Hvordan ændrer ekstrem regn sig?

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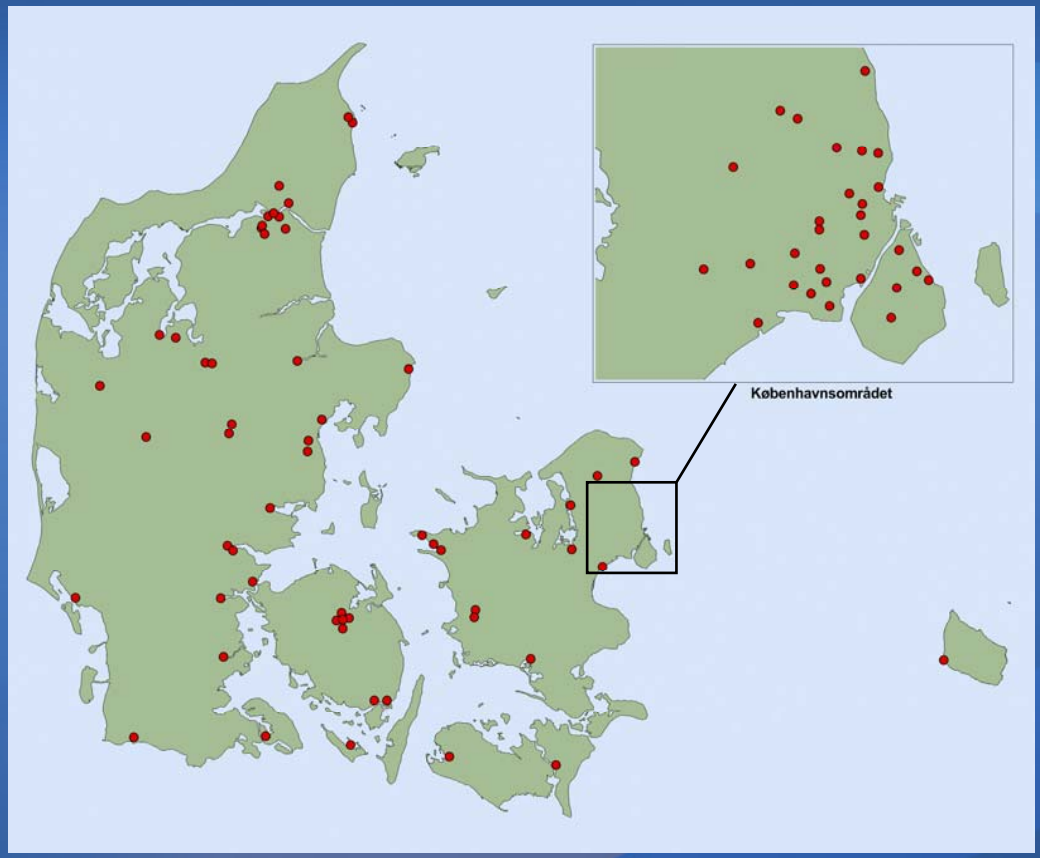
