Deutscher Wetterdienst
Wetter und Klima aus einer Hand

Towards a decadal forecast for German public

Fatemeh Davary Adalatpanah
Barbara Früh
Claus-Jürgen Lenz

Deutscher Wetterdienst
Zentrales Klimabüro

COSMO / CLM / User Seminar

2-6 March 2015
Offenbach, Deutscher Wetterdienst (DWD)

OUTLINE:

- **Motivation**
- **Hindcast**
- **Evaluation…Accuracy & Reliability**
- **Decadal Forecast for Public**
- **Summary**

FONA Decadal Climate Prediction BMBF

MiKlip

Deutscher Wetterdienst
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DWD

Forecasting decadal climate (MiKlip)

- 4 years research programme of

  German Ministry for Education and Research (BMBF)

  September 2011 . . . . August 2015

Bundesministerium für Bildung und Forschung

- **Central task:**

  development of a model system forecasting the expected climate change and related weather phenomena on a temporal scale of up to 10 years considering both anthropogenic induced changes and natural climate variation

http://www.fona-miklip.de/en

Towards a Limited-Area Climate Ensemble Prediction System for decadal forecasts

LACEPS

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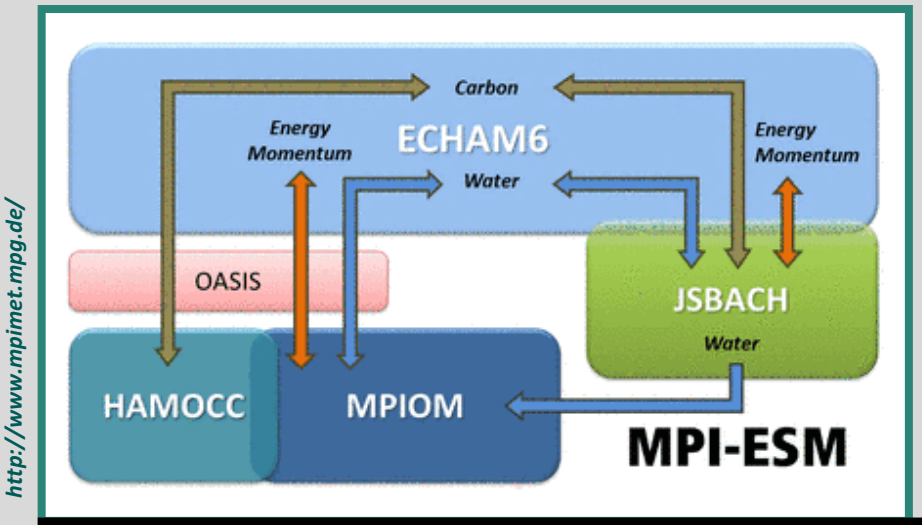
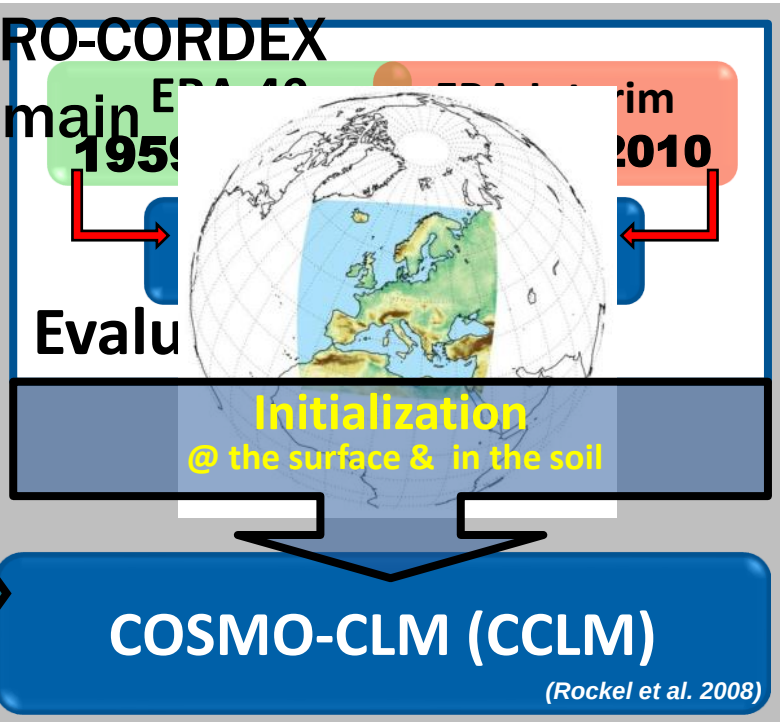
… on the global & regional scale



