Jahreszeitenvorhersagen

Johanna Baehr*

Kristina Fröhlich (DWD), Wolfgang Müller (MPI-M),

Mikhail Dobrynin*, Daniela Domeisen (GEOMAR),

Holger Pohlmann (MPI-M), Felix Bunzel (MPI-M),

Andre Düsterhus*, Markus Todt*

and several other members of the joint working group on seasonal prediction

*Institute of Oceanography, Centrum für Erdsystemforschung und Nachhaltigkeit

johanna.baehr@uni-hamburg.de

Predictions

German Premier League

Who will win this weekend's matches:

- HSV: BVB
- Koeln: Mainz

Who will be this season's champion?

Who will end up in 4th place this season?

Predictions

Next weekend	This season	5-10 years	...	100 years

Predictions

Next weekend	This season	5-10 years	...	100 years
Match	Champion	Champion		Team in premier league

Current standings – matchday 12 (of 34)

Rank	Club	Matches	W*	D*	L*	G*	GD*	Pts.*		
1	FC Bayern München	12	11	1	0	37:4	+33	34	CL*	
2	Borussia Dortmund	12	9	2	1	35:15	+20	29	CL*	
3	VfL Wolfsburg	12	6	3	3	17:15	+2	21	CL*	
4	Hertha Berlin	12	6	2	4	17:15	+2	20	CL* Qual.	⬆
5	FC Schalke 04	12	6	2	4	16:16	0	20	EL*	⬇
6	Borussia Mönchengladbach	12	6	1	5	23:18	+5	19	EL*	⬇
7	1. FC Köln	12	5	3	4	15:18	-3	18		⬆
8	Bayer 04 Leverkusen	12	5	2	5	14:16	-2	17		⬇
9	1. FSV Mainz 05	12	5	1	6	18:19	-1	16		⬆
10	FC Ingolstadt 04	12	4	4	4	7:9	-2	16		⬇
11	Hamburger SV	12	4	3	5	11:16	-5	15		⬇
12	Eintracht Frankfurt	12	3	5	4	16:17	-1	14		⬇
13	SV Darmstadt 98	12	3	5	4	13:16	-3	14		
14	SV Werder Bremen	12	4	1	7	13:19	-6	13		⬆
15	Hannover 96	12	3	2	7	12:22	-10	11		⬇
16	VfB Stuttgart	12	3	1	8	17:27	-10	10	Play-offs	⬇
17	TSG 1899 Hoffenheim	12	1	5	6	12:19	-7	8	Relegation	
18	FC Augsburg	12	1	3	8	13:25	-12	6	Relegation	

http://www.bundesliga.com/en/stats/table/?season=2015&liga=51

Predictions

Next weekend	This season	5-10 years	…	100 years
Match	Champion	Champion		Team in premier league
Importance of current standings				
Importance of financial situation				

How does this matter for climate predictions?

Next weekend	This season	5-10 years	…	100 years
Match	Champion	Champion		Team in premier league

Importance of current standings

Importance of financial situation
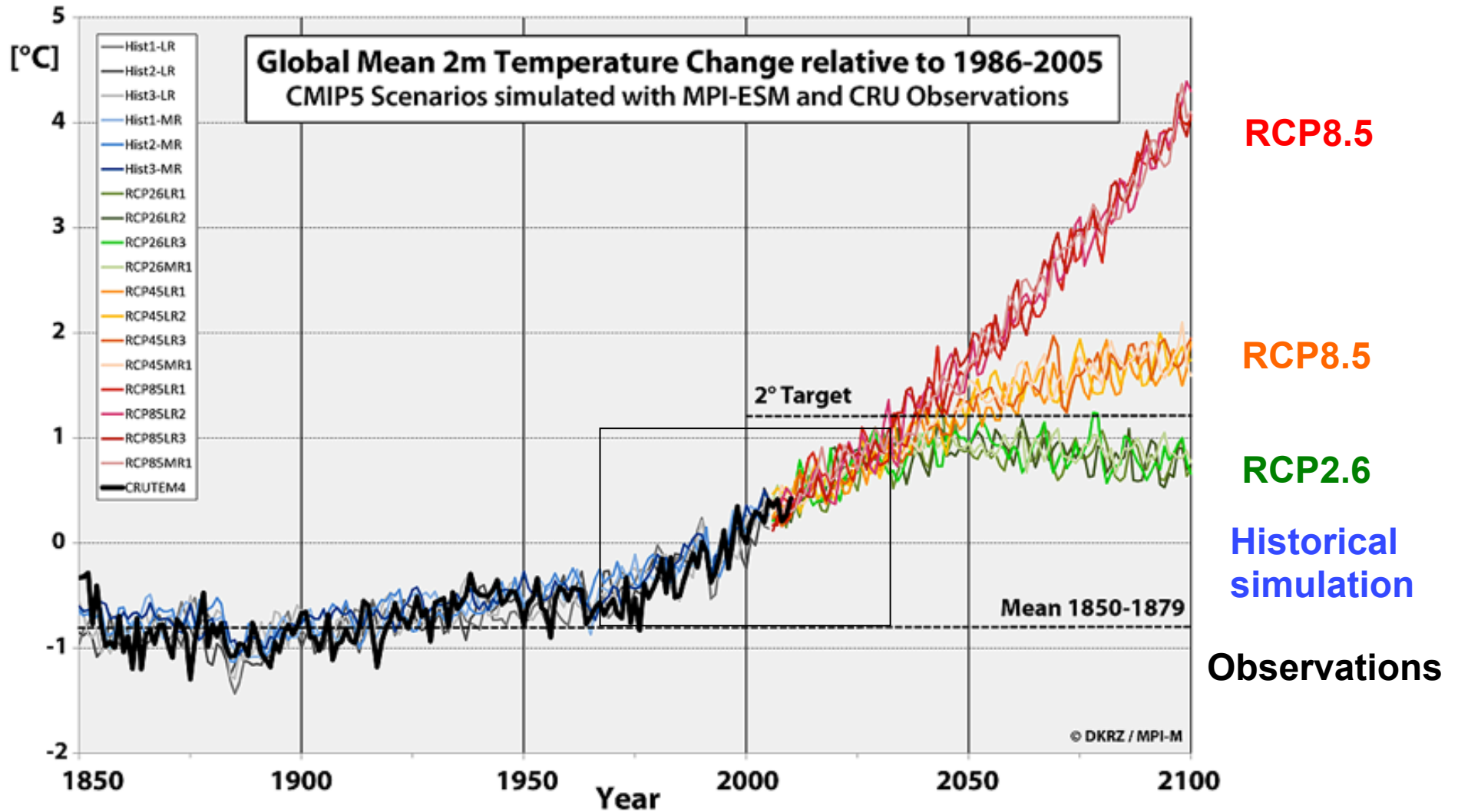
How does this matter for climate predictions?