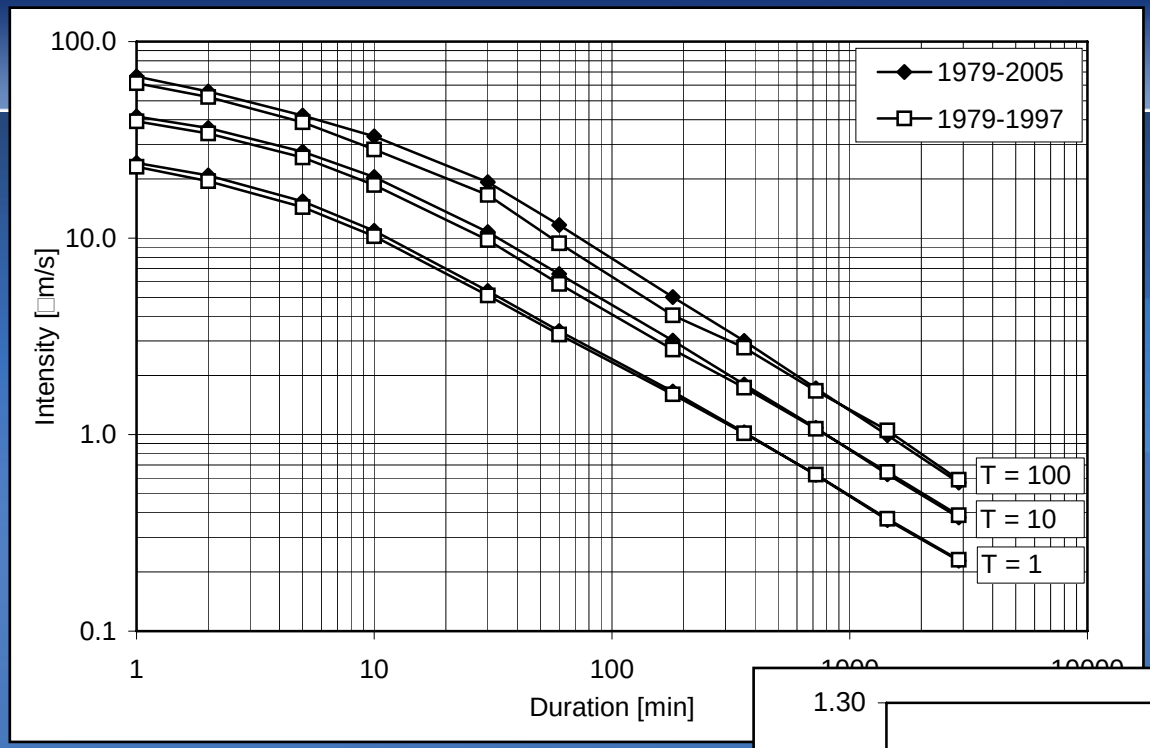
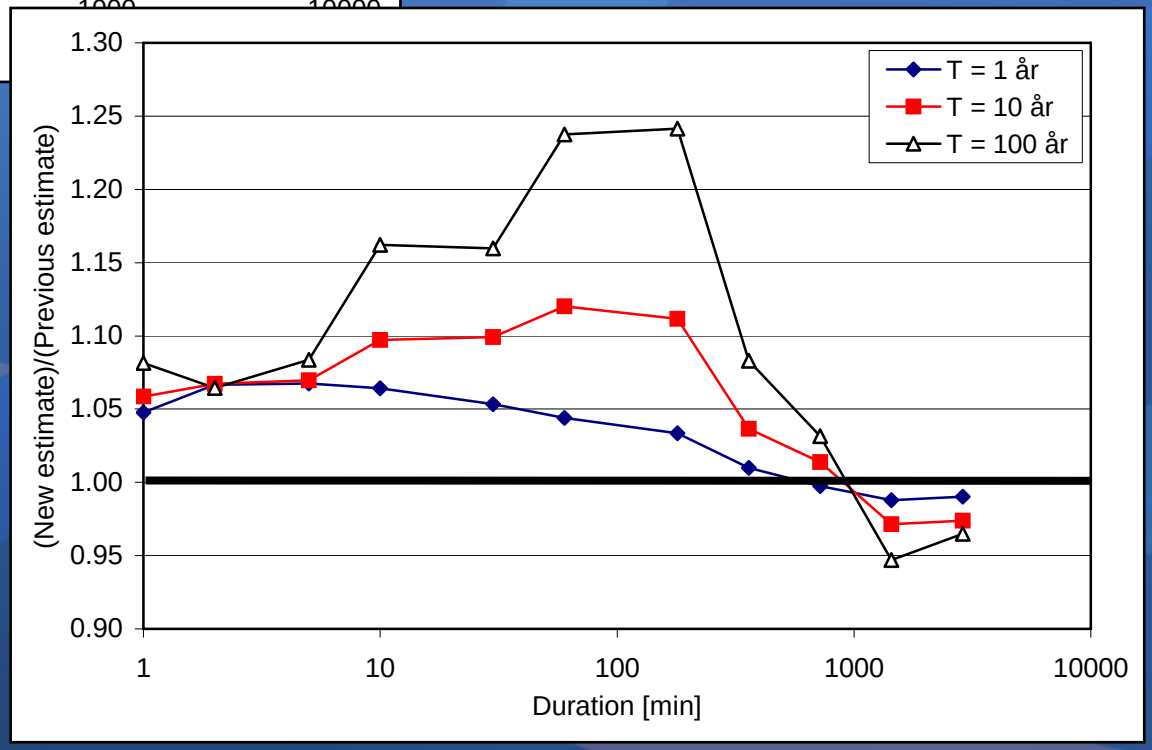
Ændringer i ekstrem regn i de seneste 30 år

