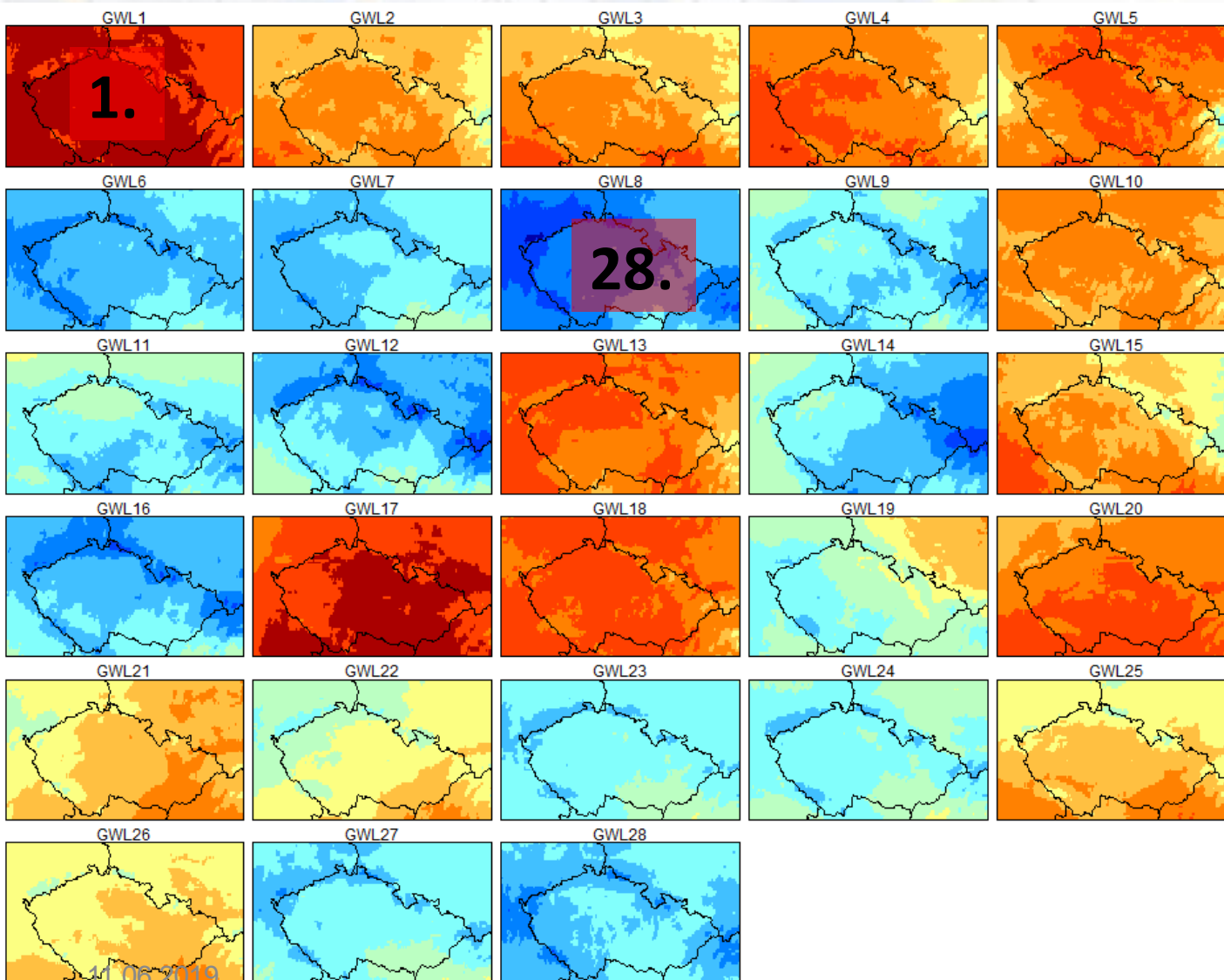


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# Global radiation (SIS, W/m<sup>2</sup>)

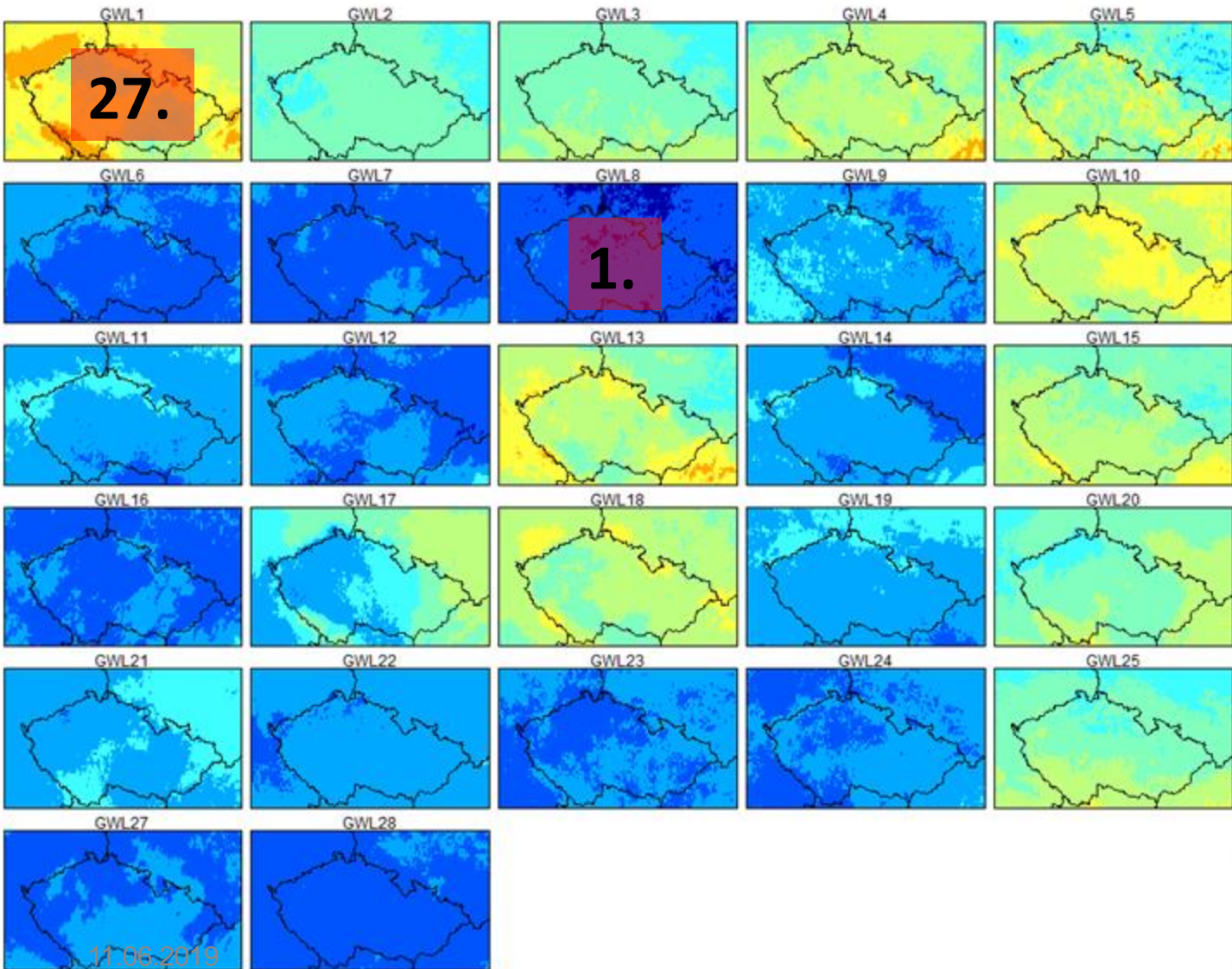
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# Cloudiness (CFC, %)

