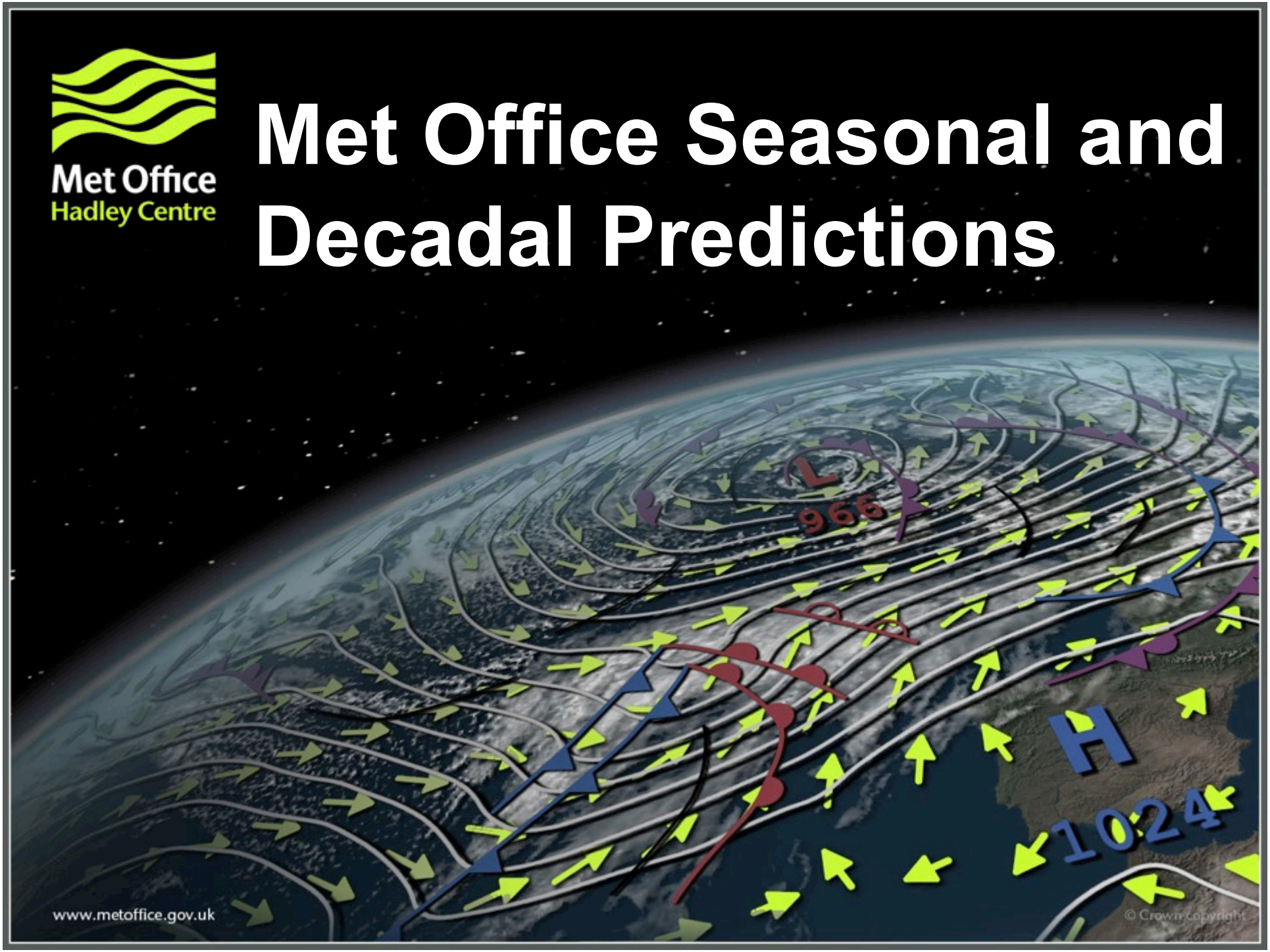
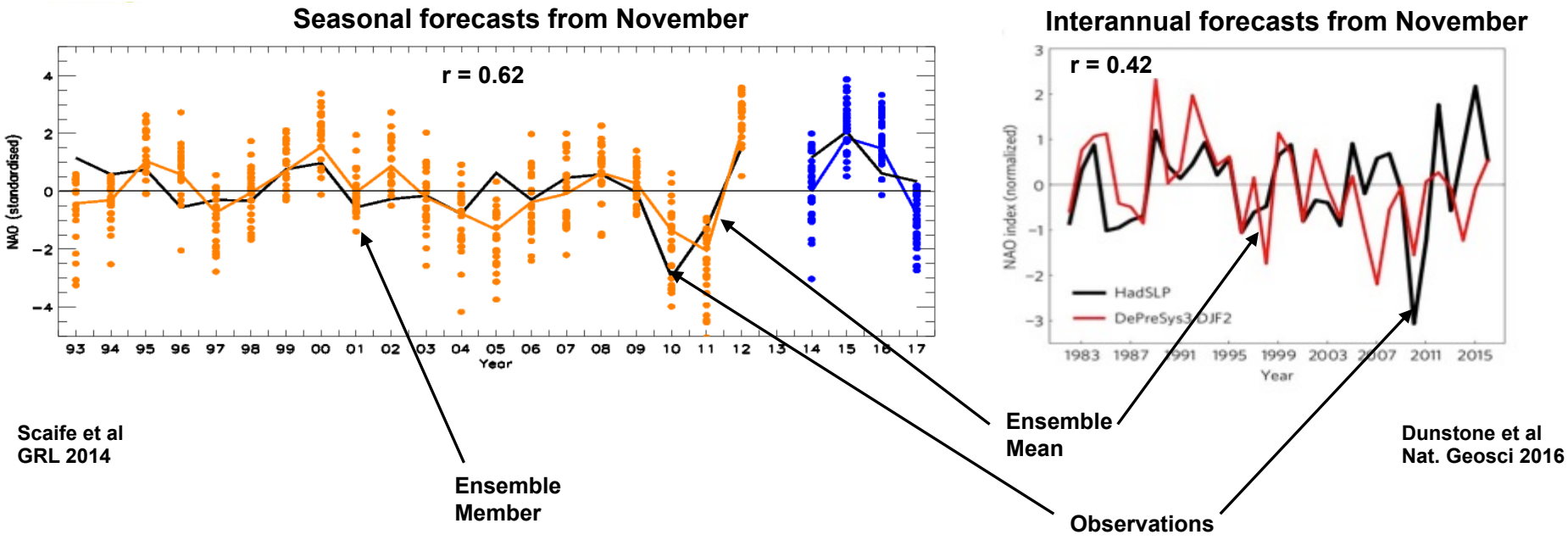
Met Office
Hadley Centre