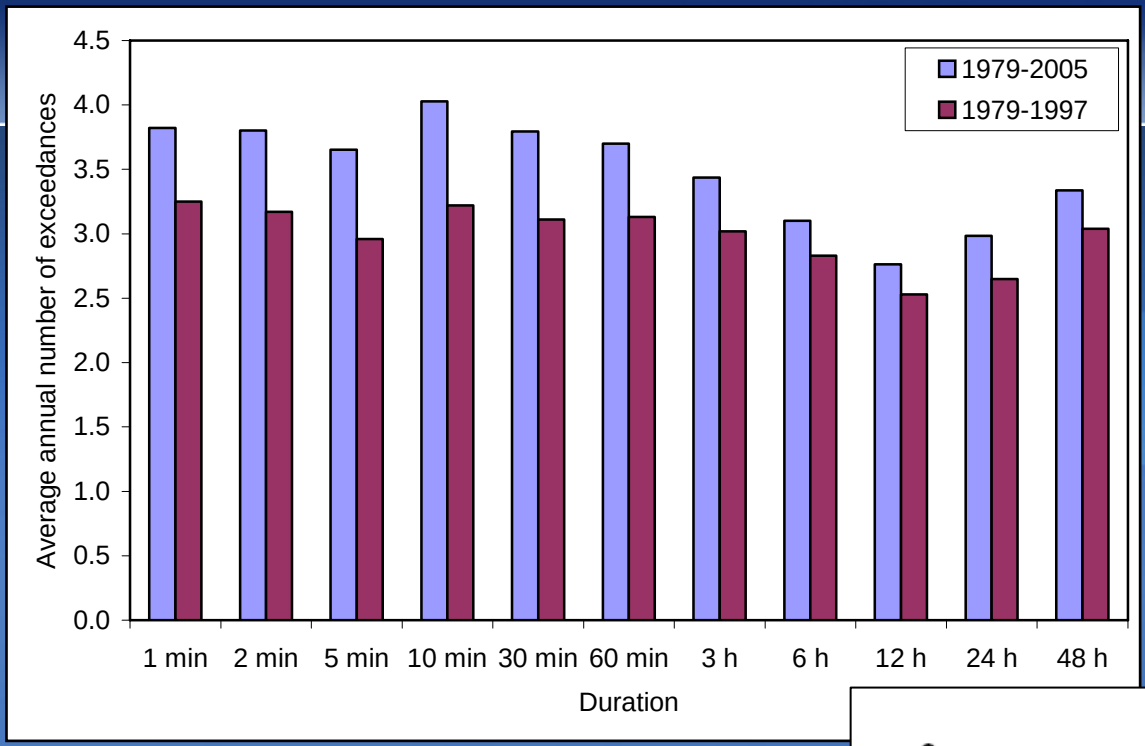


- SVK regnmålersystem oprettet i 1979
- Nedbør intensiteter for varigheder mellem 1 min og 48 h
- SVK Skrift 26:
  - Periode: 1979-1997
  - 41 stationer (650 stationsår)
- SVK Skrift 28:
  - Periode: 1979-2005
  - 66 stationer (1251 stationsår)
- MSc + PhD projekt:
  - Periode: 1979-2009
  - 70 stationer (1428 stationsår)