Next weekend	This season	5-10 years	...	100 years
Match	Champion	Champion		Team in premier league
Importance of current standings				
Importance of financial situation				
Weather	Seasonal forecast	Interannual-decadal prediction	...	Climate projection

How does this matter for climate predictions?

Next weekend	This season	5-10 years	...	100 years
Match	Champion	Champion		Team in premier league
		Importance of current standings/ initial conditions		
		Importance of financial situation/ boundary conditions		
Weather	Seasonal forecast	Interannual-decadal prediction	...	Climate projection

Climate projections

Global Mean 2m Temperature Change relative to 1986-2005
CMIP5 Scenarios simulated with MPI-ESM and CRU Observations

RCP8.5

RCP8.5

RCP2.6

Historical simulation

Observations

Climate predictions
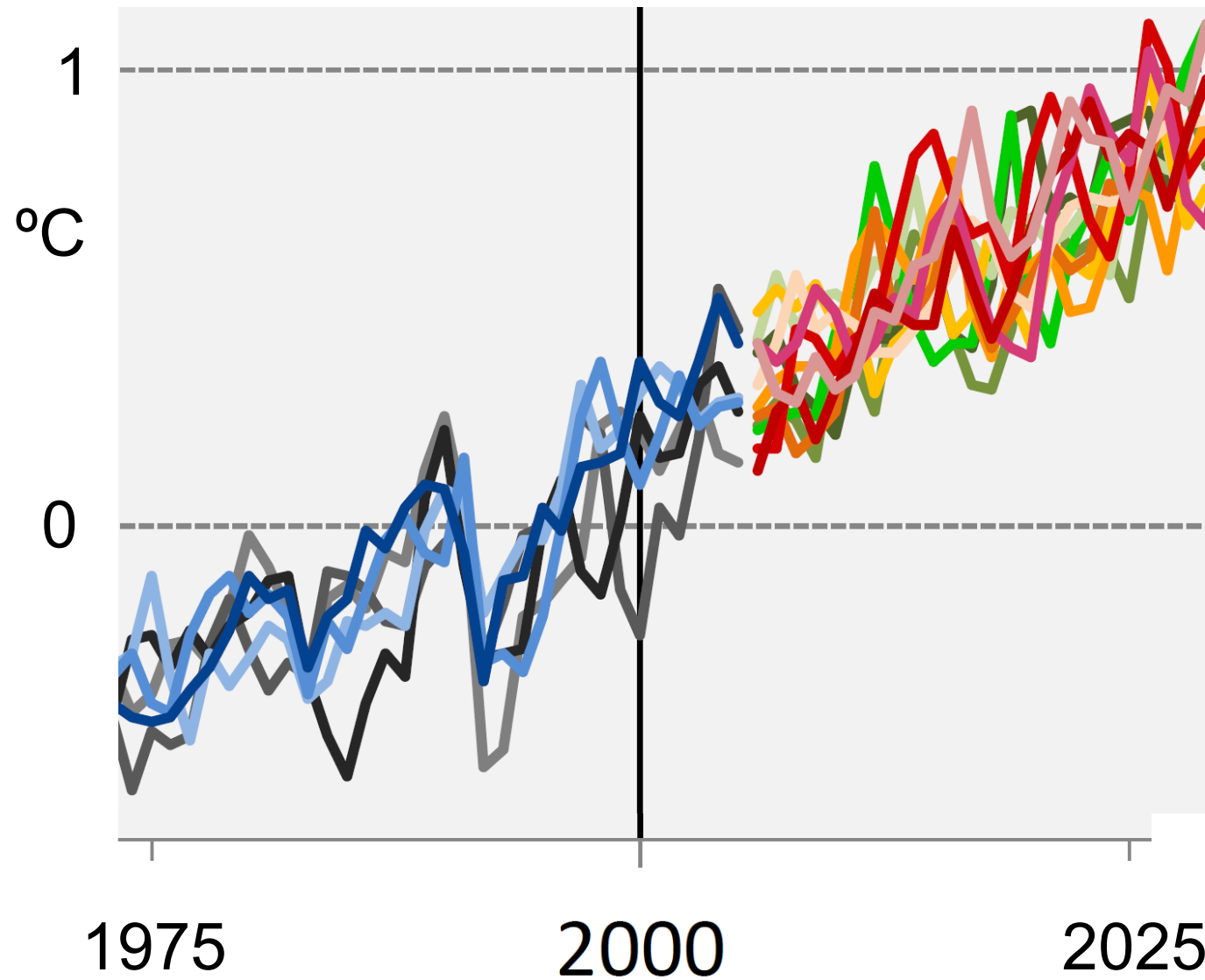
DKRZ/ MPI-M

How does this matter for climate predictions?

Next weekend	This season	5-10 years	…	100 years
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Importance of current standings/ initial conditions				
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Seasonal-to-decadal predictions
- depend on the initial conditions and the boundary conditions
- need to start from the present state of the climate system

Dynamical prediction with an Earth System Model

Global circulation model
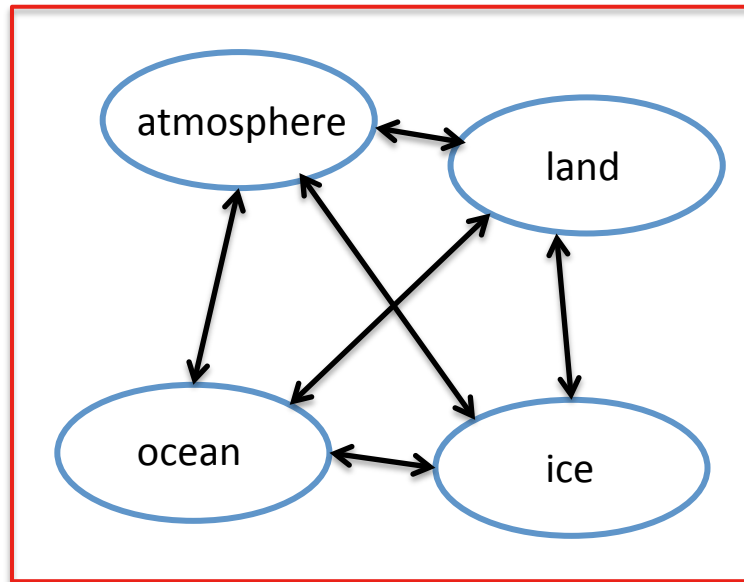
- Numerical simulation of the climate system based on laws of physics
- Expect predictability to arise from the slowly varying components
- For these components, initial conditions are important