Global Forcing



COSMO-CLM (CCLM)
(Rockel et al. 2008)

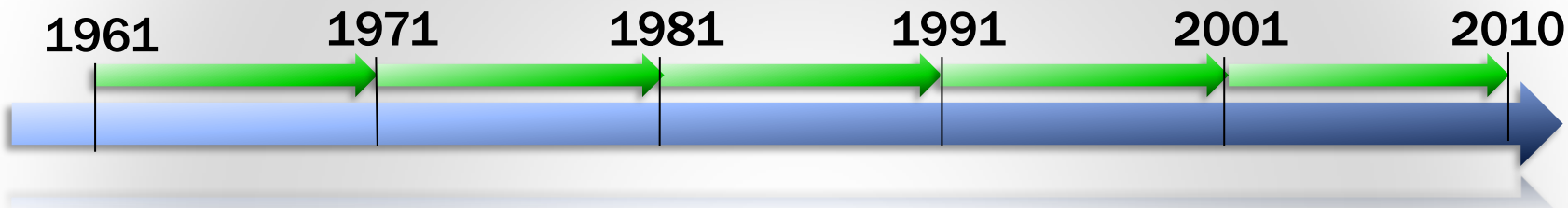
	horizontal resolution	vertical levels
ECHAM6	T63 approx. 1.9°	47 max. 0.01 Pa
MPIOM	approx. 1.5°	40