Sammenligning af IDF kurver Skrift 26 og Skrift 28

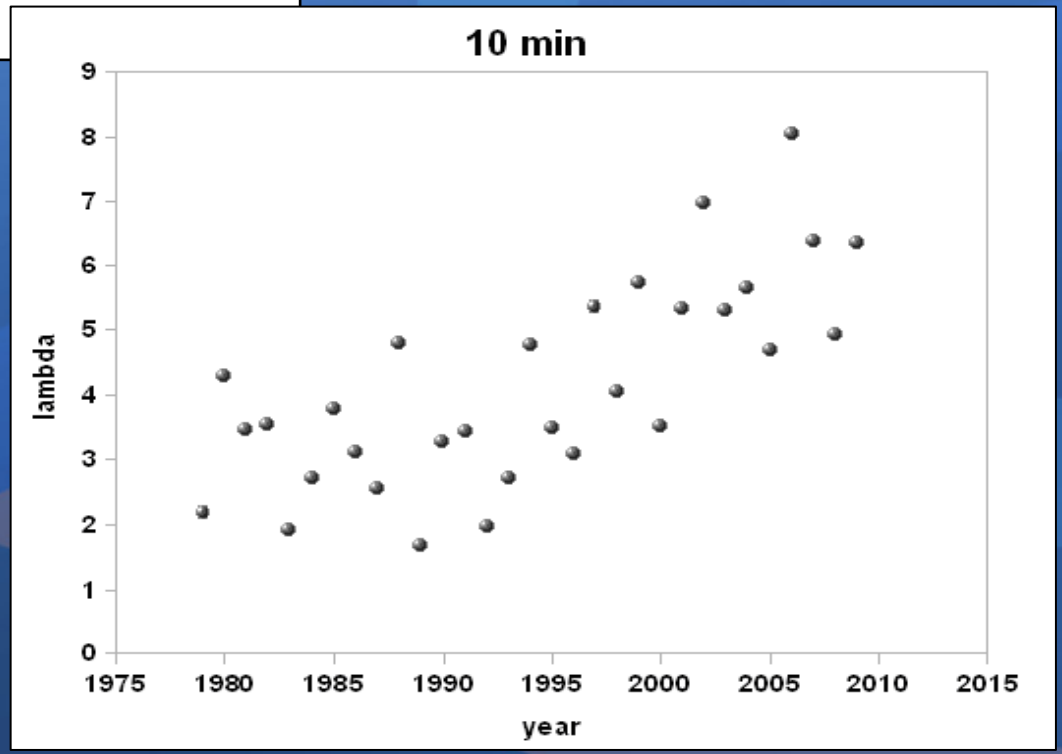






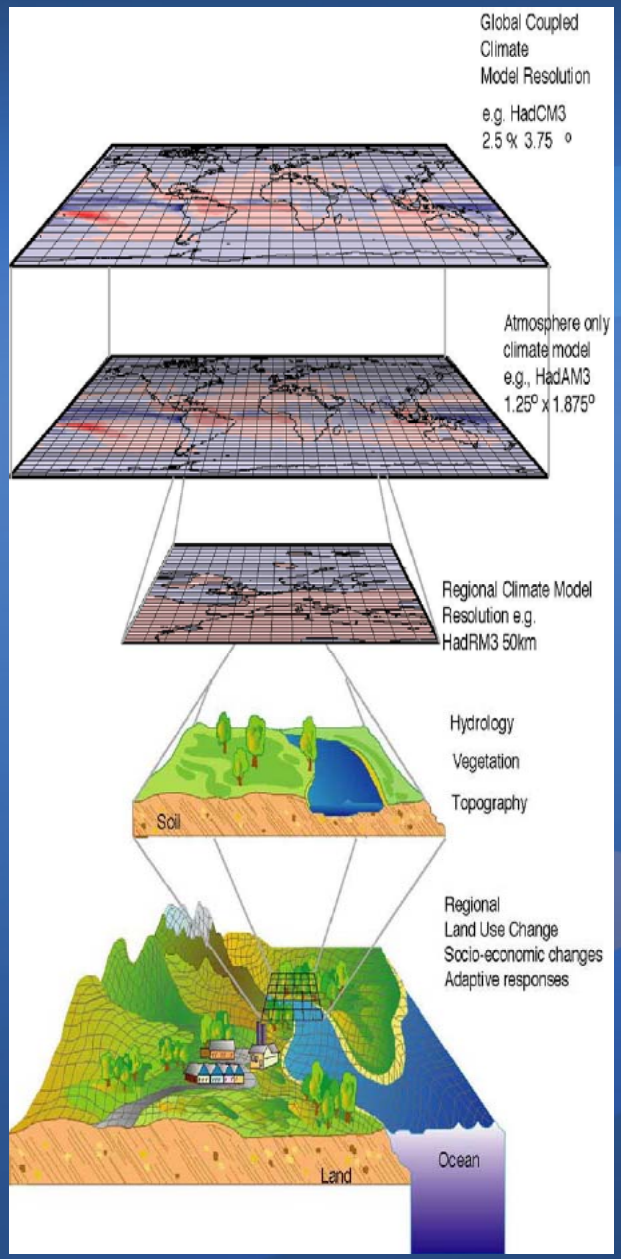
Ændringer i antal ekstreme hændelser

- Statistisk signifikant stigning
- Ca. 2% per år
- Mindst stigning for store varigheder

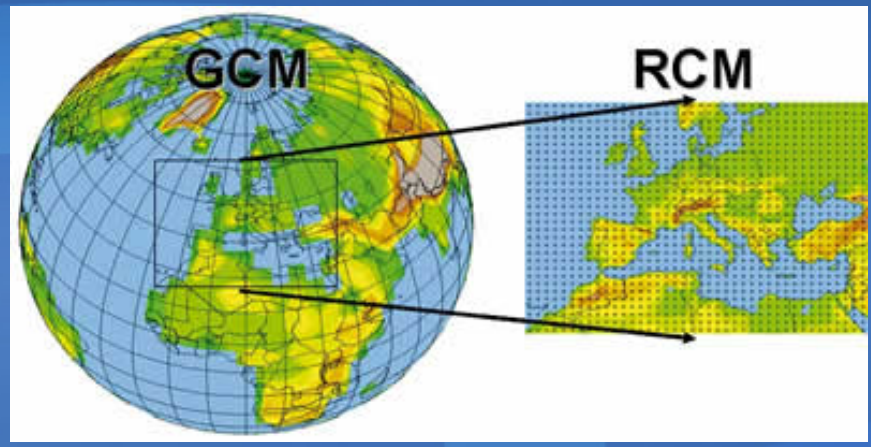


Ida Bülow Gregersen, Statistiske trends i observeret ekstrem regn, MSc Thesis, 2010

Hvordan ændrer ekstrem regn sig i fremtiden?



