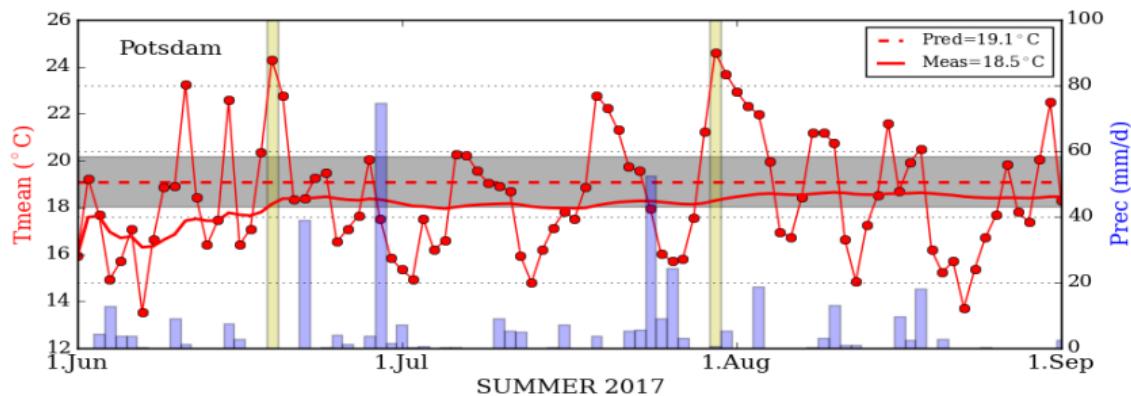


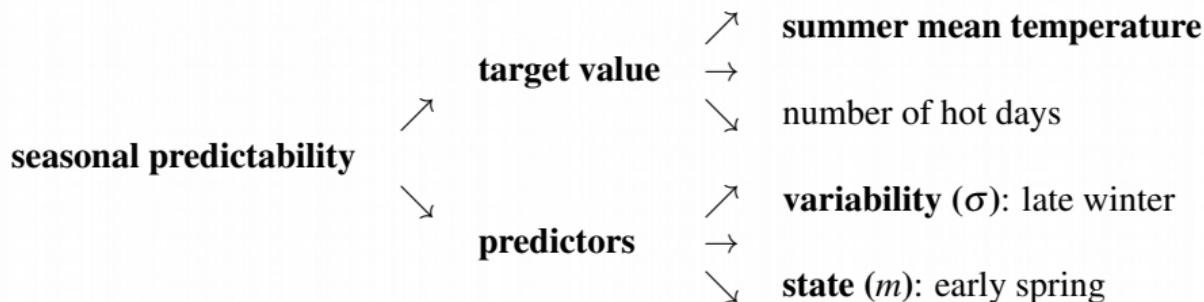
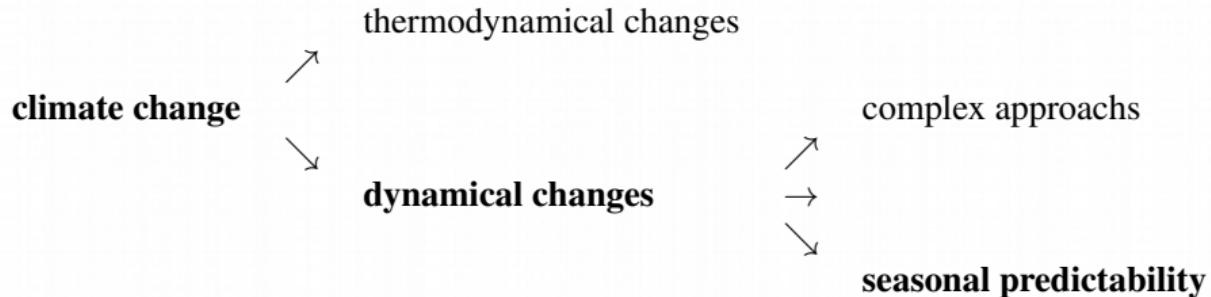
# Enhanced seasonal predictability of the summer mean temperature in Central Europe favored by new dominant weather patterns