*Winter season (November-February)*

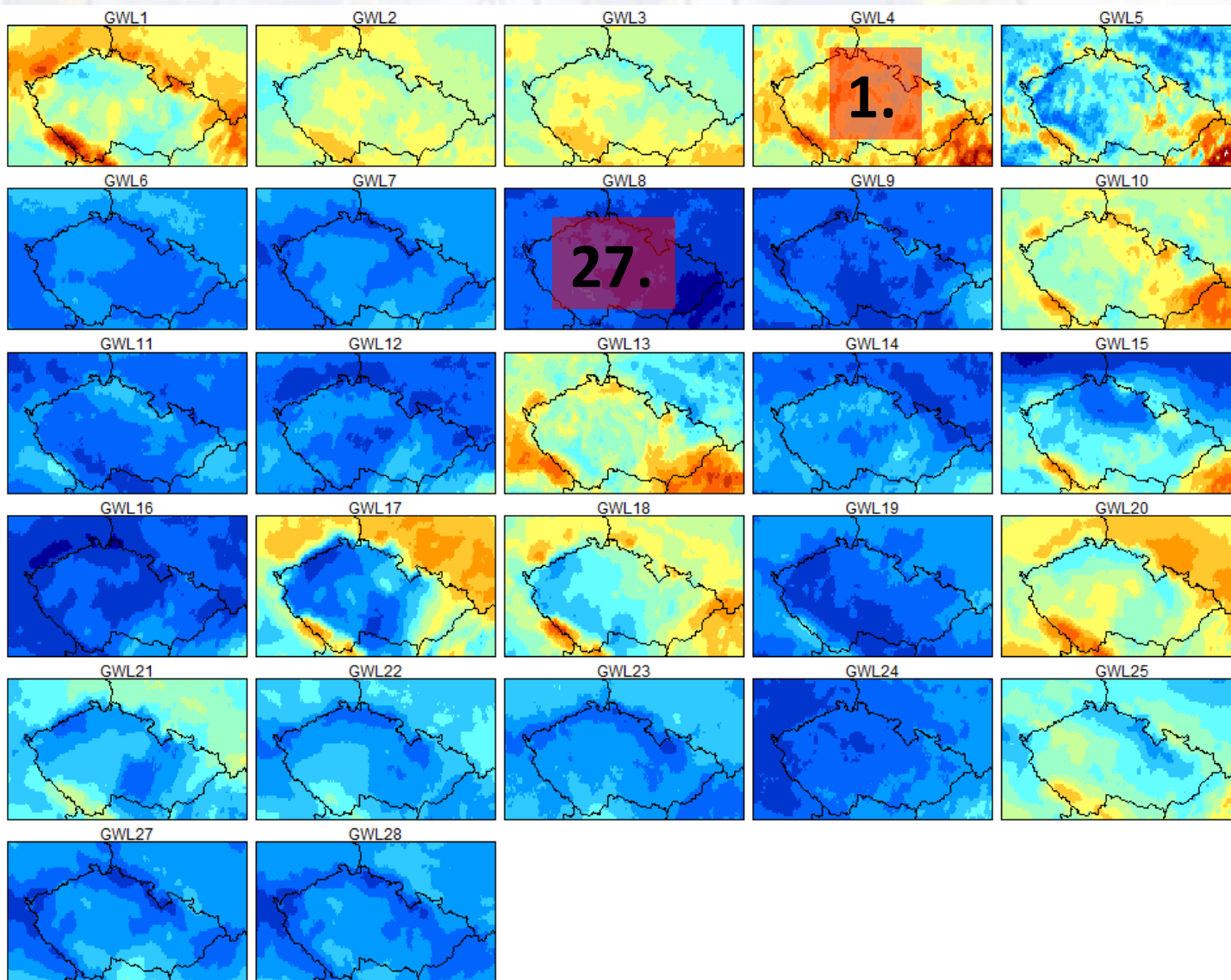


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# Sunshine duration (SDU, h)