- Combination of model and observations = data assimilation
- State close to the observations as starting point = initialization

Forecast system

Climate model

Initial conditions
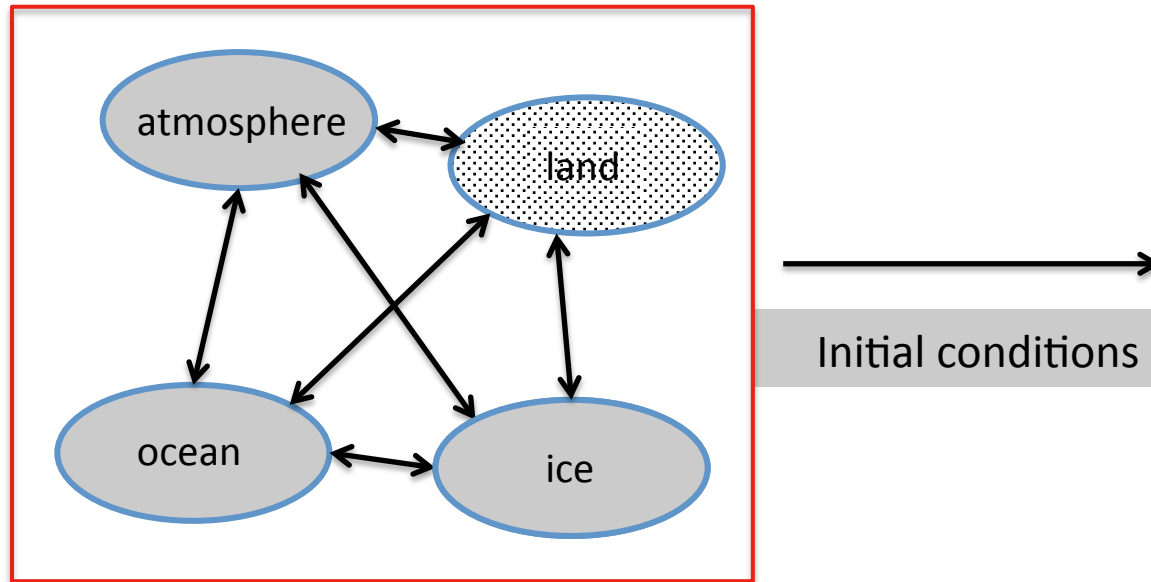
observations

- But both observations and model come with uncertainties
- Ensemble prediction to simulate different sources of uncertainties

Forecast system

Climate model

Ensemble forecast

Initial conditions | model simulation

today   + 2 months   + 4 months
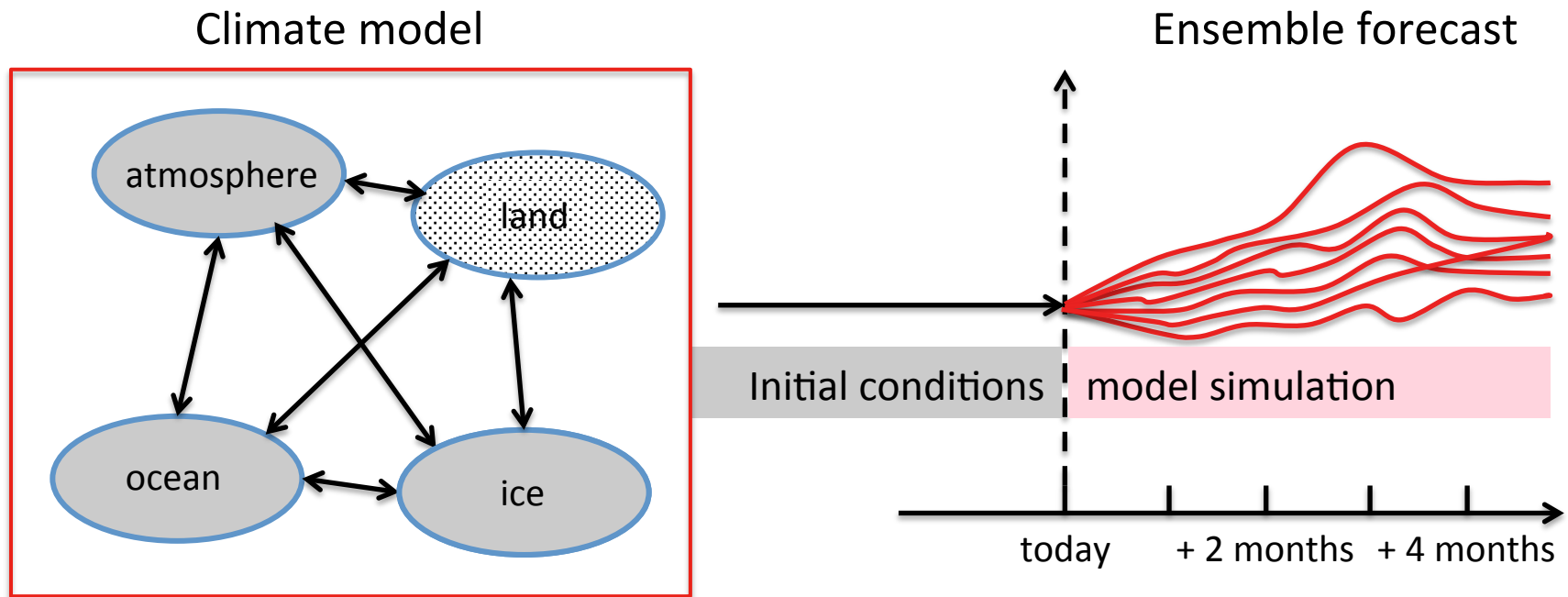
observations