P. Hoffmann



**EMS2017: SUB-SEASONAL-TO-SEASONAL PREDICTIONS (OSA2.4)**

# 1. Concept of the diagnostic/prediction Tool



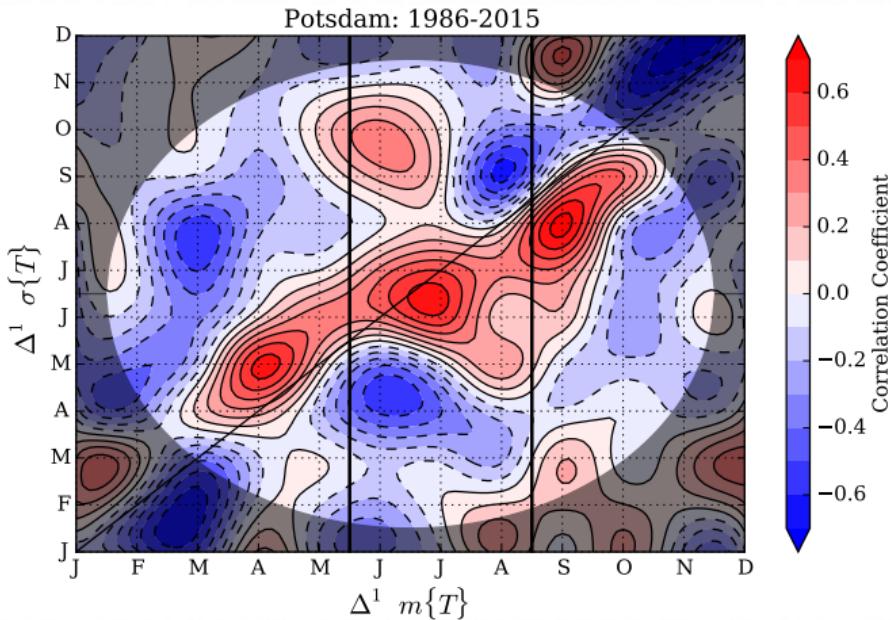
FIRST ORDER DIFFERENCES

$\Delta^1$



## 1.1. From Correlation Matrix to Regression Model

$$\text{corr} \left( m \{ T_{JJA} \}, \sigma \{ T_{Apr} \} \right) = \text{neg.}$$



## 2. Local (Potsdam)

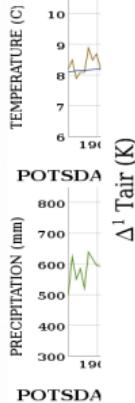
### Local Climate Monitoring: Potsdam

POTSDAM

TMIT  
TREND

POTSDAM

HETA



Potsdam

$\Delta^1\text{Tair}$  (K)

6  
4  
2  
0  
-2  
-4

800  
700  
600  
500  
400  
300

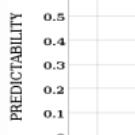
1980 1985 1990 1995 2000 2005 2010 2015 2020 2025

prediction →

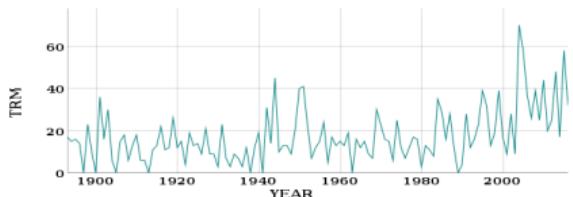
- obs
- mod:  $r^2 = 0.45$
- JJA2015: 19.3°C
- Jun2015: 16.9°C
- Jul2015: 19.6°C
- Aug2015: 21.8°C
- JJA2015: 19.3°C

IST

A line graph showing the temperature trend for Potsdam from 1900 to 2015. The y-axis ranges from 0 to 0.6. The trend shows a significant increase starting around 1980.