Met Office Seasonal and Decadal Predictions



Winter prediction skill for the NAO



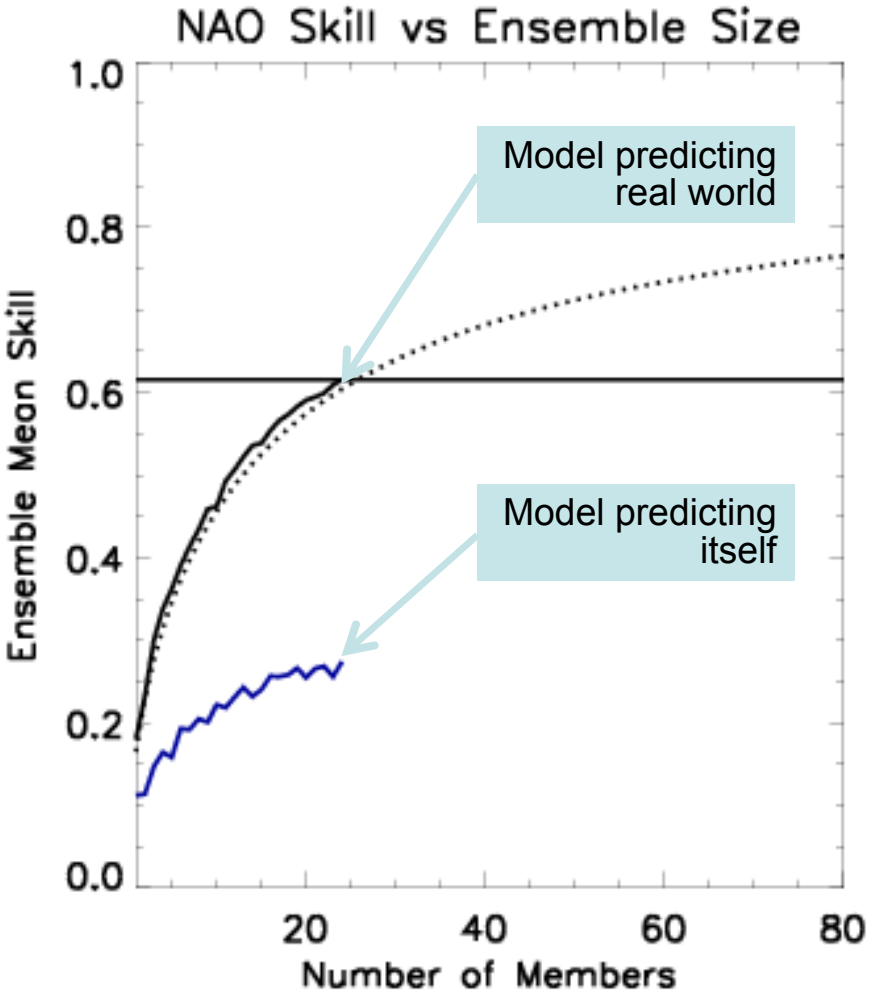
Our original tests are shown in orange and indicate a correlation skill of 62%