- Both observations and model come with uncertainties
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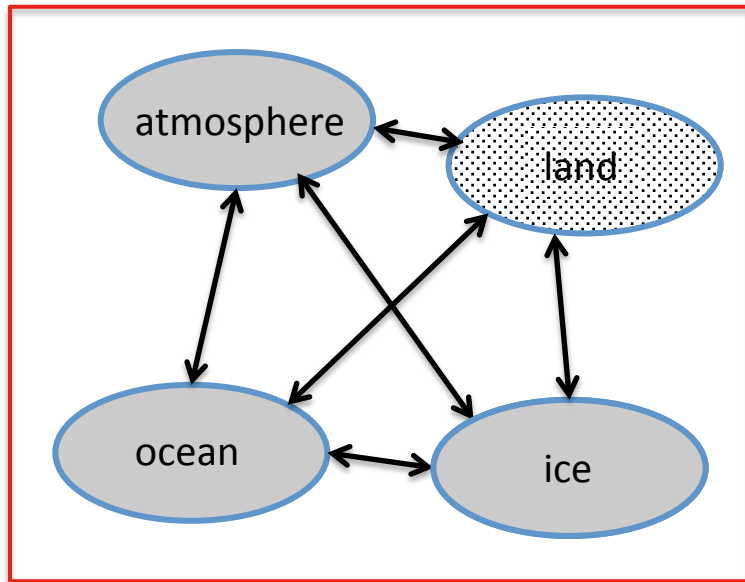
Example forecast

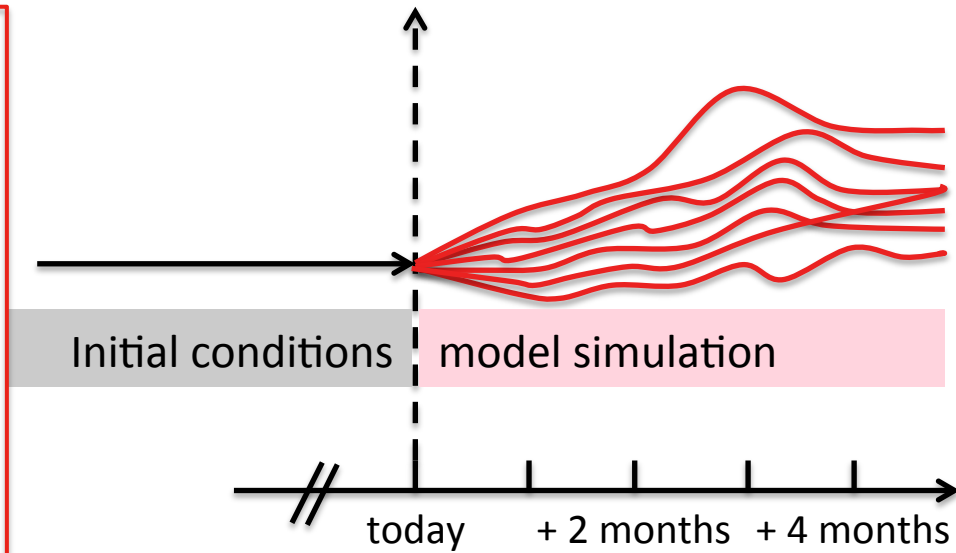Forecast: Temp2m anomaly in Dec-Jan-Feb 2015/2016
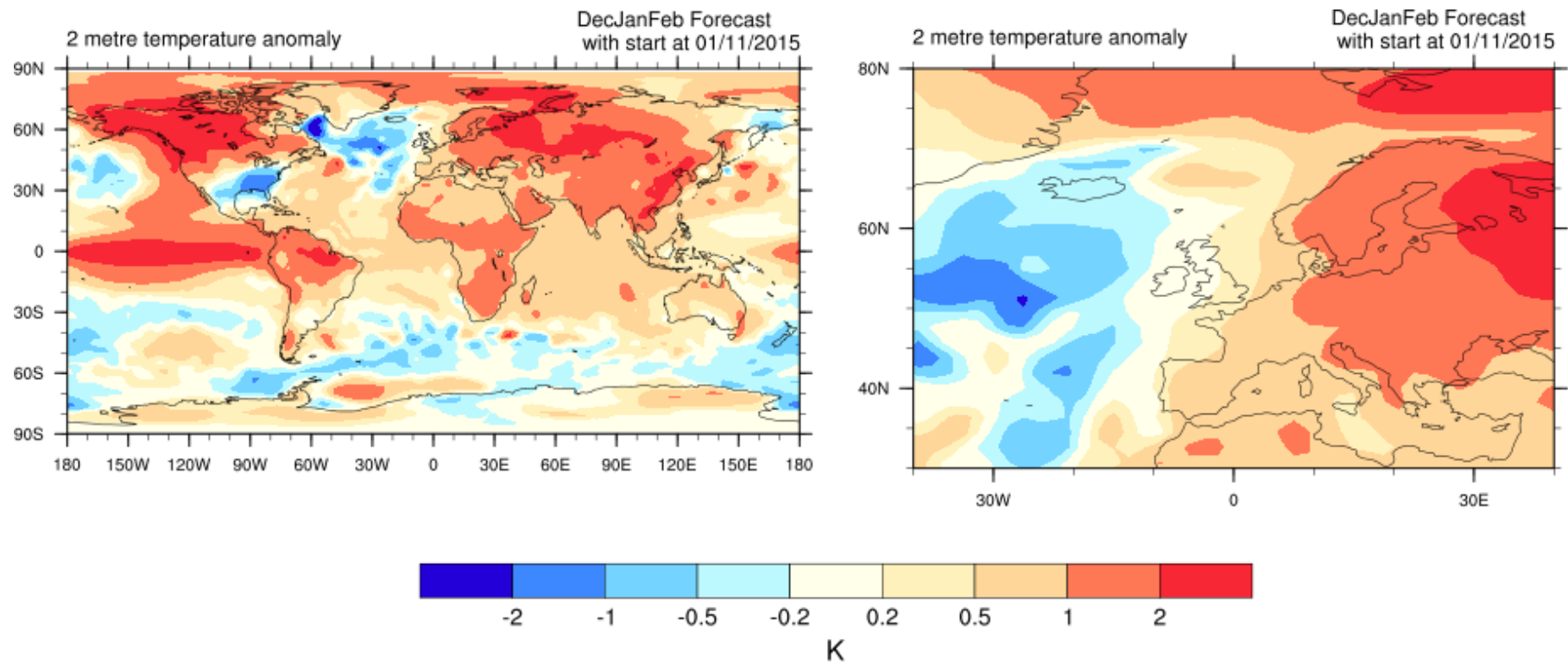
How do we test whether this is working?