	horizontal resolution	vertical levels
COSMO4.8 -CLM17	0.22°	40

COSMO-CLM Hindcasts

5 decadal COSMO-CLM hindcasts

jointly performed by KIT GOETHE UNIVERSITÄT FRANKFURT AM MAIN DWD



10 realizations . . . . . initial conditions perturbation

long time period
ensemble size
Horizontal resolution 0.22°

no overlapping hindcasts
small number of hindcasts

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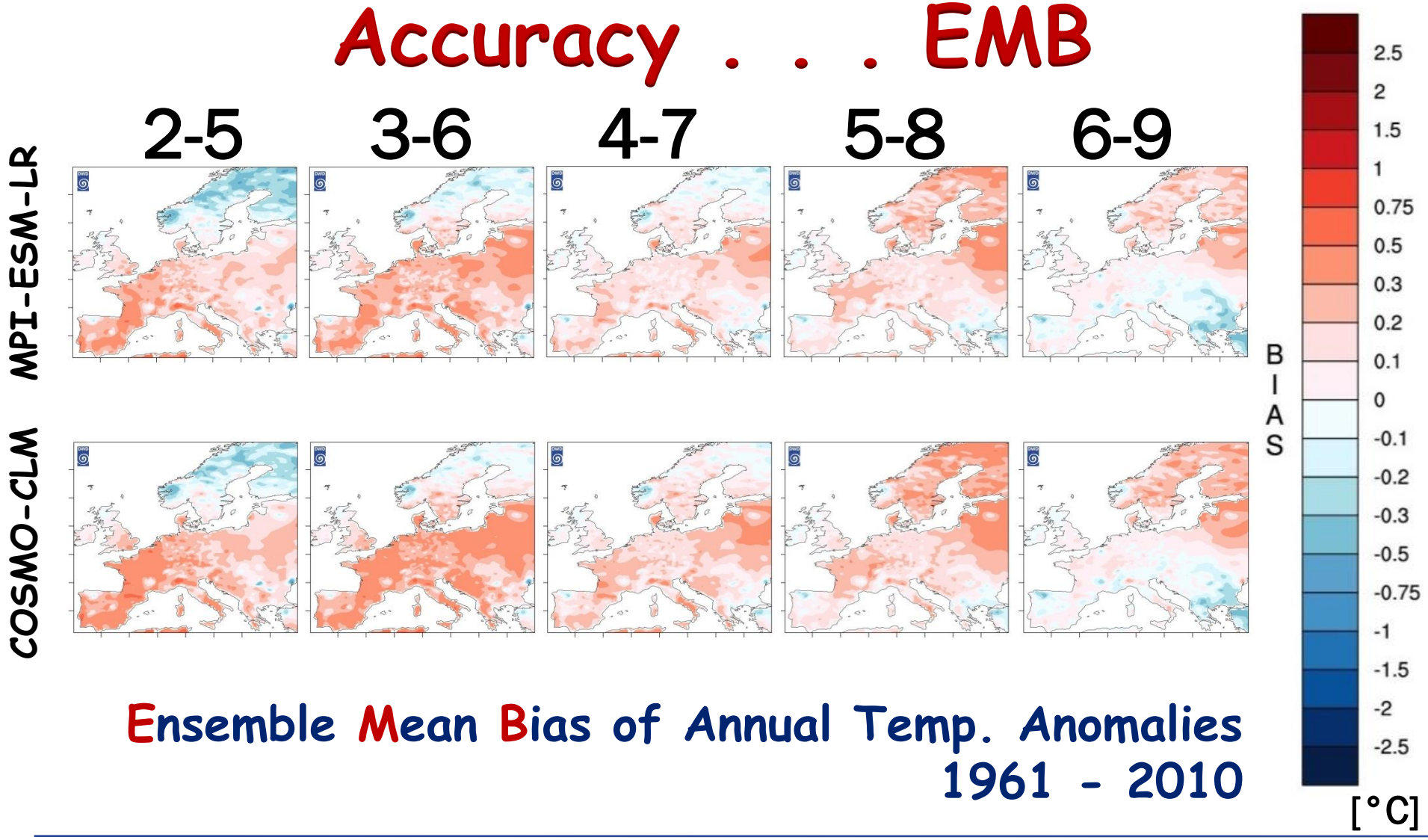
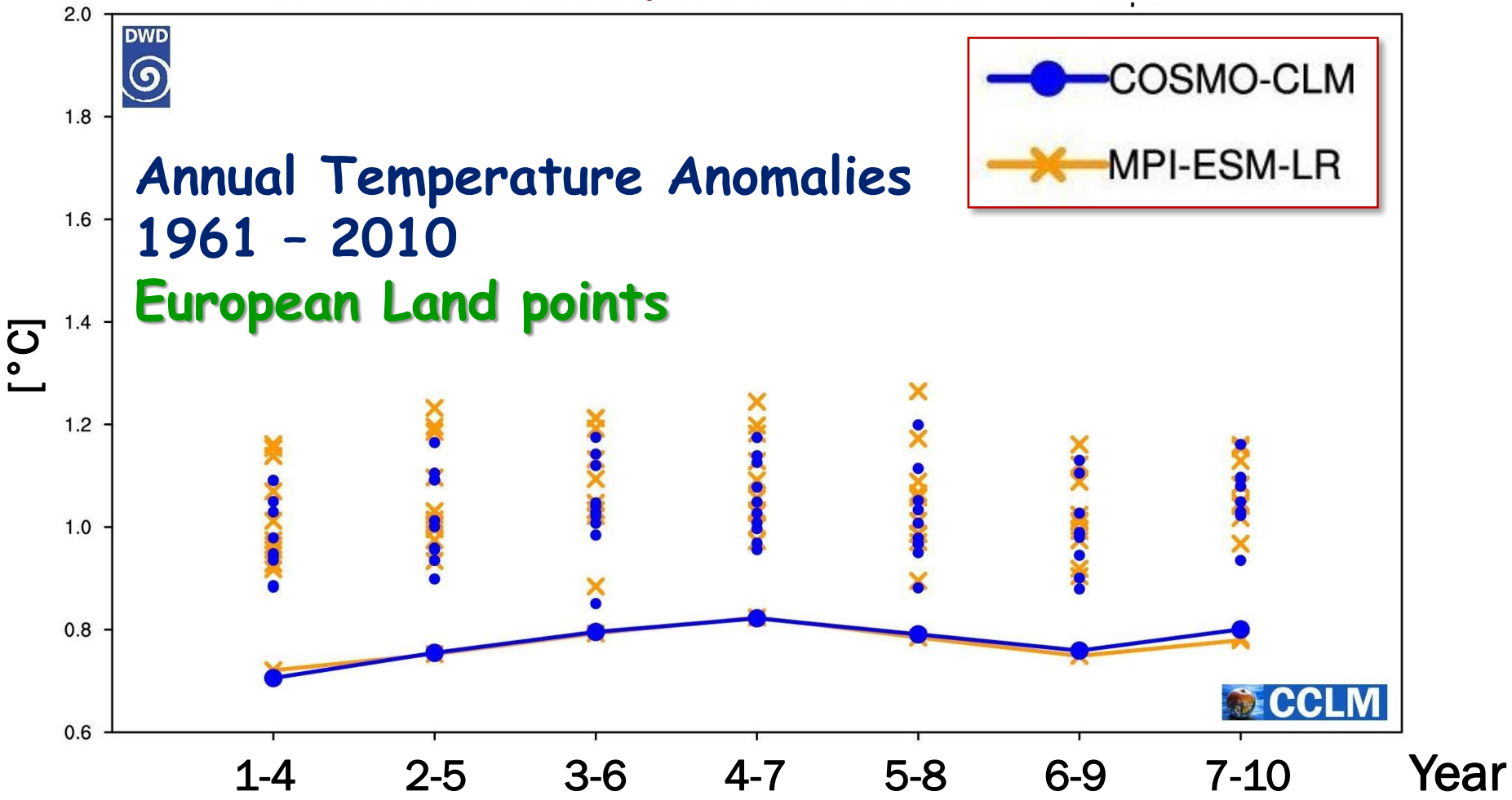
Accuracy . . . EMB