YEAR

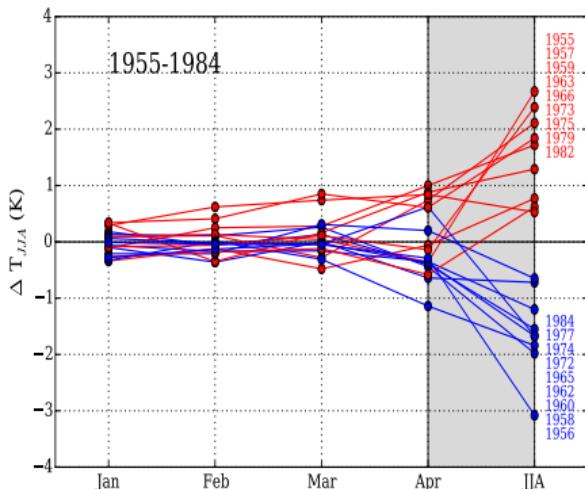


YEAR



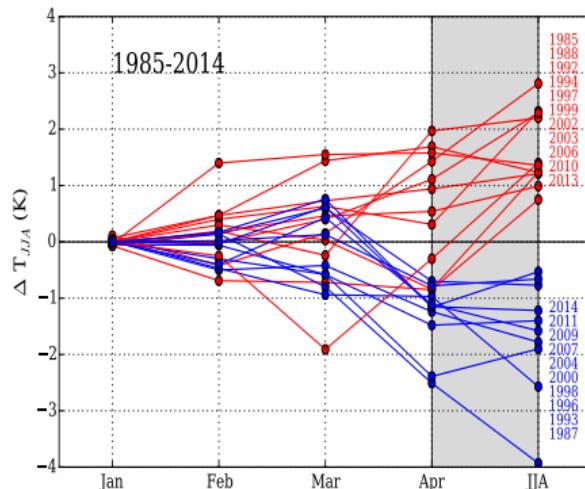
## 2.1. Long-Term Analysis

past:



weak contributions

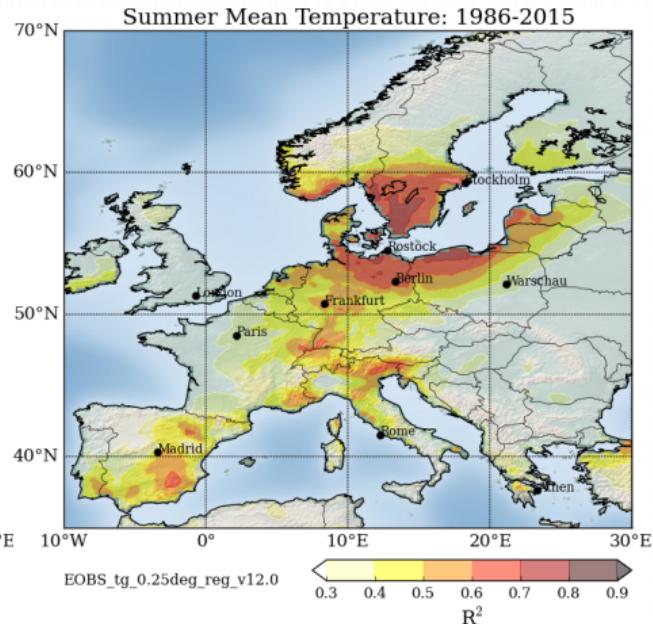
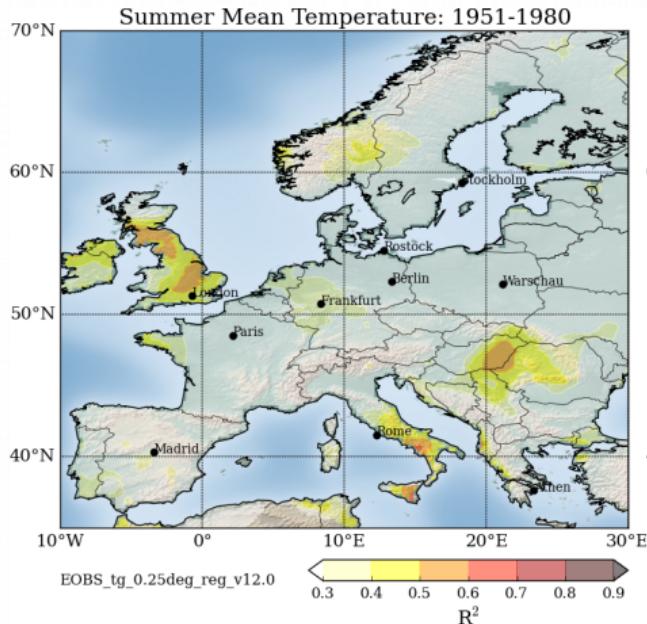
recent:



strong contributions

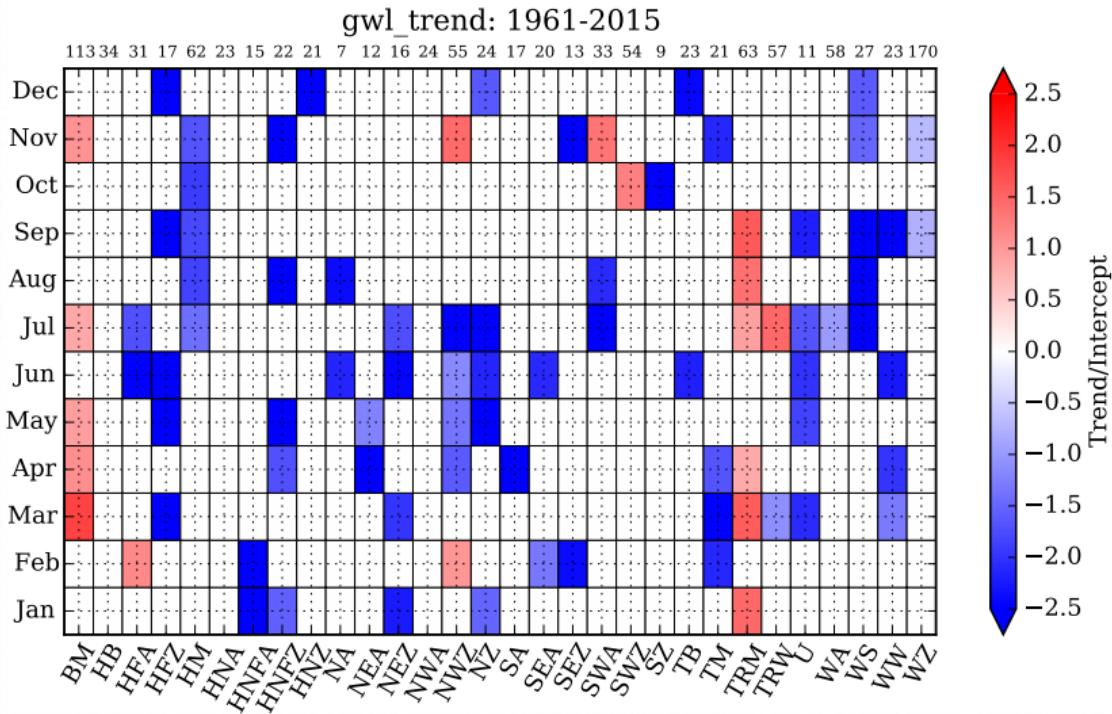


### 3. Regional (Europe)

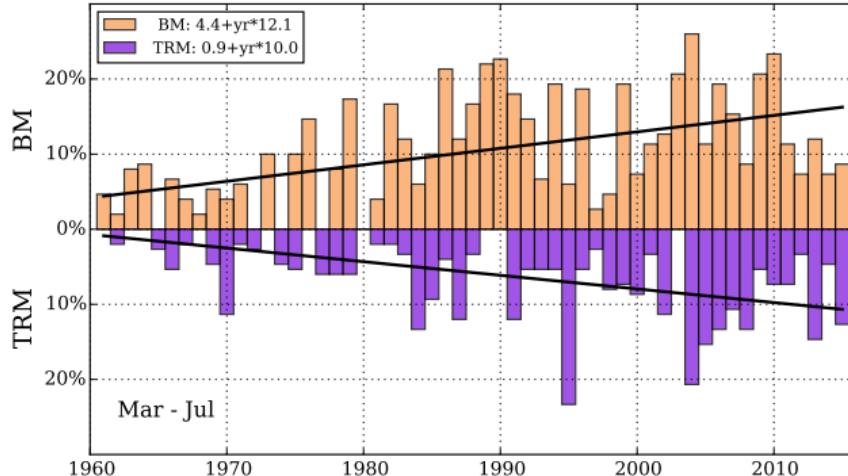
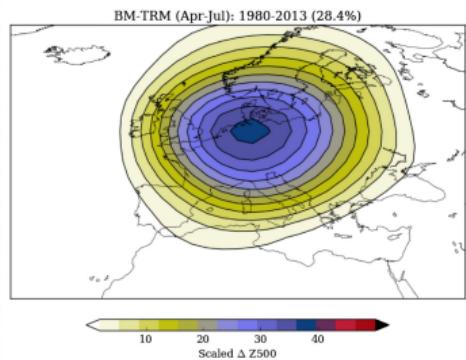
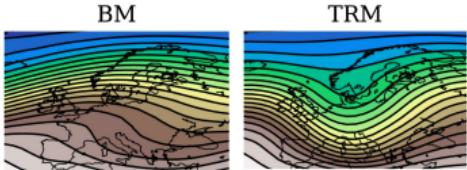