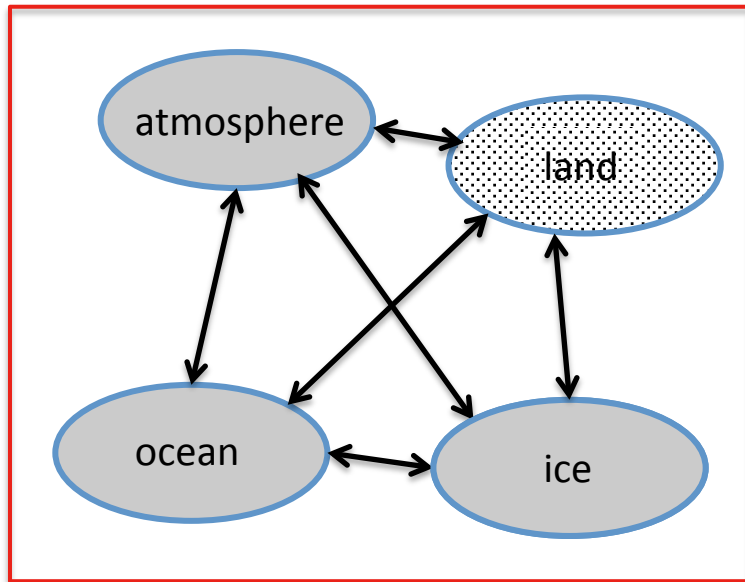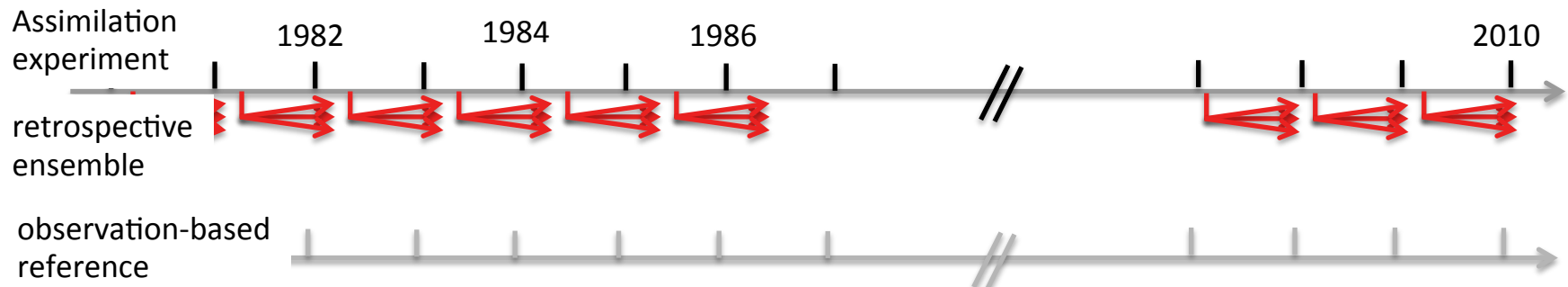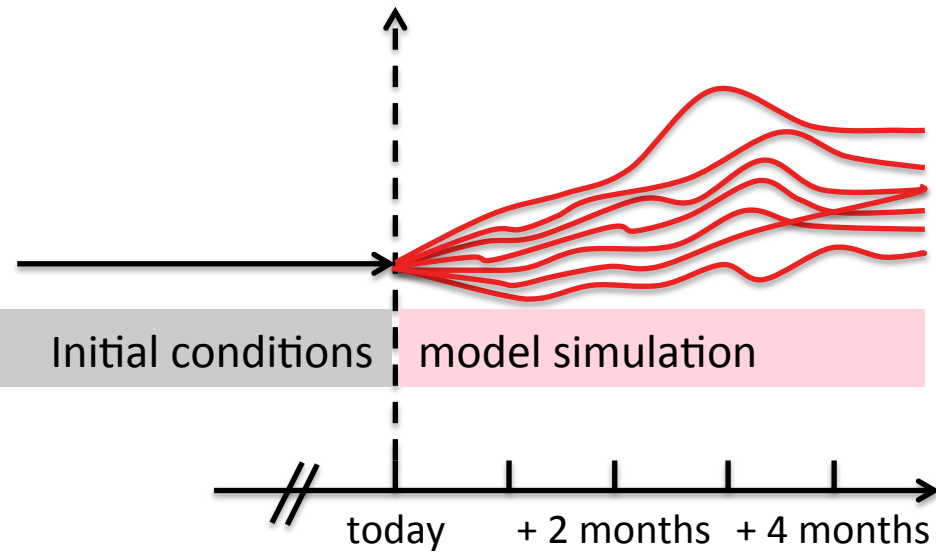Global circulation model

Ensemble forecast

How do we test whether this is working?

Global circulation model

Ensemble forecast

Initial conditions | model simulation

today | + 2 months | + 4 months

Assimilation experiment

1982   1984   1986   2010

retrospective ensemble

observation-based reference
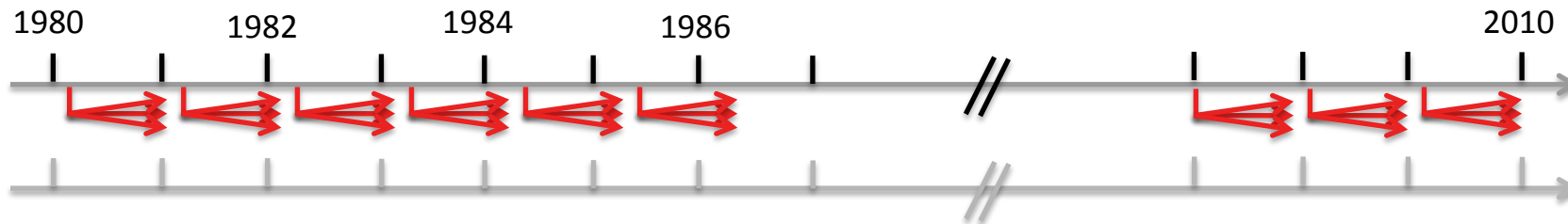
How do we test whether this is working?