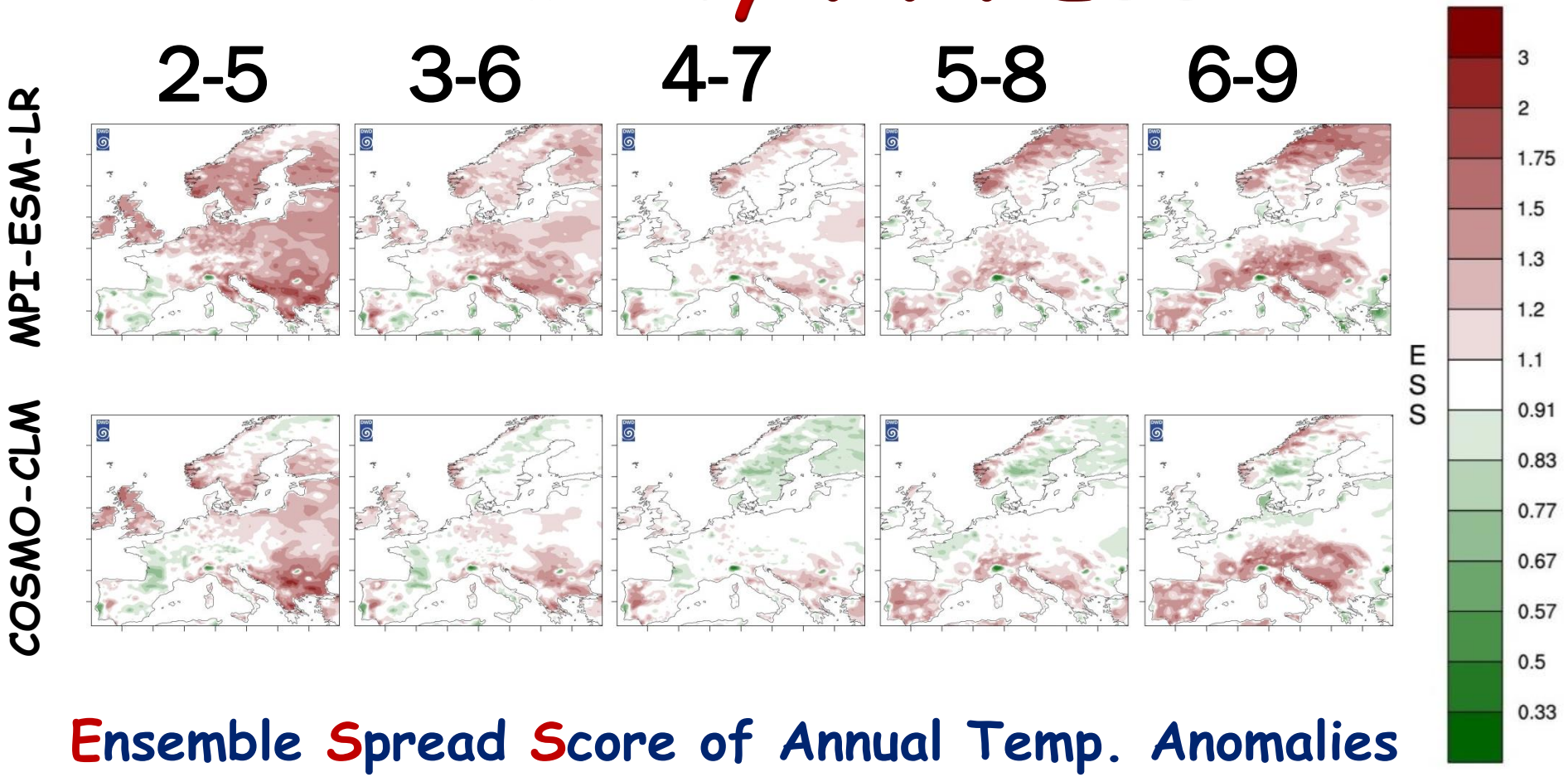


Ensemble Mean Bias of Annual Temp. Anomalies 1961 - 2010

Accuracy . . . RMSE



Reliability . . . ESS



Ensemble Spread Score of Annual Temp. Anomalies 1961 - 2010

Doblas-Reyes, 2013; Keller, 2012; Palmer, 2006

Spread – Error Diagram

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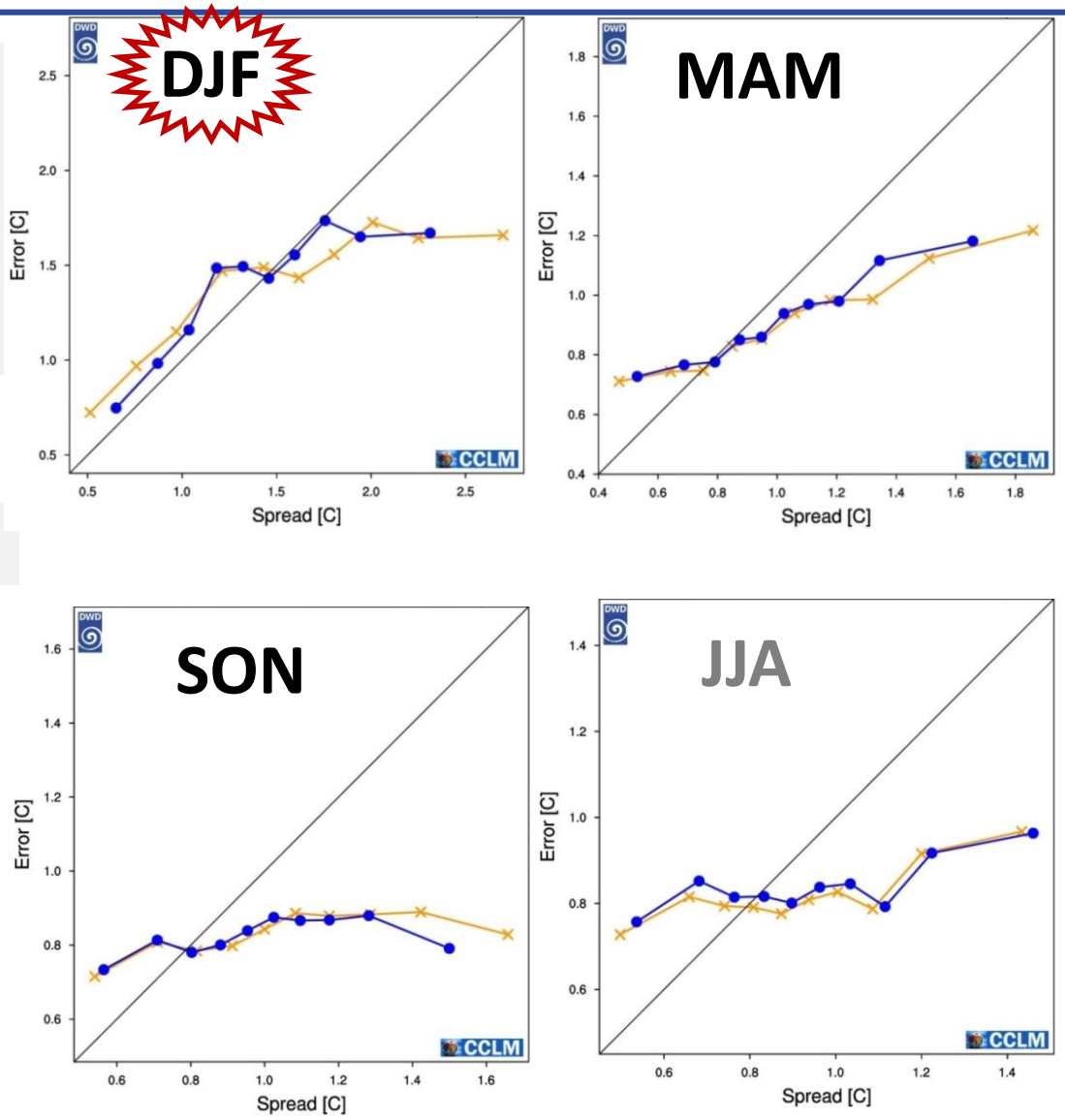
Temp. Anomalies 1961-2010