*Winter season (November-February)*

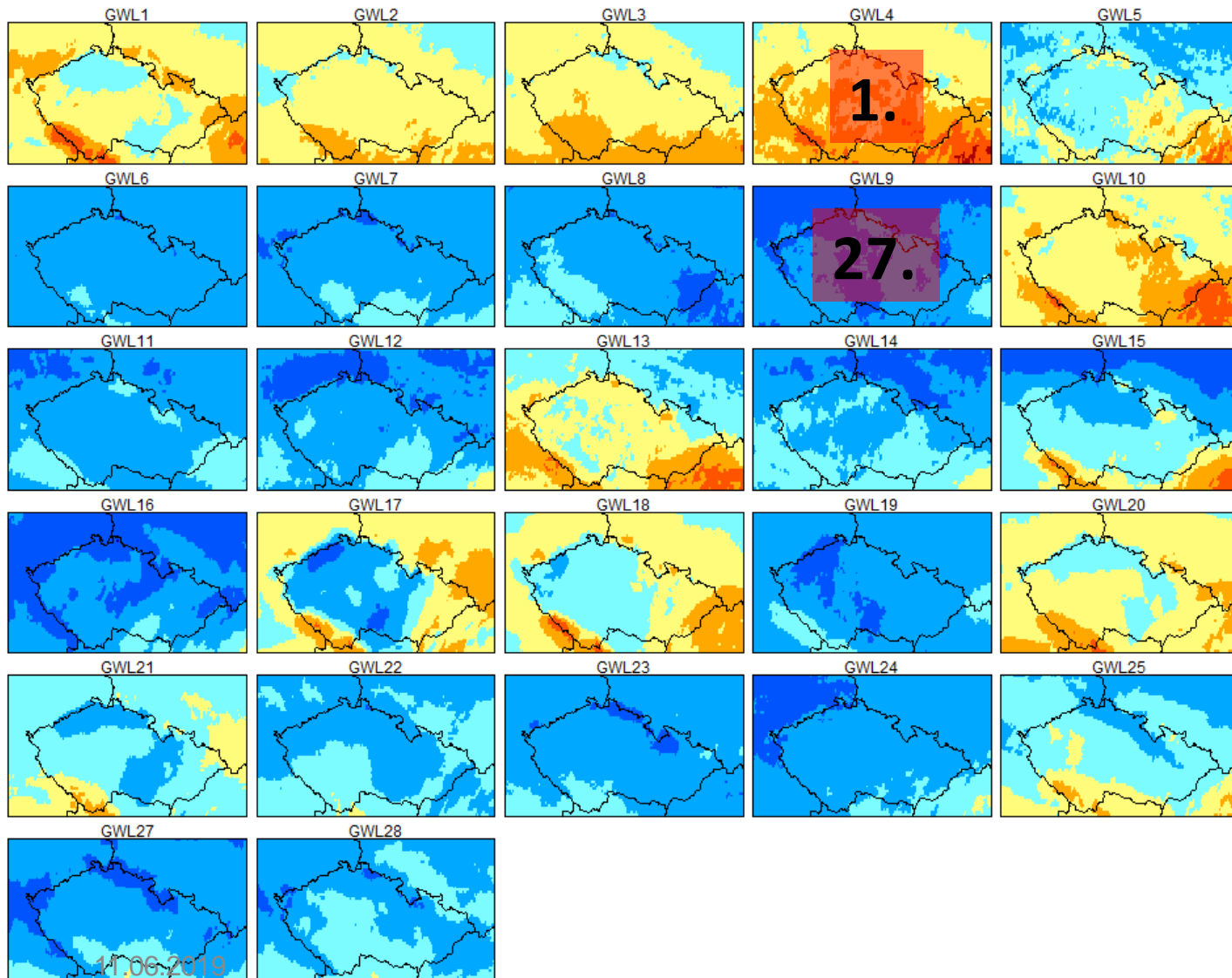


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# Global radiation (SIS, W/m<sup>2</sup>)

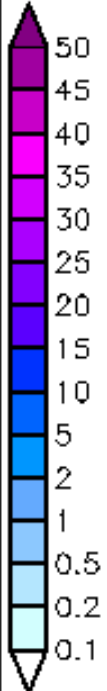
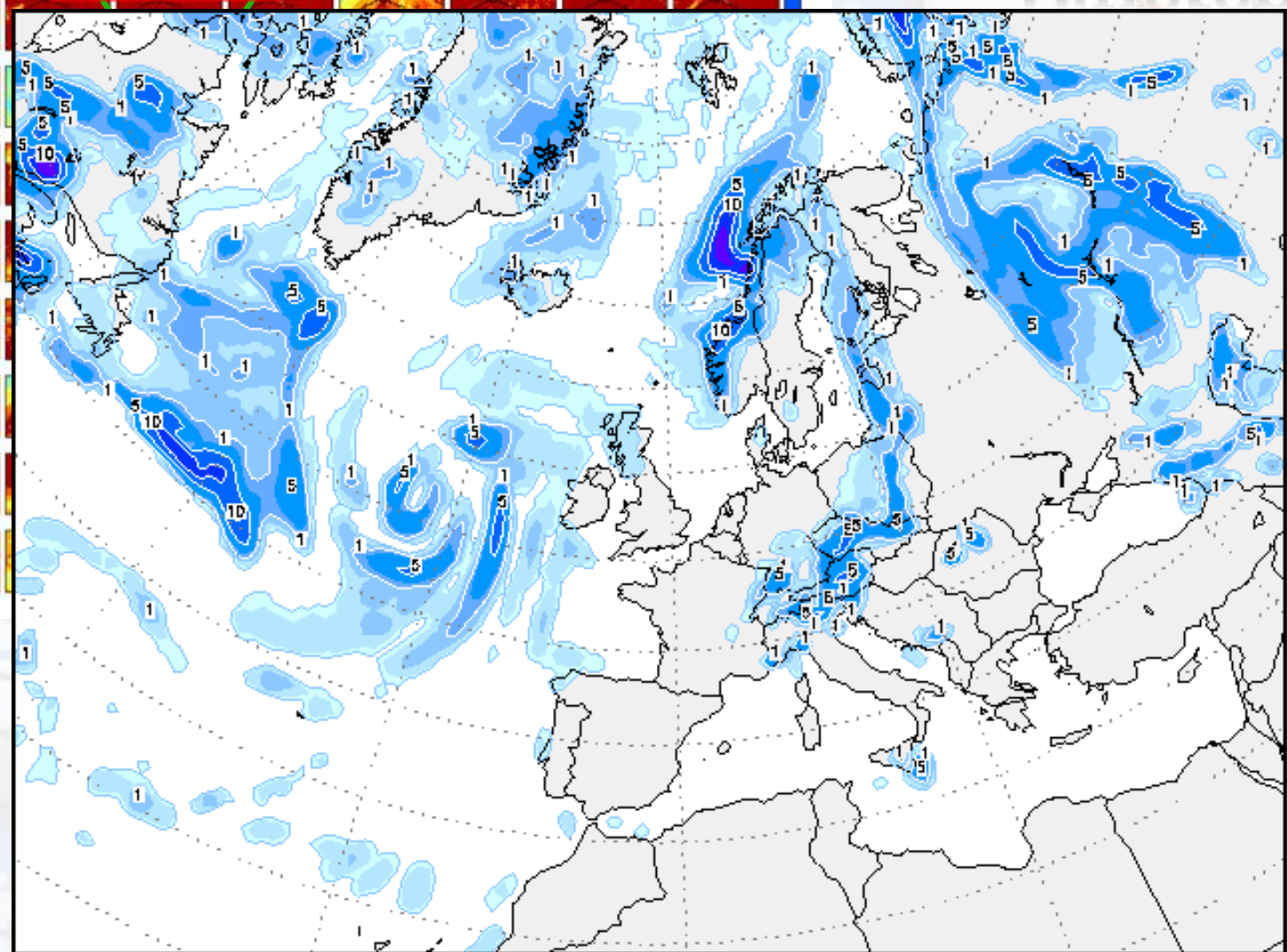
*Winter season (November-February)*