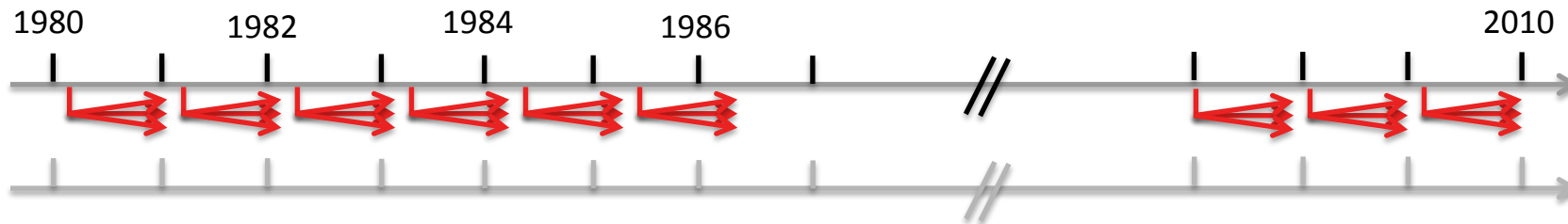Assimilation experiment (1980-2010)

Observation-based reference

Retrospective (hindcast) ensemble
- initialized from assimilation experiment
- starting each MAY/NOV from 1982 to 2010
- with multiple ensemble members each
- evaluated against observation-based reference

How do we test whether this is working?

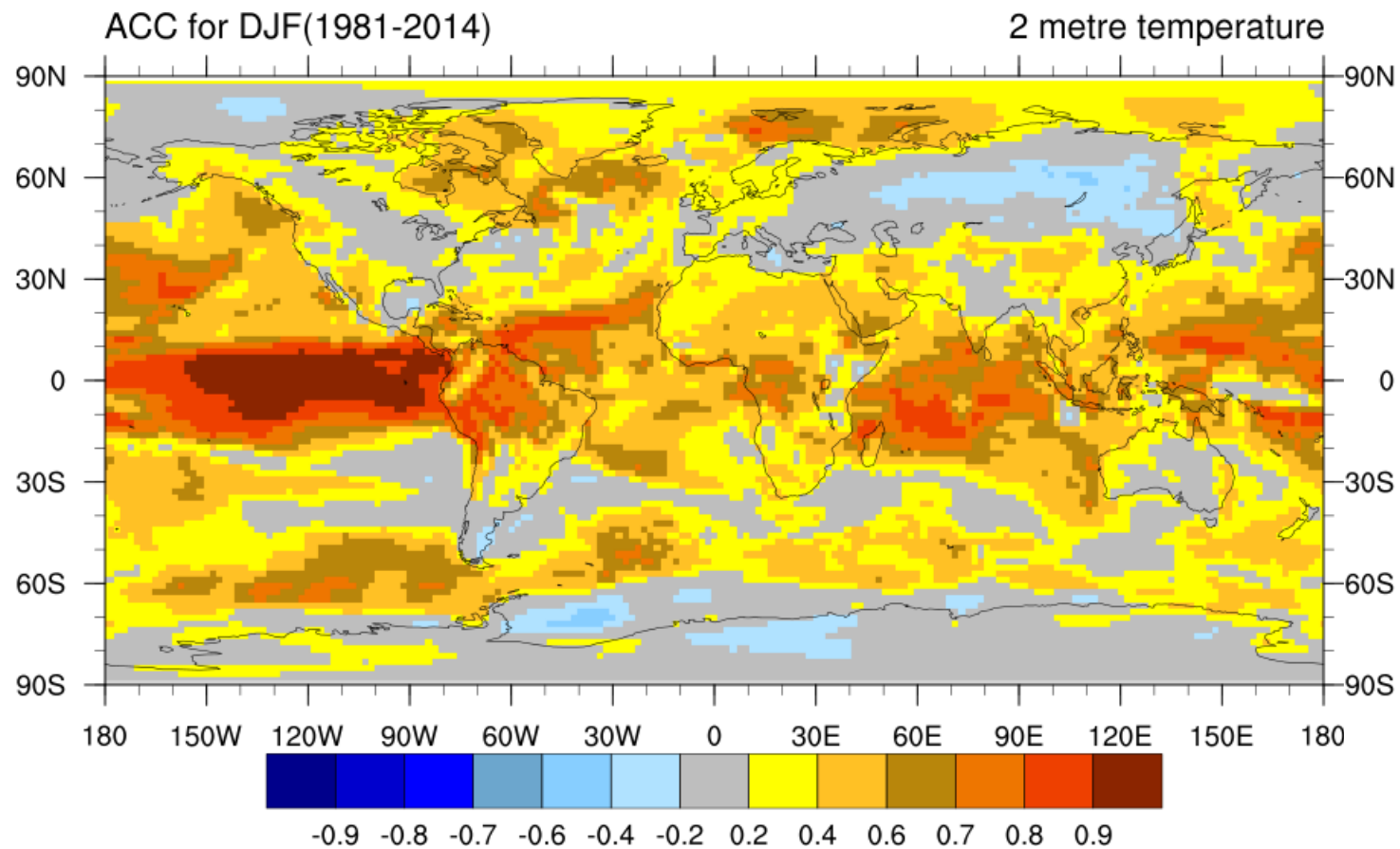Assimilation experiment (1980-2010)

Observation-based reference

Lead time dependent analysis
- ensemble mean
- months after initialization
- often seasonal means,
  for example Dec-Jan-Feb (DJF)
- skill measure, for example
  anomaly correlation