Climate vision Year 2-9

to

ups

Perfect line = diagonal



COSMO-CLM

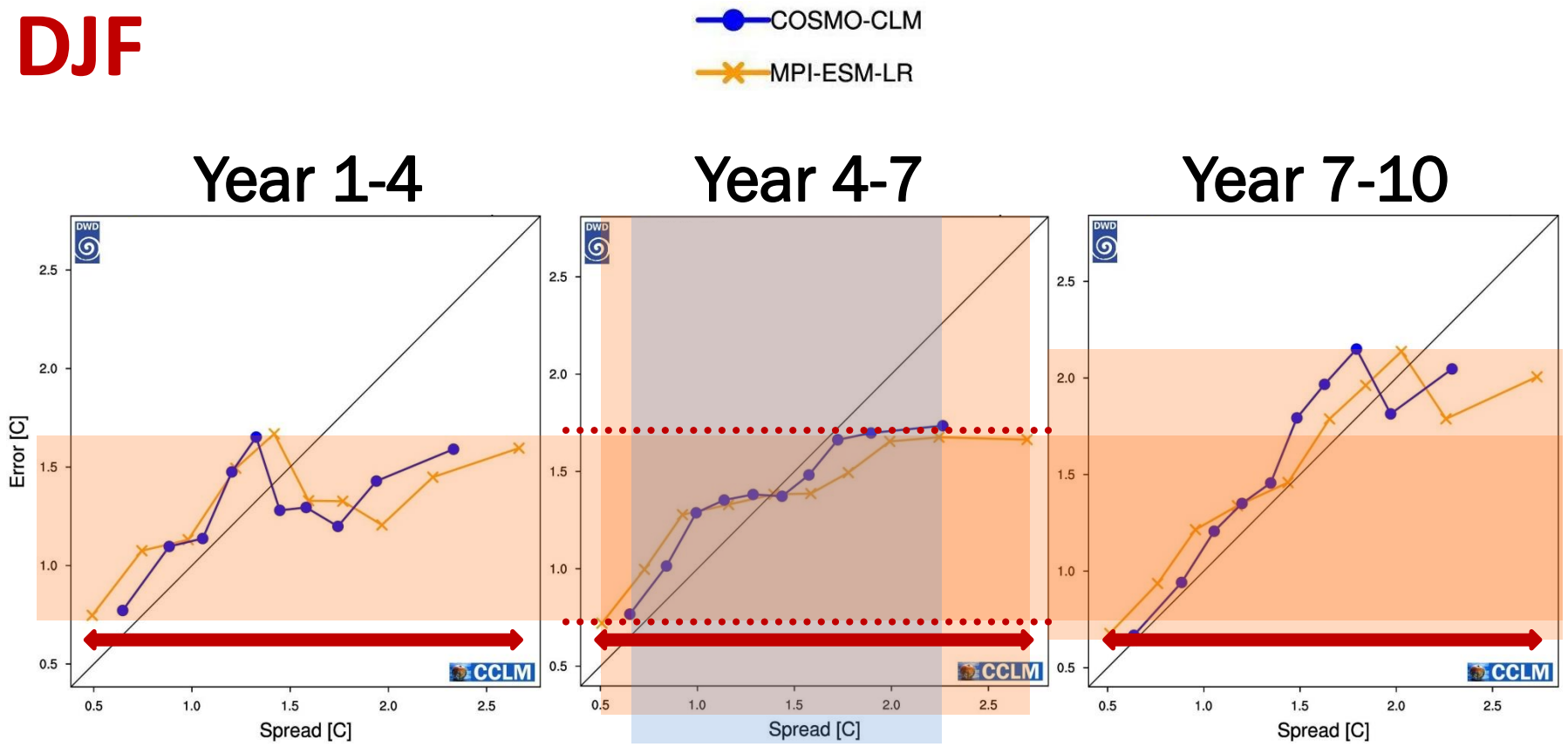
MPI-ESM-LR

Large sample size

no spatial pattern

LACEPS

DJF



Tuning the spread by
In the cost of losing accuracy
COSMO-CLM

LACEPS

OUTLINE:

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Decadal Forecast for Public

Summary

Towards a decadal forecast for German public

1981 - 2010

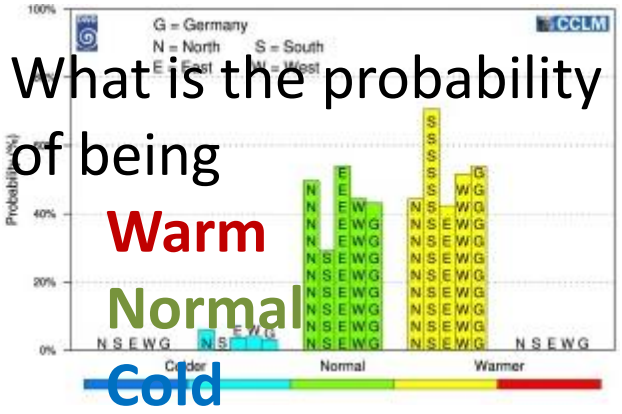
Warmer
Normal
Colder

To Climatology

Will it be
Warm
Normal
Cold
?

rm

To Climatology



What is the probability of being
Warm
Normal
Cold
?