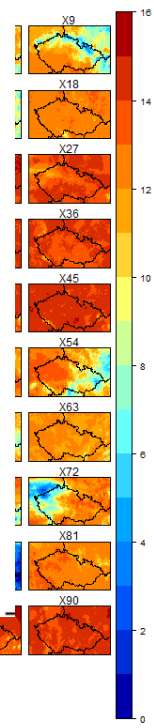
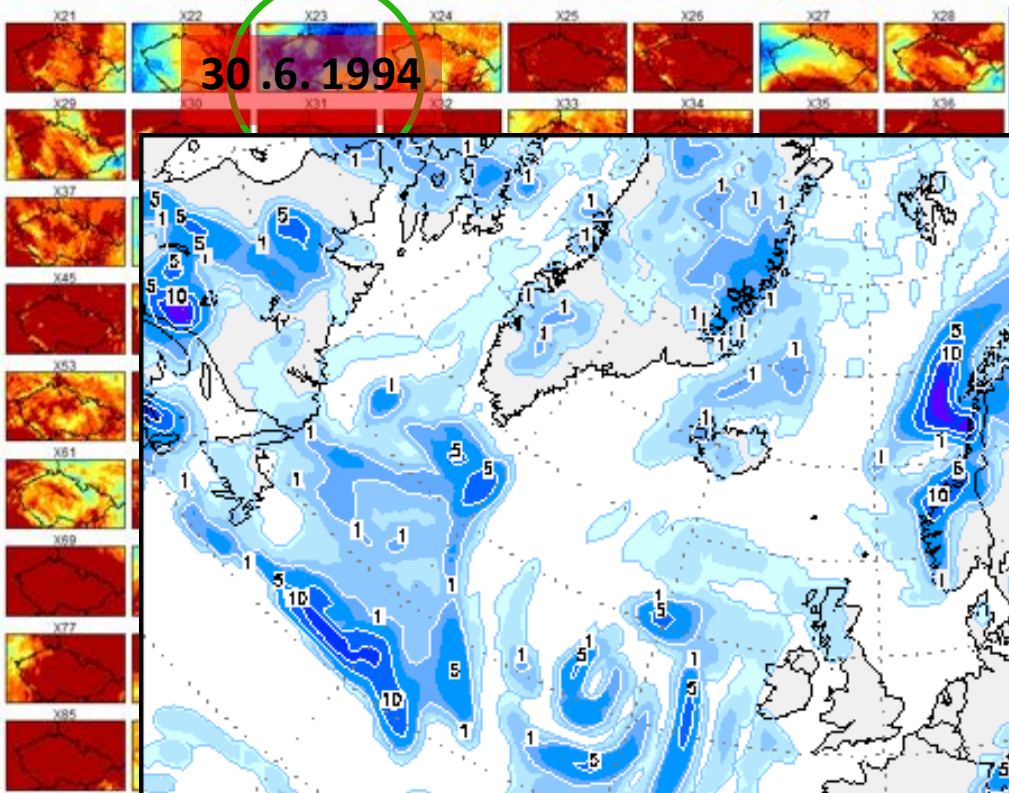
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# Difference