More ensemble members => more skill and ~0.8 may be possible

Now extended to show significant interannual skill

So far so good with real time forecasts and early services….

However: forecast members are not interchangeable with obs



Skill rises slowly with ensemble size

Real world more predictable than model!

Undermines basis of ensemble prediction

Members NOT alternate realisations of obs

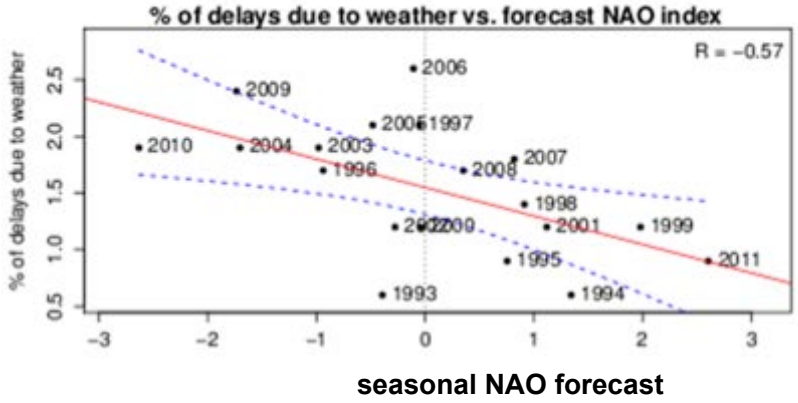
Not a simple problem of incorrect spread