Dynamisk nedskalering

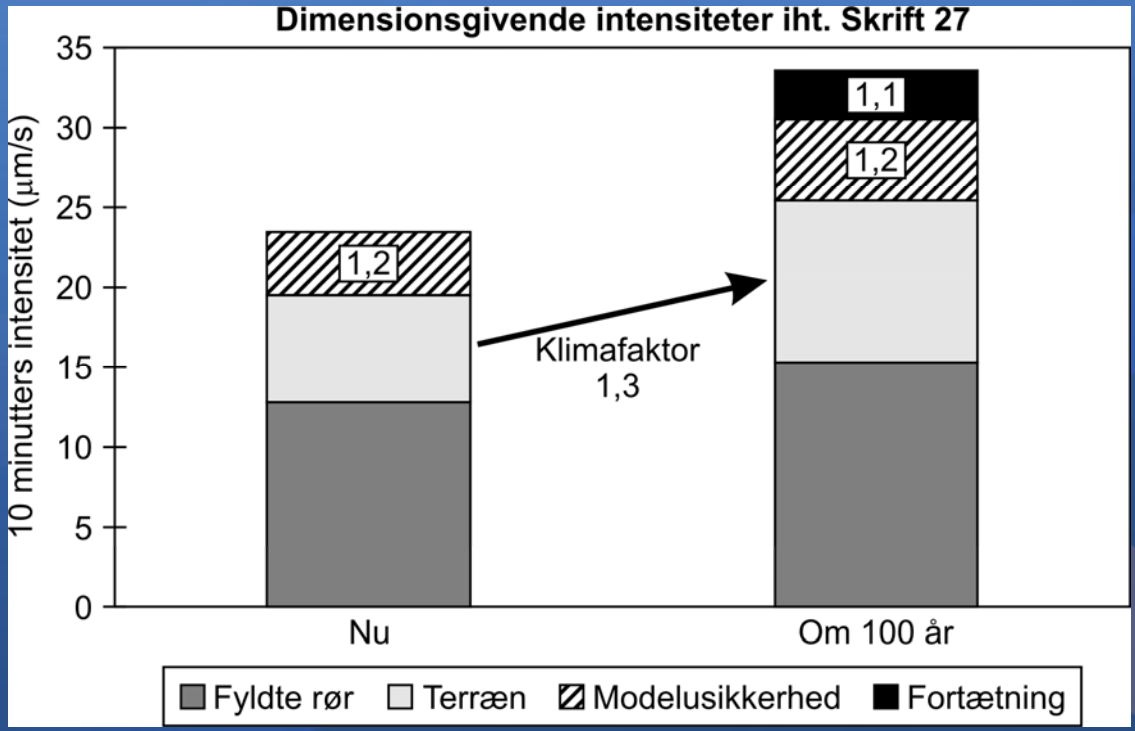


Statistisk nedskalering

- Skalering spatialt + temporalt
- Statistisk justering af klimamodel output

SVK Skrift 29

Gentagelsesperiode [år]	2	10	100
Klimafaktor (100 år)	1.2	1.3	1.4
Simpel fremskrivning af observeret trend	2	2	2



Skrift nr. 29
Forventede ændringer i ekstremregn som følge af klimaændringer
2008
IDA Spildevandskomiteen