30.6.1994

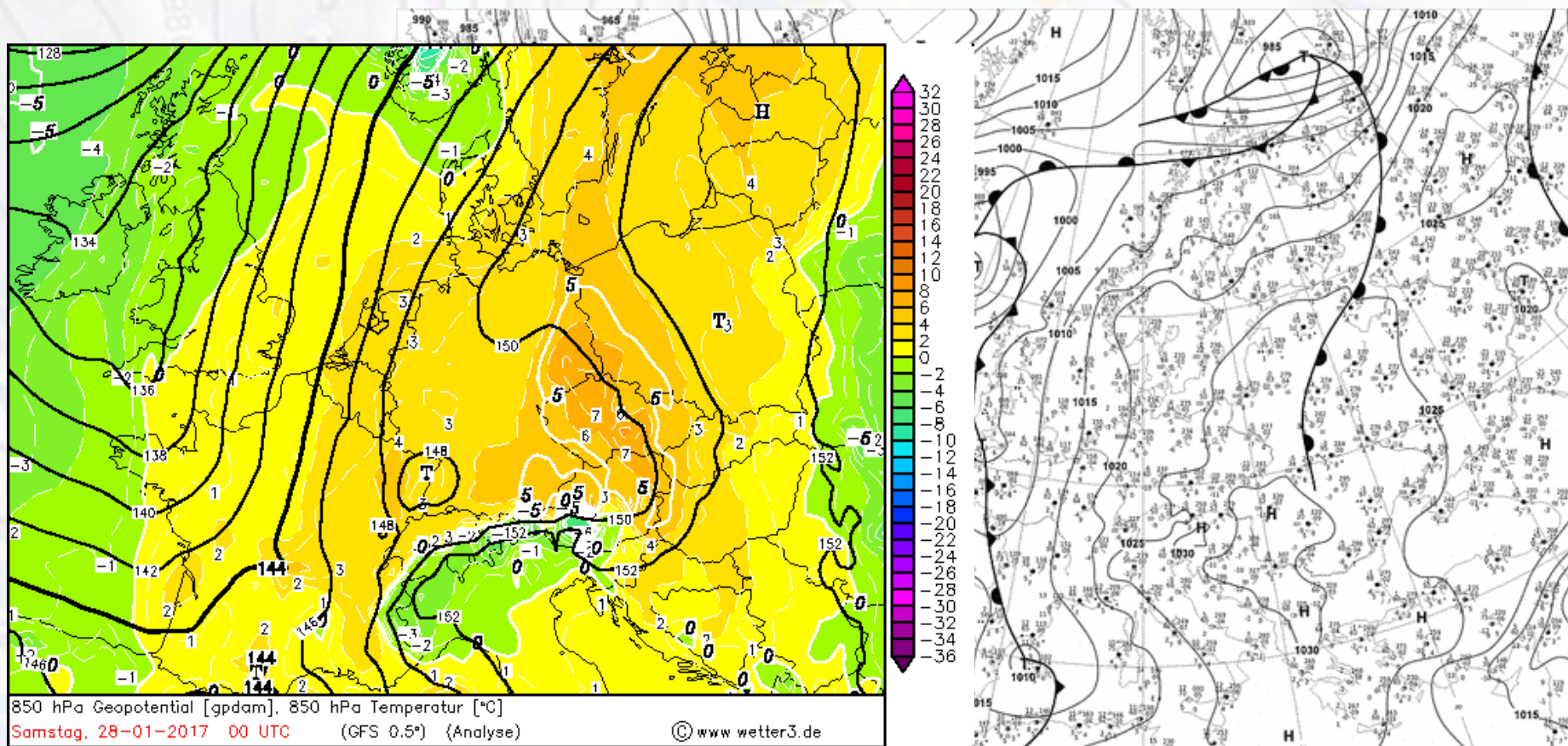


6 - stündiger Niederschlag bis Donnerstag 12 UTC [mm]  
 Donnerstag, 30-06-1994 12 UTC (CFS) (Donnerstag 06 + 06) © www.wetter3.de



# Groups of situations

- days with advection of warm air and stable/inverse stratification in the lower troposphere in winter