Forecast Map

Probability Diagram

SON 1985–1988 (5-8) from realized Hindcast on Jan 01, 1981

1985 -1988

1—4
4—7
5—8
6—9
7—10
2—Climate Vision—9

1 2 3 4 5 6 7 8 9 10

January 1st 1981

MiKlip LACEPS | CCLM

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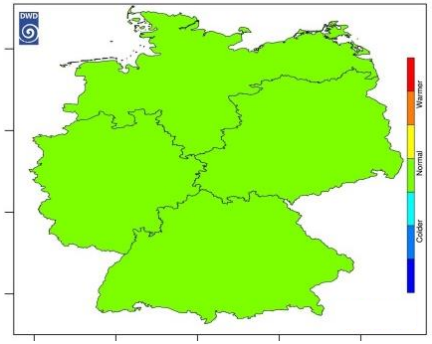
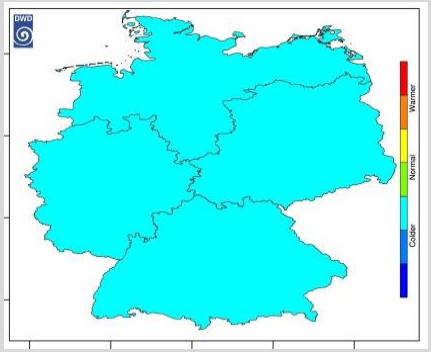
1981 - 2010

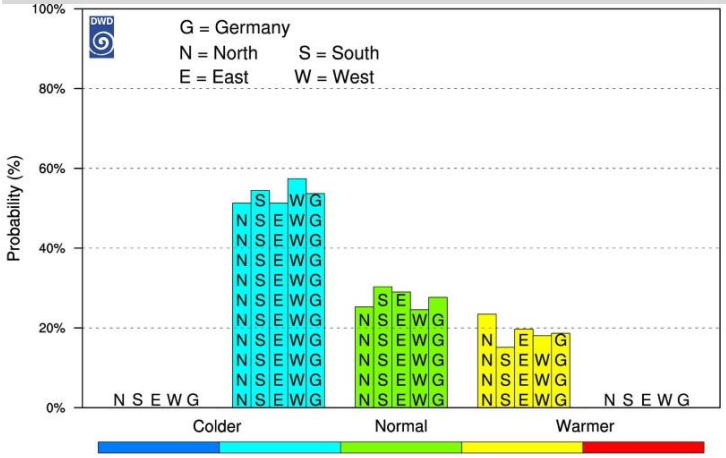
SON 1985–1988 (5-8) from realized Hindcast on Jan 01, 1981