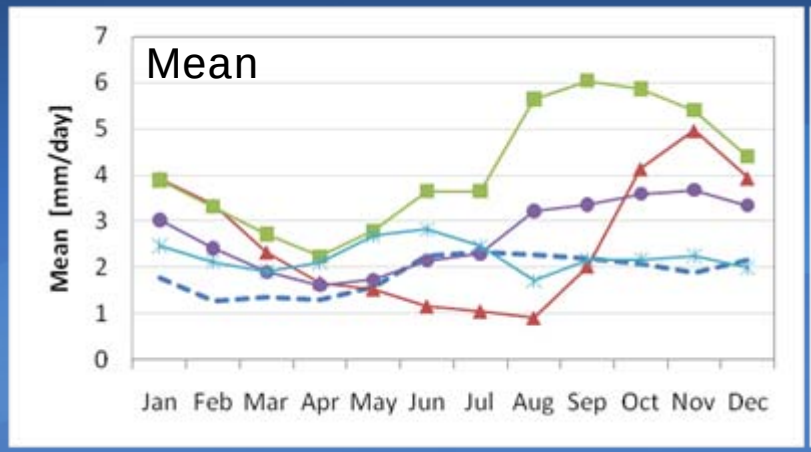
Nye klimamodel data

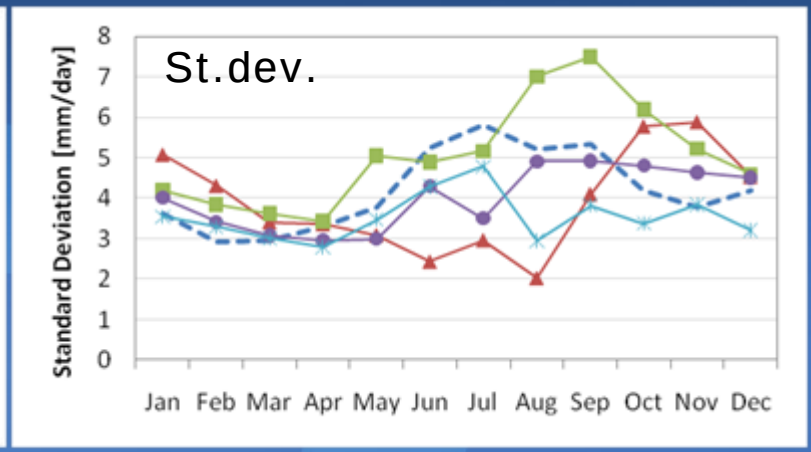
ENSEMBLES GCM-RCM Matrix 22/2/2010

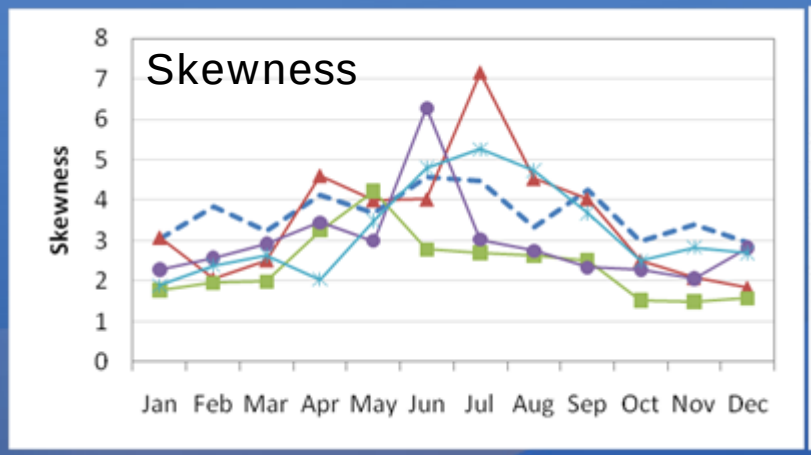
Global model Regional inst.	METO-HC Standard	METO-HC Low sens.	METO-HC Hi sens.	MPIMET Standard	MPIMET Ens.m. 1	MPIMET Ens.m. 2	IPSL	CNRM	NERSC	MIROC	CGCM3	Total number
METO-HC	2100	2100*	2100*	2100 (late 2010)								4
MPIMET				2100			2050*					2
CNRM								2100				1
DMI				2100*				2100	2100* (04/2010)			3
ETH	2100											1
KNMI				2100* 2100	2100*	2100*				2100*		1+4
ICTP				2100								1
SMHI		2100*		2100* 2100*					2100			3+1
UCLM	2050											1
C4I			2100*		2050 (A2)*							2
GKSS							2050*					1
METNO	2050*								2050*			1
CHMI								2050* (12/2009)				1
OURANOS**											2050*	1
VMGO**	2050*											1
Total (1951-2050)	5	2	2	7+2	0+1	0+1	2	3	3	0+1	1	25+5

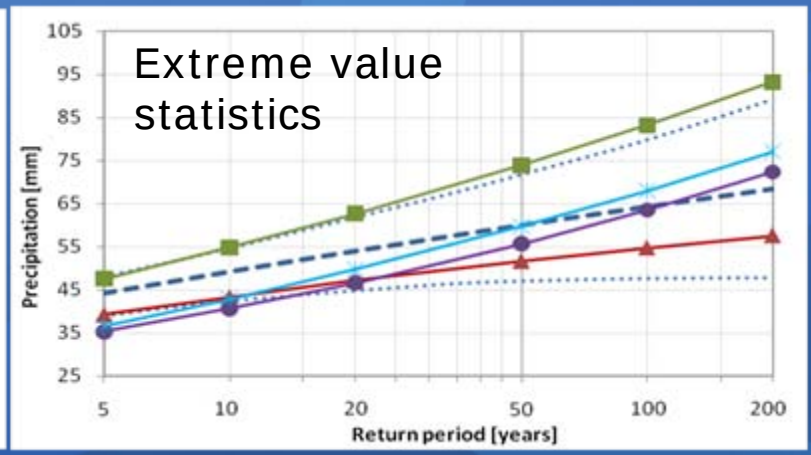
Red: Online now; *: non-contractual runs; **:affiliated partners without obligations; underscore: 50km resolution; (in parantheses): Expected date. For partner acronym explanations, see the participant list. **NOTE** that all partners also did an ERA-40 driven analysis 1951(1961)-2000