11.06.2019

Samstag, 28-01-2017 00 UTC

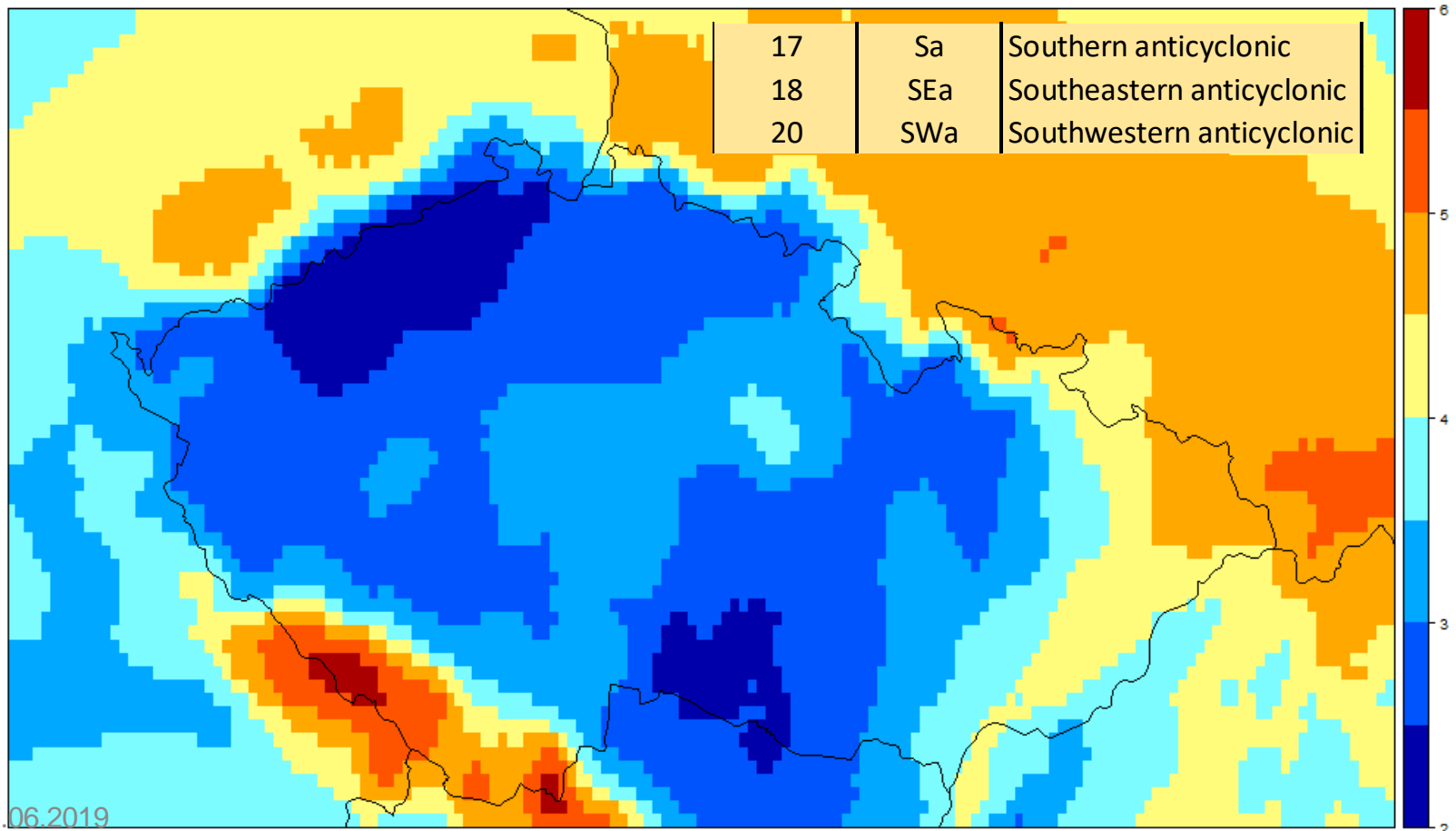
(C) 2017 Deutscher Wetterdienst



# Groups of situations

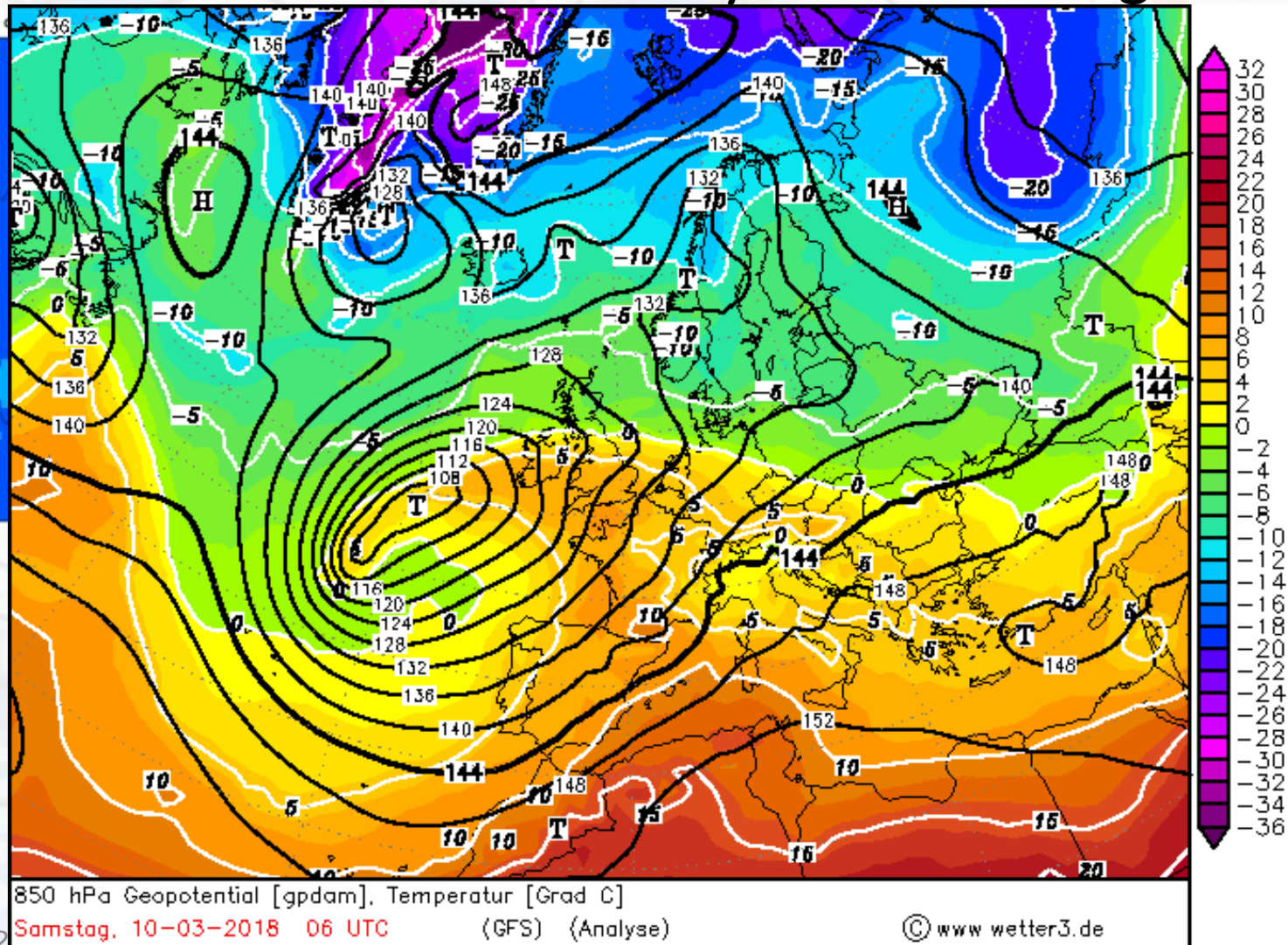
- days with advection of warm air and stable/inverse stratification in the lower troposphere in winter