Circular R<sup>2</sup>-Pattern over the Baltic Sea (for recent climate)

### 3.1. Hess/Brezowsky Weather-Type Analysis



### 3.2. New Dominant Weather-Types (Mar-Jul)

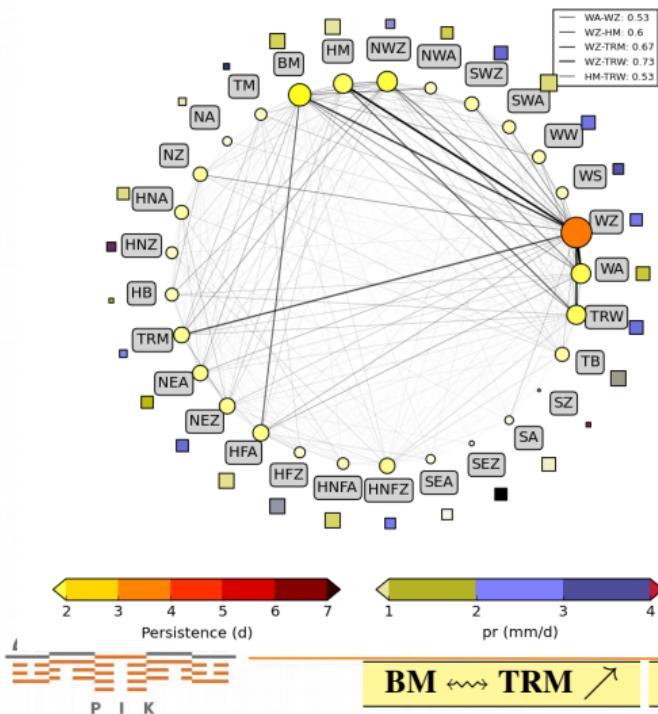


<b>BM</b>	Zonal Ridge across Central Europe	<b>Heat Waves</b>	<b>30 %</b>
<b>TRM</b>	Trough over Central Europe	<b>Heavy Rain</b>	

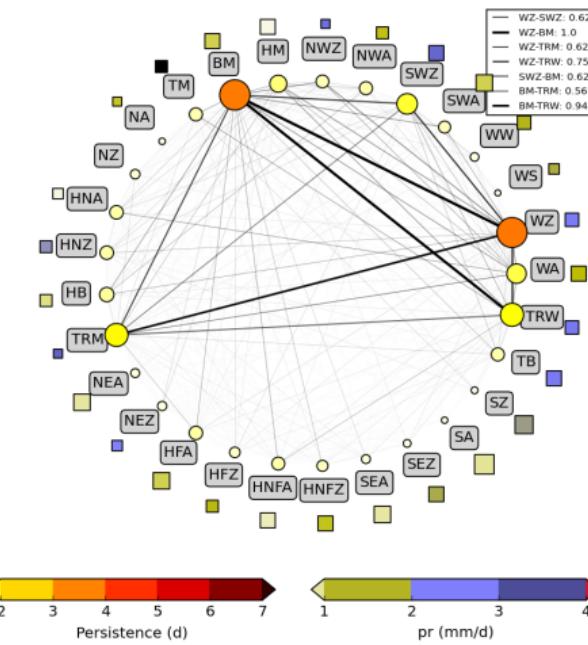


### 3.3. Sequences of Weather-Types (Apr-Aug)

Sequence of European Weather-Types between 1951-1980 (Apr-Aug)



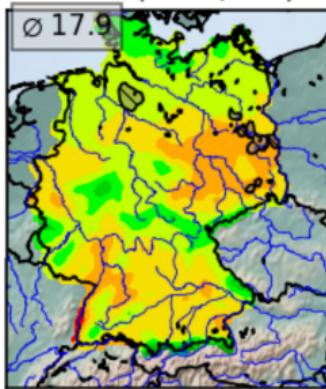
Sequence of European Weather-Types between 1987-2016 (Apr-Aug)



## 4. National (Germany): update 2017-05-01

### Germany 2017

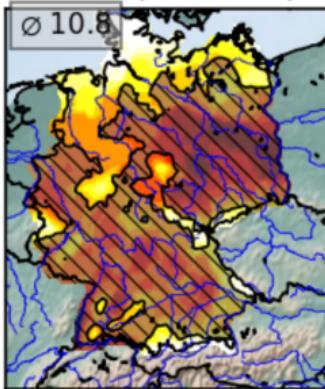
2017 (17.9/0.9)