Klimamodeller sammenlignet med observationer



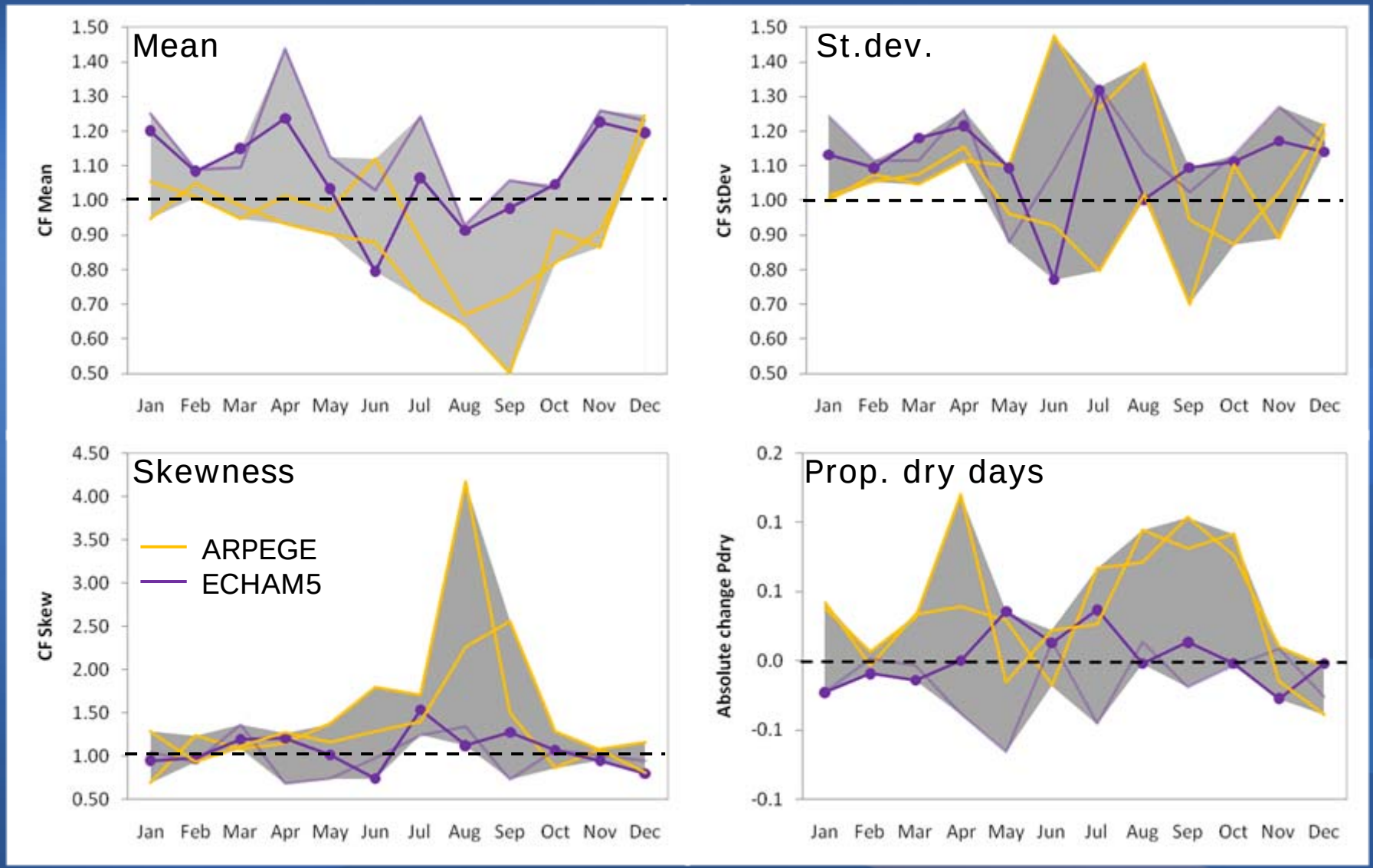




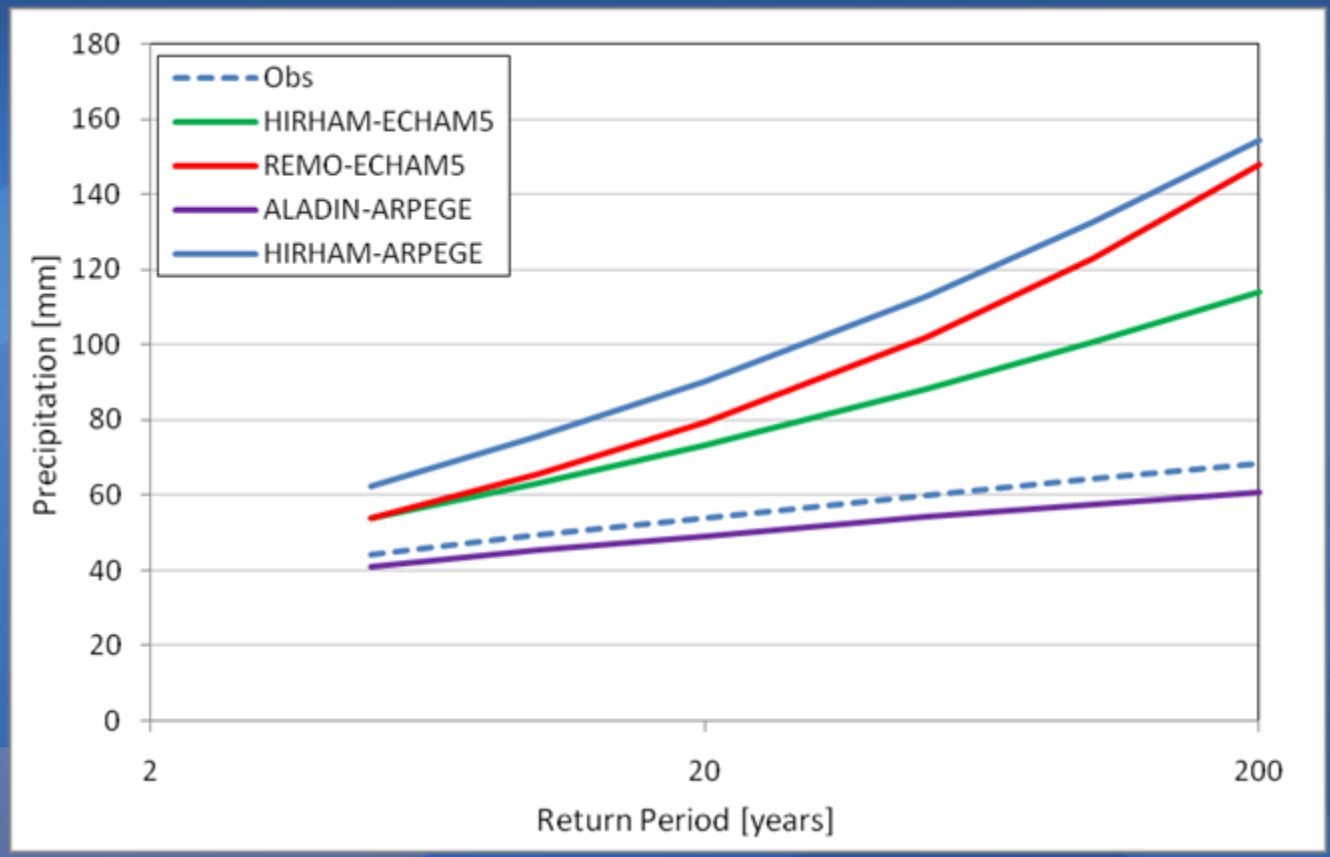


ALADIN-ARPEGE
HIRHAM-ECHAM5
REMO-ECHAM5
HIRHAM-ARPEGE
Observed

Klimamodel projektioner - ændringer (2070-2100)