Grosswetterlage 17,18,20 - SDU, Mean of winter seasons 1983 - 2015, CM SAF



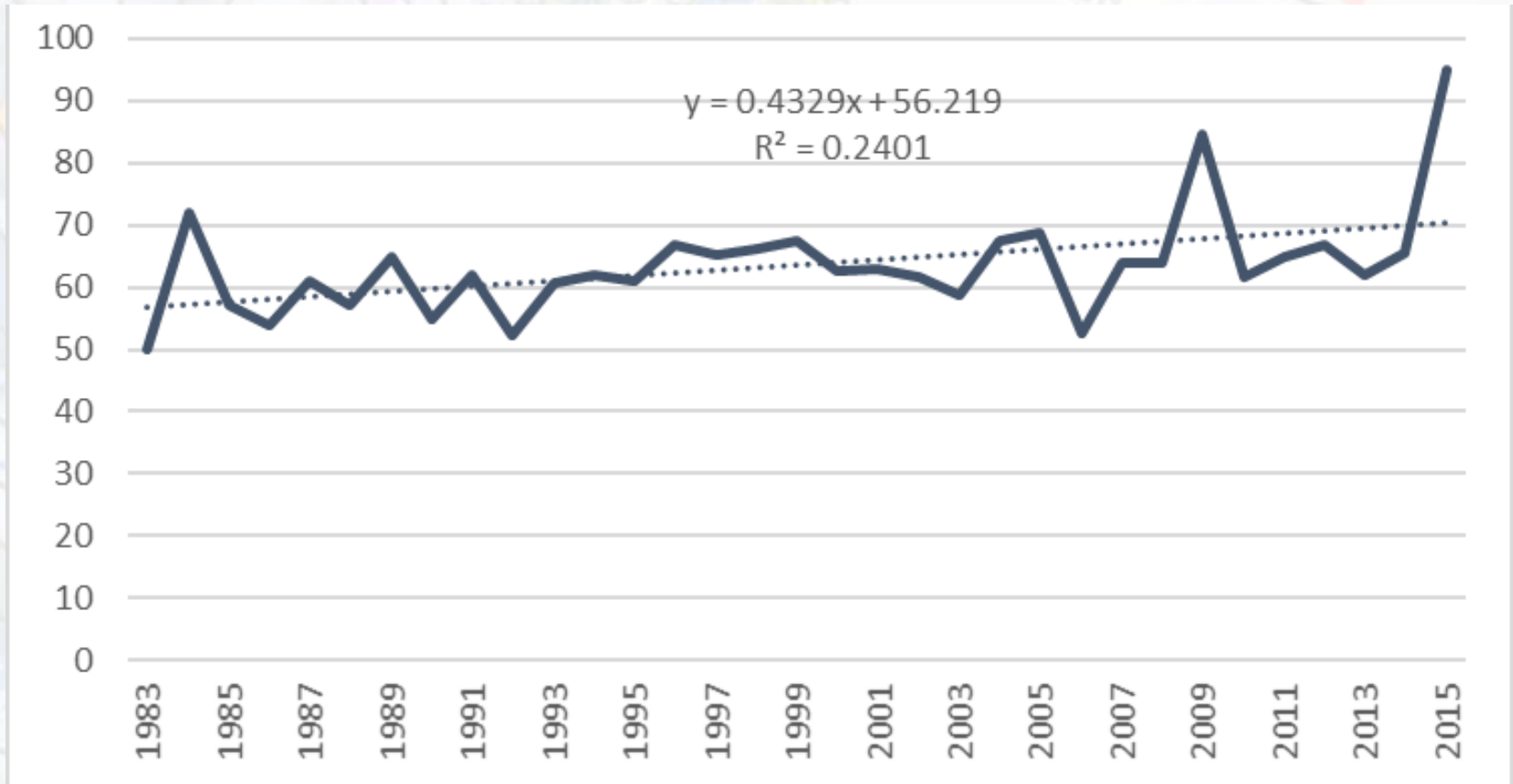
# Groups of situations

- situations with southwesterly air flow at higher levels



# Long term changes

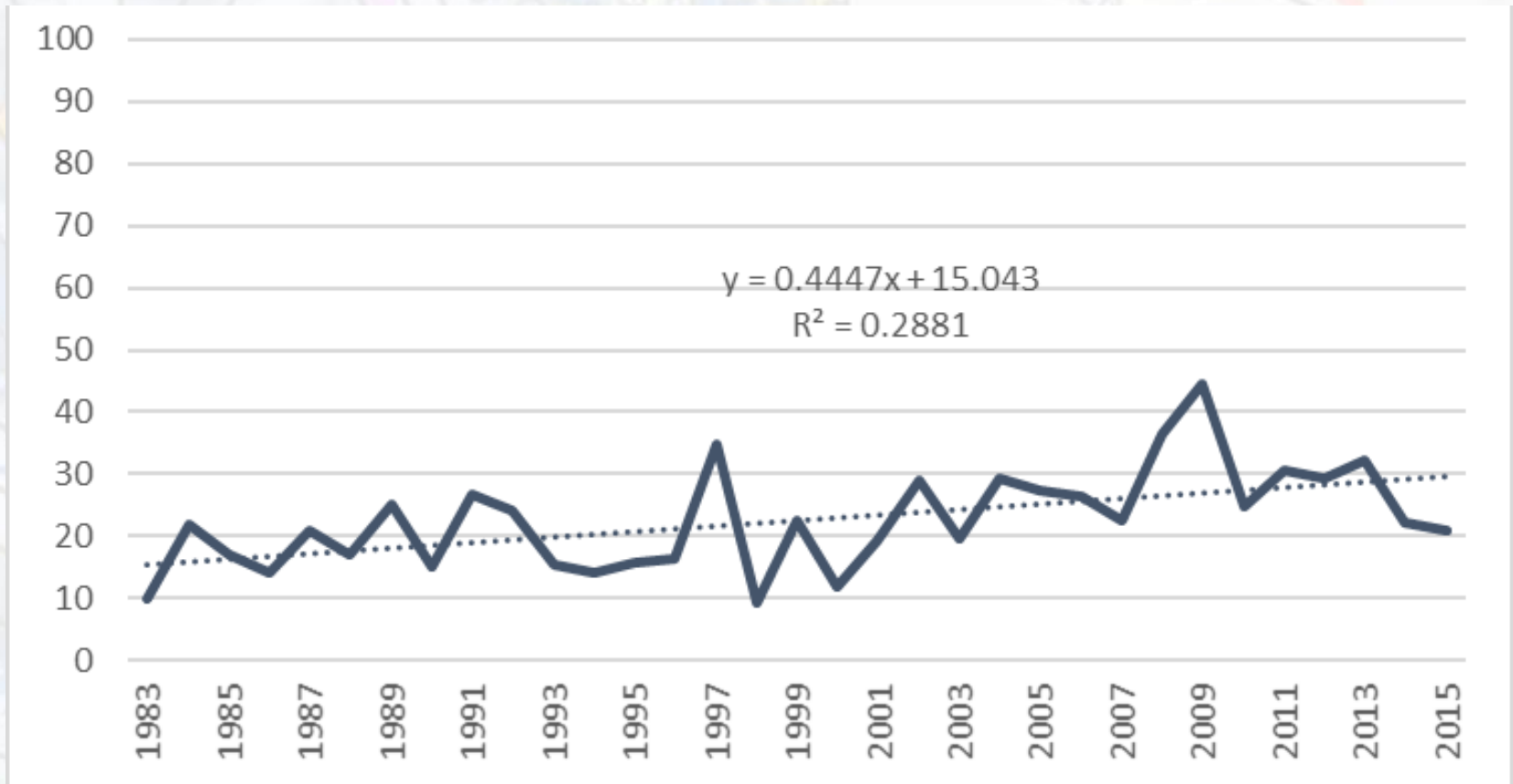
- CFC during „cloudy“ types, JJA





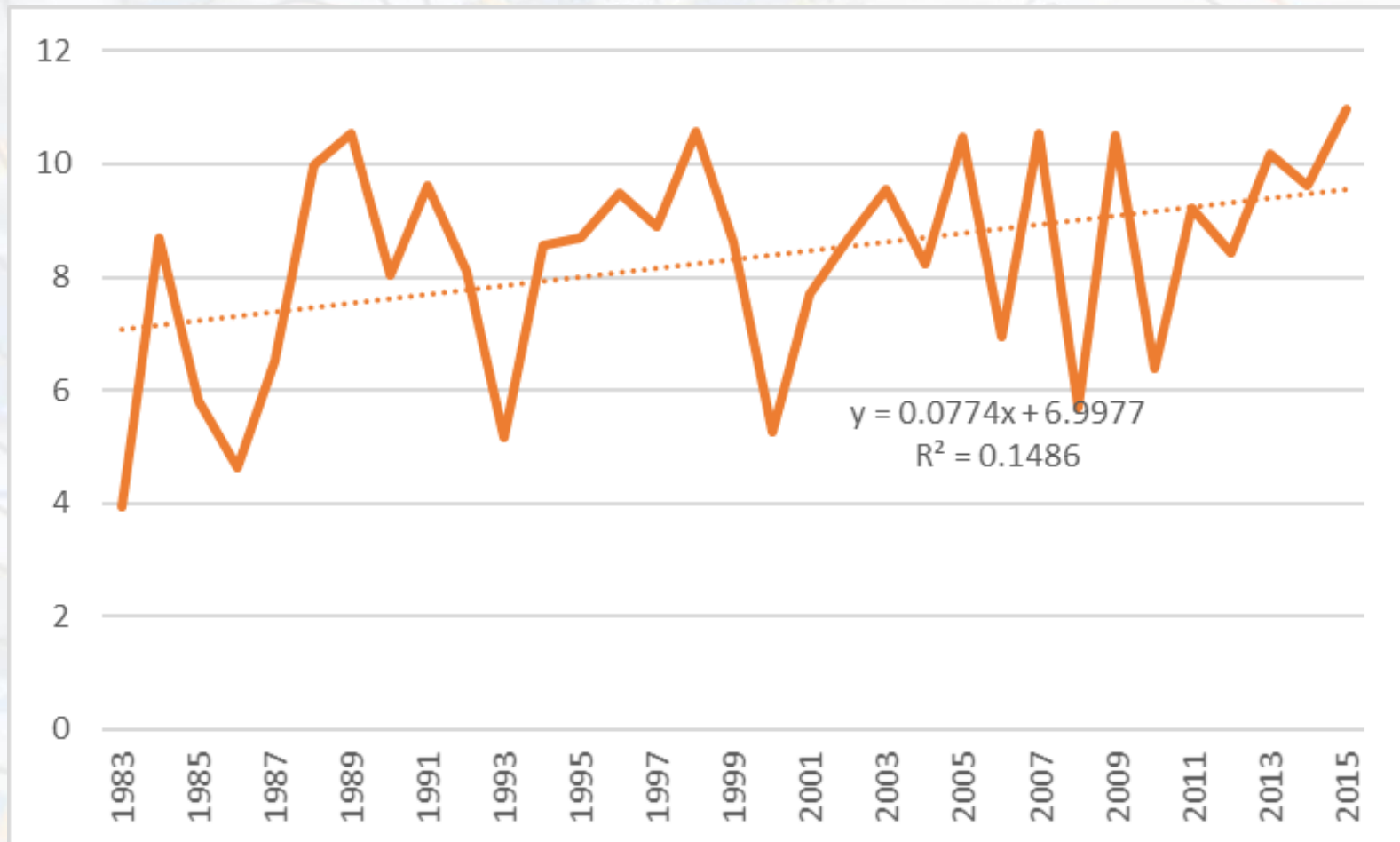
# Long term changes

- CFC during „sunny“ types, JJA



# Long term changes

- SDU during „sunny“ types, March



# Conclusion

- CMSAF data provide very useful data to complete our knowledge about „typical“ weather under given circulation type in the Czech Republic
- Other modification (temporal, parameters) possible/planned (diploma thesis)
- Comparison with „objective“ classification planned
- ... *special thanks to Christine Träger and Jörg Trentmann!*



A background map of Europe showing a weather system. The map features isobars (lines of equal atmospheric pressure) with values ranging from 980 to 1034. A low-pressure system is centered over the North Sea, with a cold front extending southwestward and a warm front extending northeastward. The text "Thank you for your attention" is overlaid in the center of the map.

**Thank you  
for your attention**