10 15 20

SMT (K)

2017 (10.8/4.8)



5 10 15 20

HT (d)

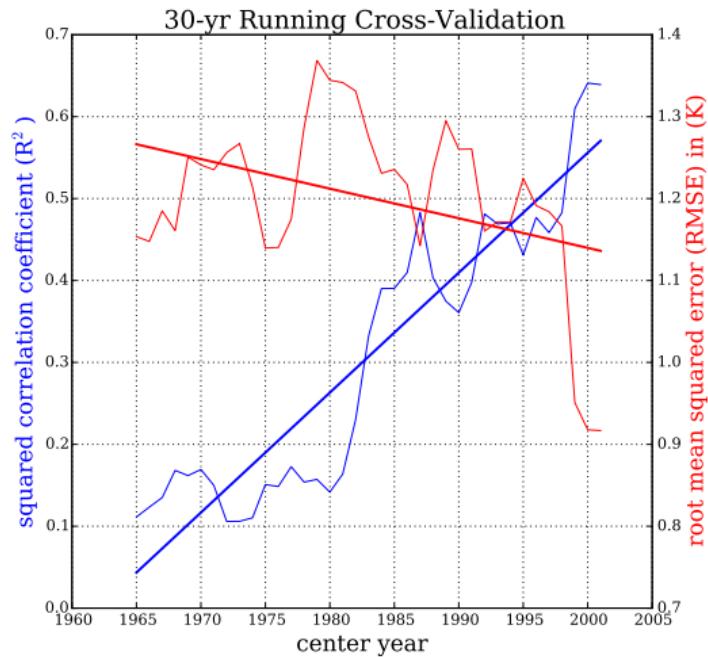
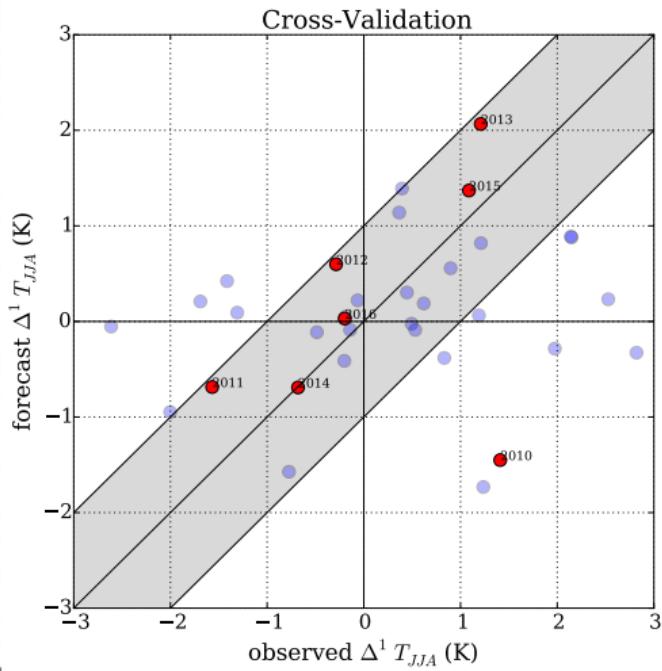
### Potsdam 2017

Jun-Aug	Jul-Aug	Hot-Days
20.5	20.5	20
20.0	20.0	18
19.5	19.5	16
19.0	19.0	14
18.5	18.5	12
18.0	18.0	10
17.5	17.5	8
17.0	17.0	6
16.5	16.5	4
16.0	16.0	2

(c) peterh@pik-potsdam.de

SMT2017 similar to SMT2016 +++ HT2017 more than HT2016 ↗ more extreme weather events