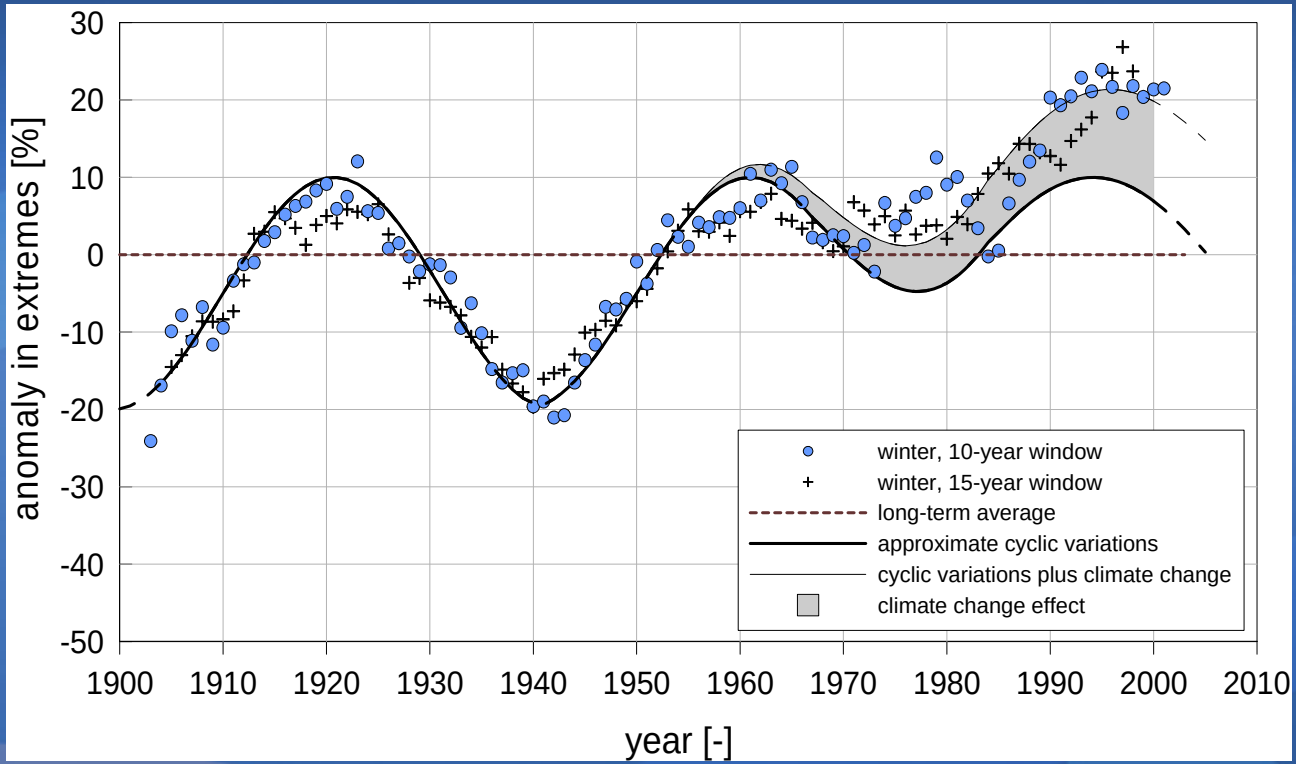
Nedskaleret ekstrem regn (2070-2100)



Nedskaleret ekstrem regn (2070-2100)

Gentagelsesperiode [år]	10	100
Klimafaktor – range Klimafaktor – middel	0.9 - 1.5 1.3	0.9 - 2.1 1.6
Klimafaktor Skrift 29	1.3	1.4
Simpel fremskrivning af observeret trend	2	2

Trends og oscillationer?



Anomaly in quantiles of 10 minutes rainfall extremes at Uccle, Brussels, in the winter season, for moving windows of 10 and 15 years in comparison with the full period 1898-2005 (Ntegeka & Willems, 2008)

Konklusion

- Observeret ændringer i ekstrem regn i Danmark i de seneste 30 år
  - 10 års regn: +10%
  - 100 års regn: +20%
- Estimerede fremtidige ændringer baseret på klima model projektioner – konsistent med observationer?
  - 10 års regn: +30% i 2100 (Skrift 29 og ENSEMBLES data)
  - 100 års regn: +40% i 2100 (Skrift 29), +60% (ENSEMBLES data)
- Brug af klima model projektioner kræver statistisk nedskalering
  - Skalering til passende spatial og temporal skala
  - Statistisk justering af klima model output
- Store usikkerheder – og vigtigt at tage dem i regning
  - Klima scenario
  - GCM/RCM model projektion
  - Statistisk nedskalering
- Igangværende forskningsaktivitet under CRES - Centre for Regional Change in the Earth System (http://cres-centre.dk)