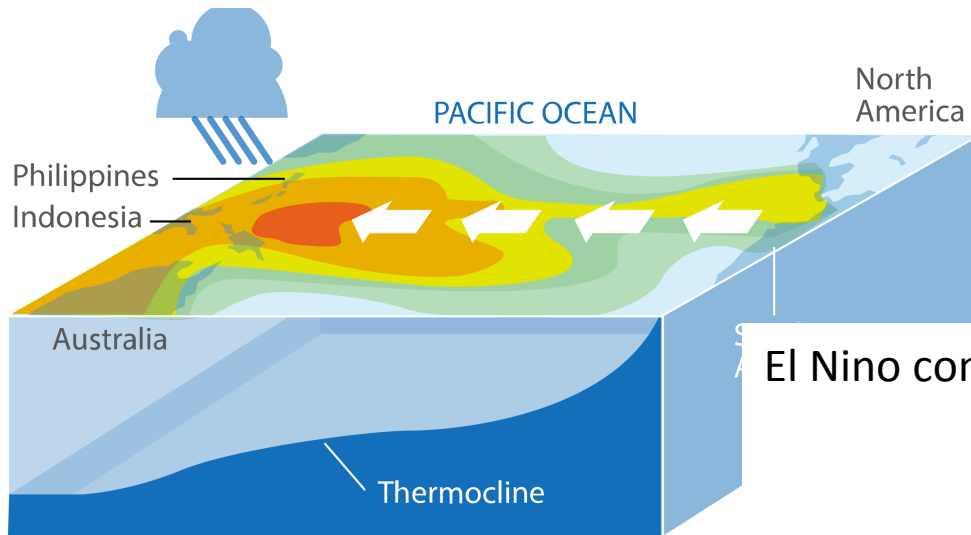# Forecast skill of the German Climate Forecast System (GCFS)

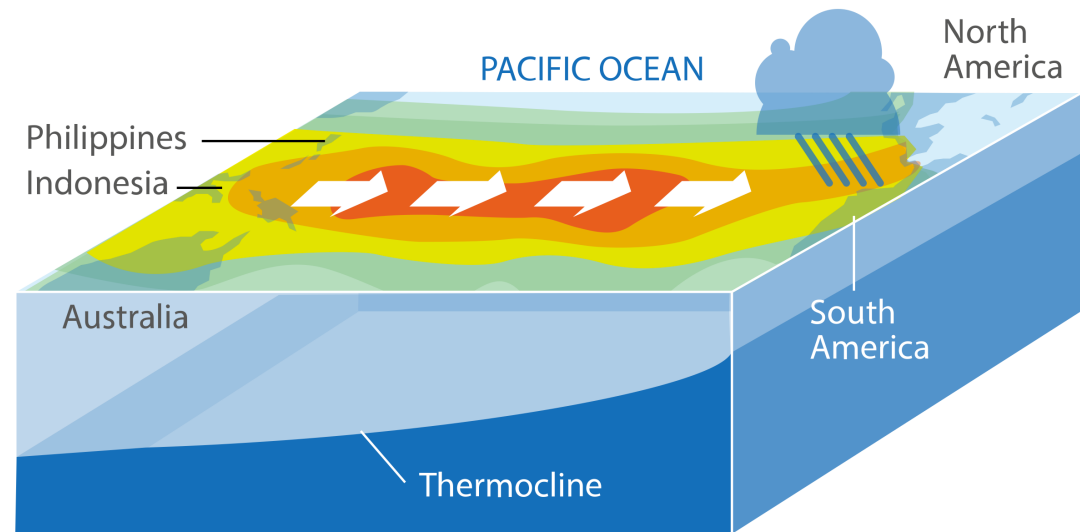Anomaly correlation for Dec-Jan-Feb surface air temperature

15 ensemble members started each Nov between 1981-2010

K. Froehlich, DWD

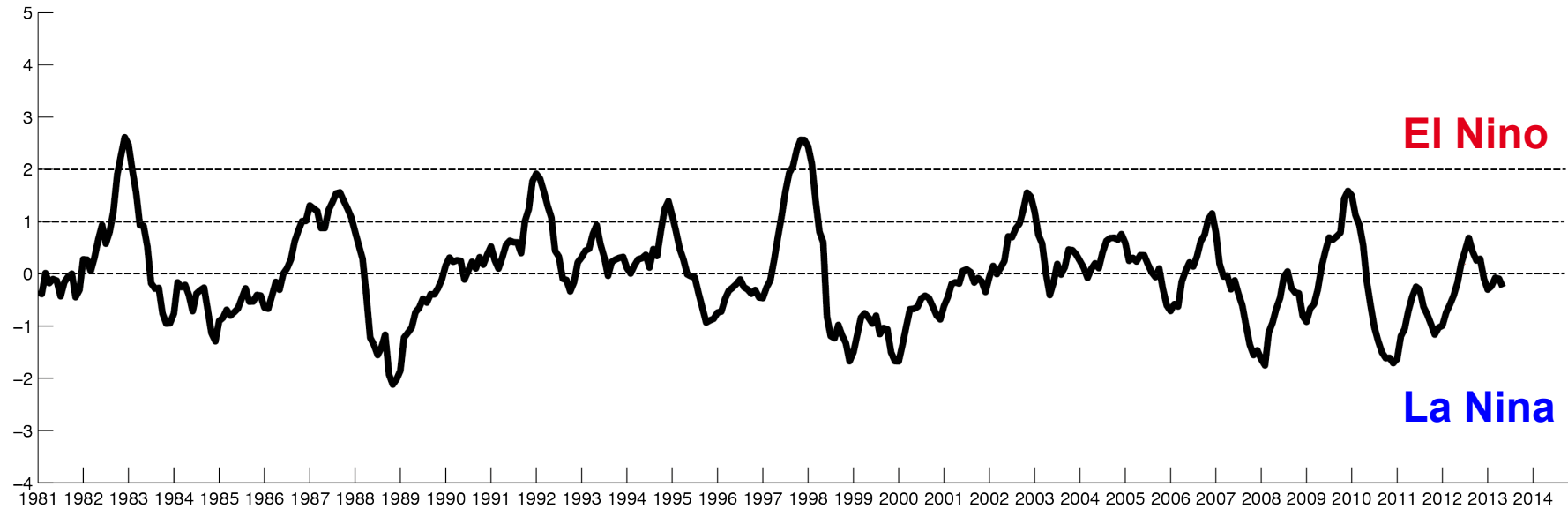# ENSO: presumably 'the' example of seasonal predictions...