EOBS_V8

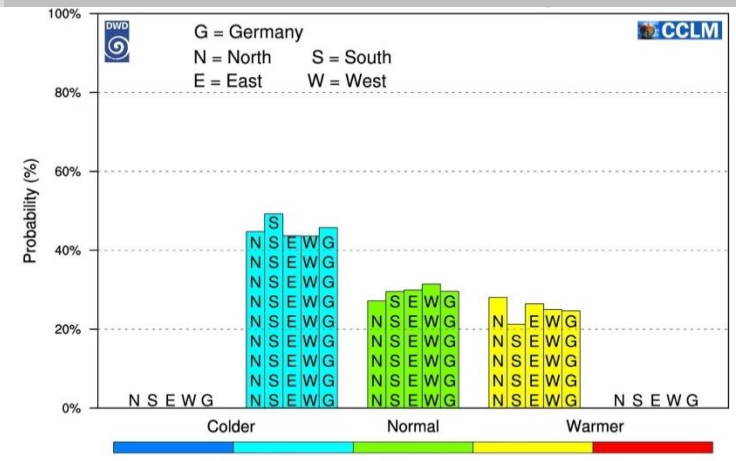


MPI-ESM



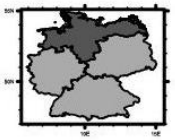


COSMO-CLM



Towards evaluating the forecast quality

All (5) hindcasts for SON – MPI-ESM

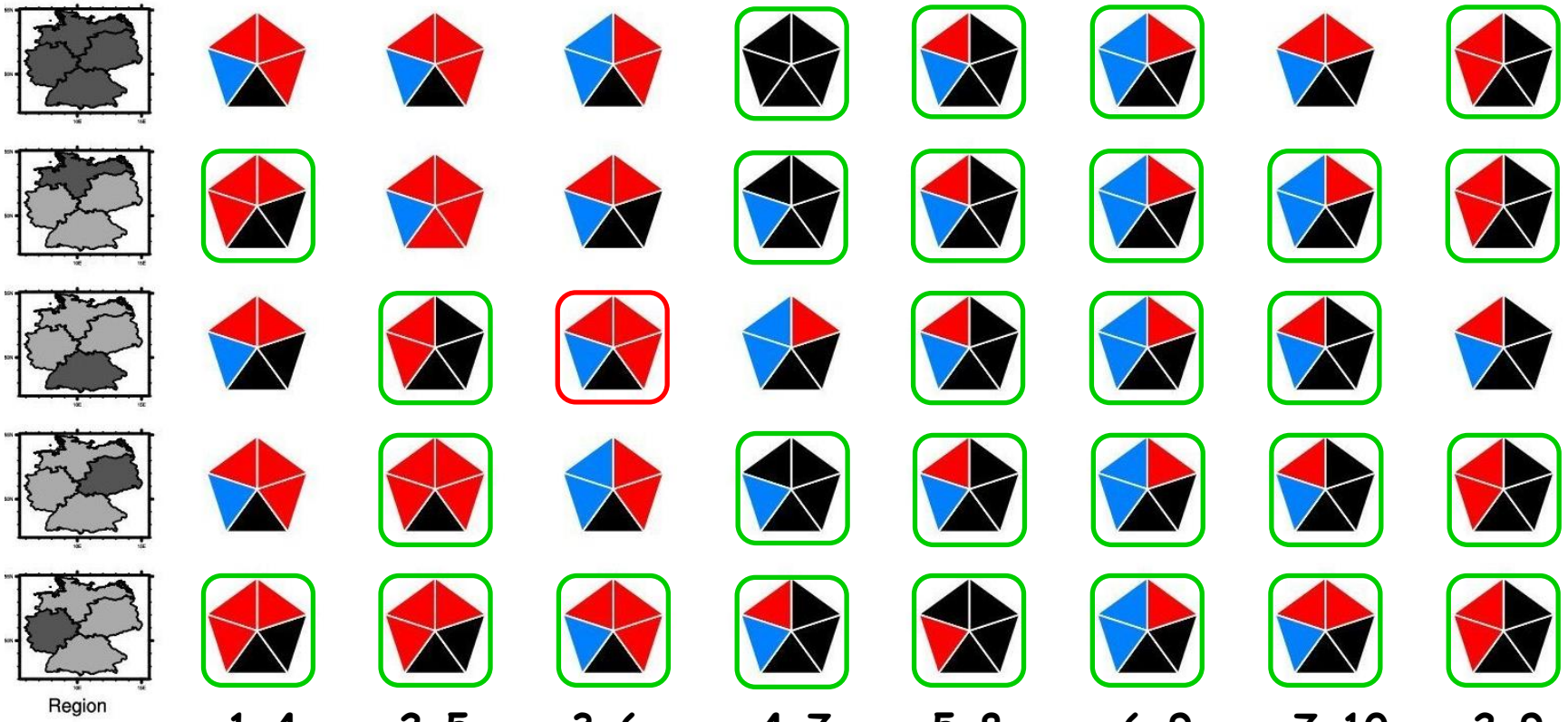


1-4

Towards evaluating the forecast quality

28 1

All (5) hindcasts for SON – COSMO-CLM



LACEPS

Towards an evaluation of the forecast quality

All hindcasts for All seasons

Annual	DJF	JJA	SON	MAM
4 2	3 3	6 14	28 1	2 14

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SUMMARY:

Evaluation of decadal forecast

- Similarity of bias pattern for COSMO-CLM and the MPI-ESM, in all lead time
- Equally reliable COSMO-CLM in the lead times of mid-decade
- Added value of regional decadal predictions for T2m for 5 decades with 10 ensemble members, more pronounce in winter
- The source of added value of reliability in the middle of decade could likely be tuning the spread by COSMO-CLM simulation

How could a decadal forecast look like?

- Simple & very general product shown, not user tailored yet
- Much more hindcasts necessary to quantify the quality of the forecast

Towards a decadal forecast for German public

Thank you for your attention!