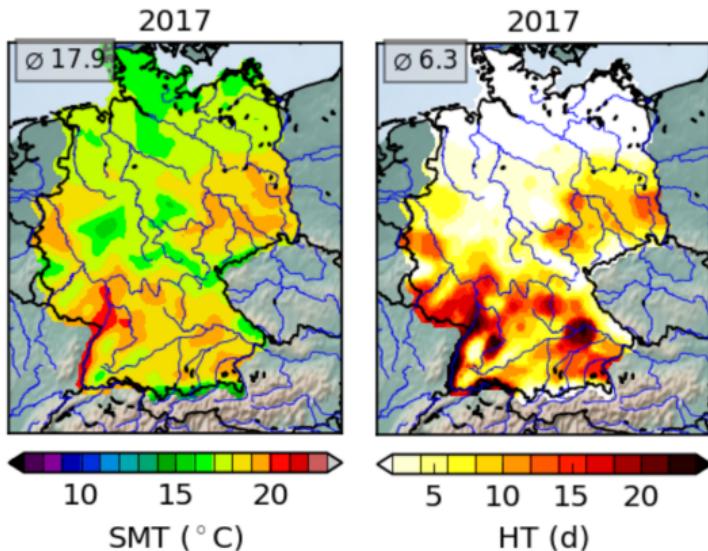
## 4.1. Seasonal Prediction Skill for Potsdam (Cross-Validation)



Potsdam: Prediction of the last 3 years nearly perfect !

## 4.2. Evaluation of the Prediction 2017: update 2017-09-01

### Germany 2017



### Potsdam 2017

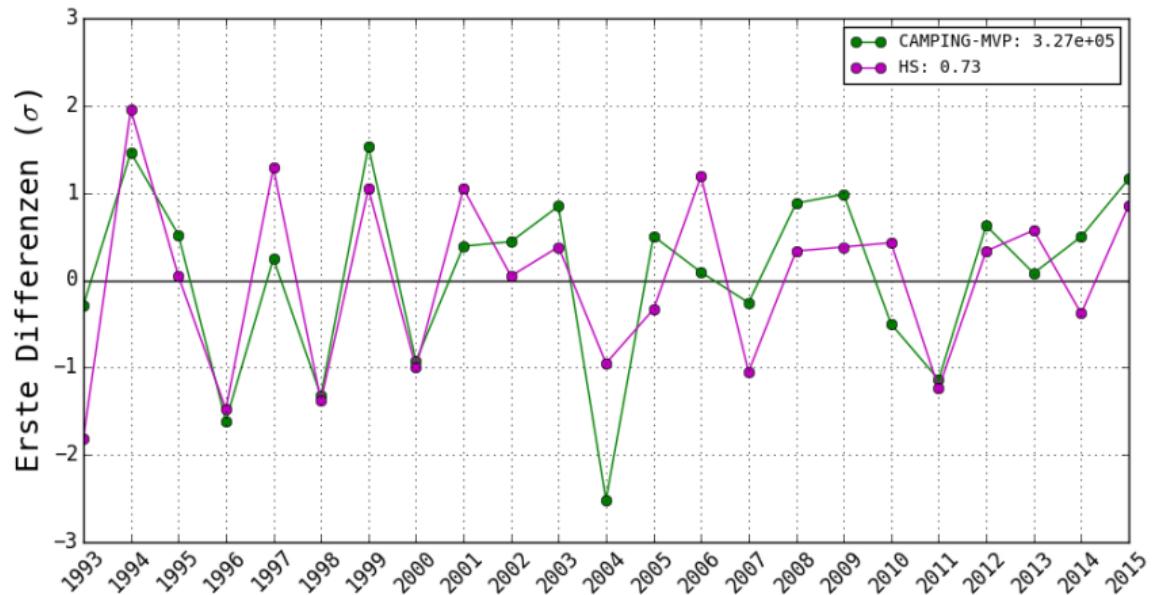
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18.0	18.0	10
17.5	17.5	8
17.0	17.0	6
16.5	16.5	4
16.0	16.0	2

2017 vs. 2016

(c) peterh@pik-potsdam.de

△SMT2017 =~0.0K +++ △HT2017=-4d ↗ record breaking rainfall events in Central Europe

## 4.3. Application: Camping Tourism around the Baltic Sea



High correlation between  $T_{Jul-Aug}$  and “overnight stays” in “Mecklenburg-Vorpommern”!

## 5. Summary & Conclusions

- Seasonal predictability measure for detecting circulation changes over Europe
- Enhanced seasonal predictability of the summer mean temperature over the Baltic Sea
- Circular Pattern can be explained by two new dominant weather patterns

**CAUTION:** Both favor extreme weather events: BM (heat waves) & TRM (heavy rain)

- A linkage to a weakening jet stream caused by changing temperature gradients is supposed

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Clim Dyn  
DOI 10.1007/s00382-017-3772-0



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Received: 19 May 2016 / Accepted: 16 June 2017  
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