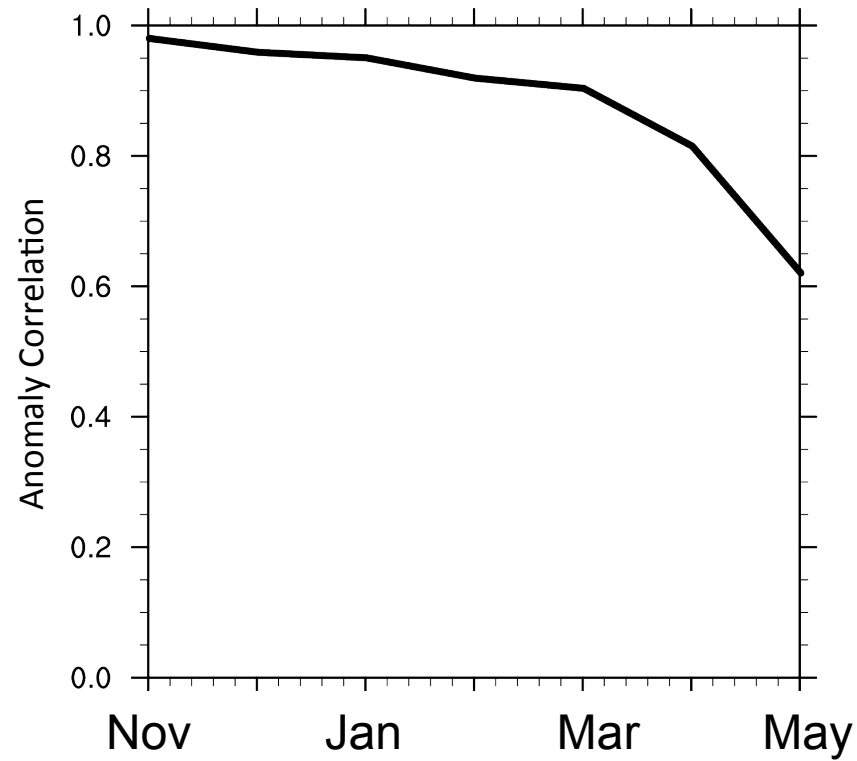Normal conditions

El Nino conditions

ENSO Index

ENSO index based on sea surface temperature anomalies, from 'observations'
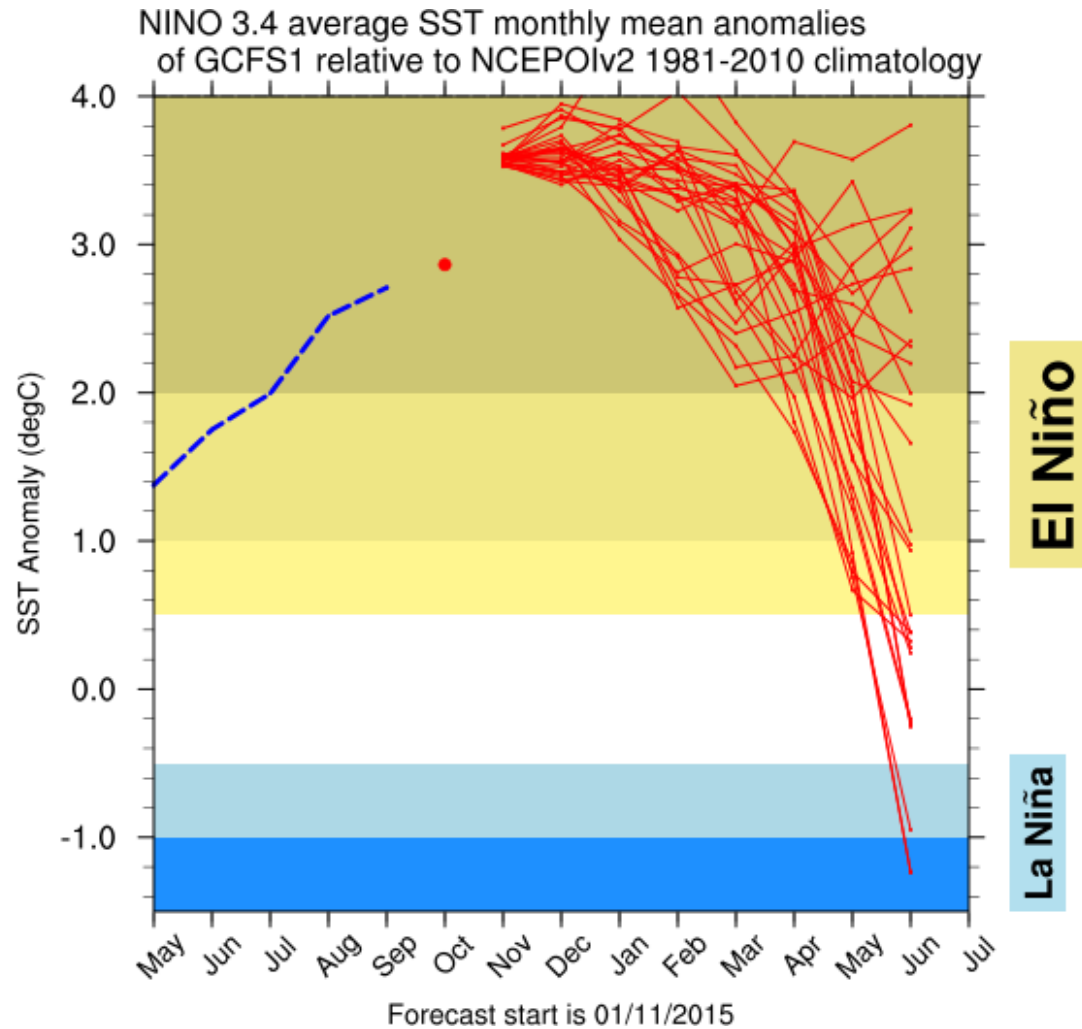
Reliable predictions of El Nino occurrence for 2-4 months ahead

Skill scores for sea surface temperature against 'observations' in ENSO region (NOV start)

Baehr et al., 2015

GCFS1 forecasts strong El Nino conditions over the entire winter

NINO 3.4 average SST monthly mean anomalies of GCFS1 relative to NCEPOIv2 1981-2010 climatology

Forecast start is 01/11/2015

Forecast start date Nov 1st, 2015

K. Froehlich, DWD

Jahreszeitenvorhersagen

- Es ist einfacher, das Klima in 100 Jahren zu prognostizieren als das Klima in 4 Monaten (oder 10 Jahren)

- Operationelle Jahreszeitenvorhersagen sind (bisher) vor allem für die äquatorialen Breiten möglich.

- Im Pazifik entwickelt sich zur Zeit ein vergleichsweise starker El Nino. Ob dieser El Nino spürbare Auswirkungen auf das Klima in Europa haben wird, lässt sich derzeit nicht sagen.