spread in model NAO ~ variability in obs NAO

Scaife et al GRL 2014, Eade et al GRL 2014, Dunstone et al 2016

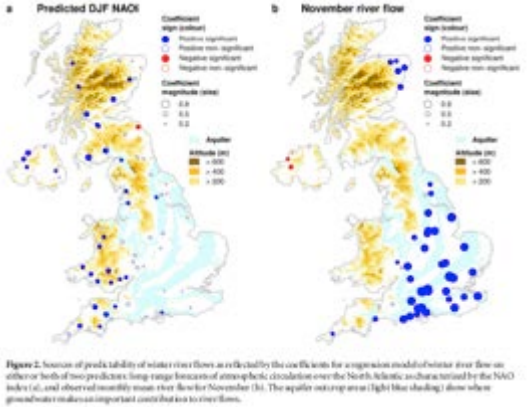
Consequences for climate services

Winter airport disruptions



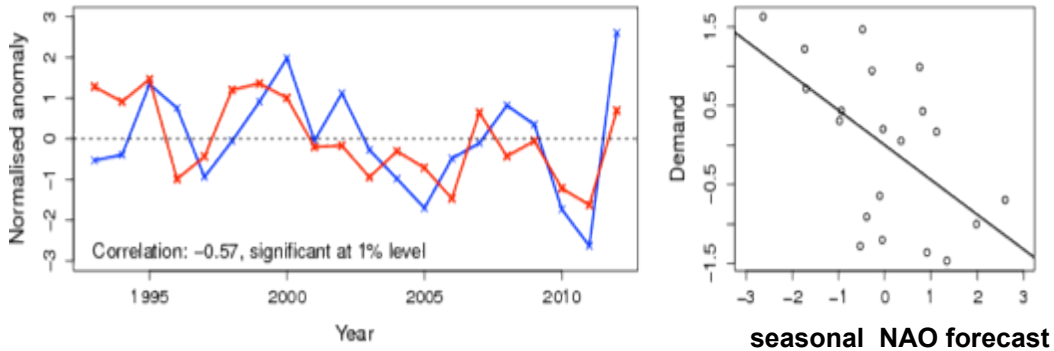
Palin et al, J. App. Met. Clim., 2015

Winter river flow forecasting from NAO and persistence



Svensson et al, Env. Res. Lett., 201

Winter GB electricity demand and seasonal forecast



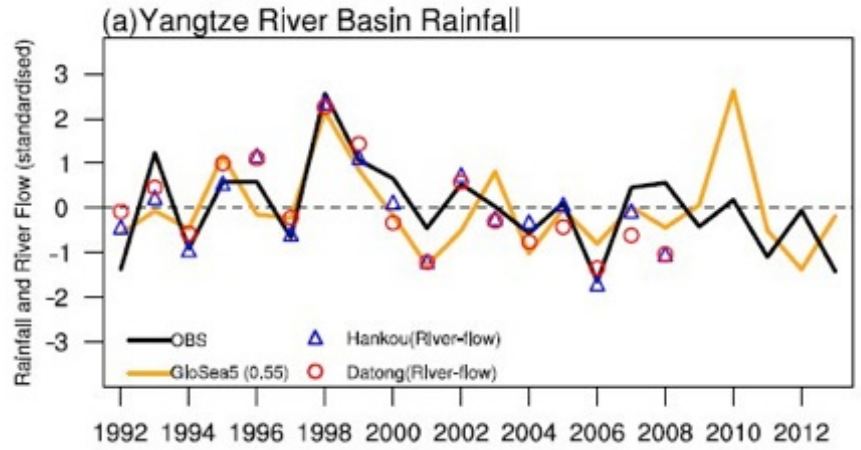
Clark et al, ERL, 2017

Impacts are skilfully predicted, suggesting potential climate services

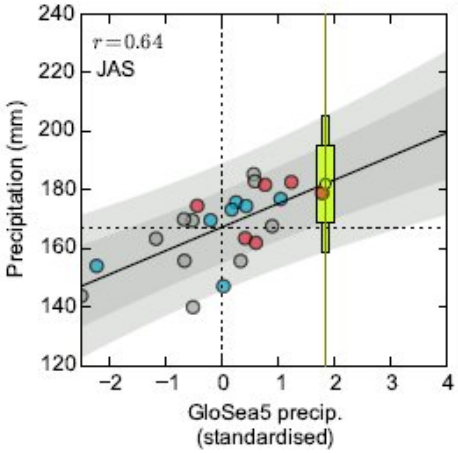
but

Have to use ensemble mean NAO and regression at present

Real time forecast with China Met' Administration



Li et al, ERL, 2016



Above-average precipitation		Observed: Yes	Observed: No
Predicted	Yes	10 Hits	4 False alarms
	No	4 Misses	5 Correct rejections
Hit Rate:		70%	
False Alarm Rate:		45%	

Bett et al, submitted

Useful regional average skill (r = 0.55)

Real time service tested

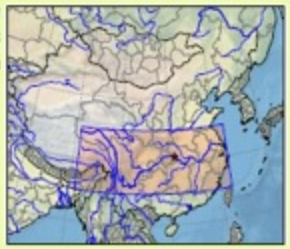
This document provides forecasts for the Yangtze river region in 2016. The region used is shown on the right. The location of the Three Gorges Dam is marked with a star. Forecasts are for area-averaged seasonal precipitation accumulations, or river flow. The current headline results are:

For the coming 3-month period (JAS):

- **There is a 90% chance of above-average *rainfall*.**
- **There is a 85% chance of above-average *river flow*.**

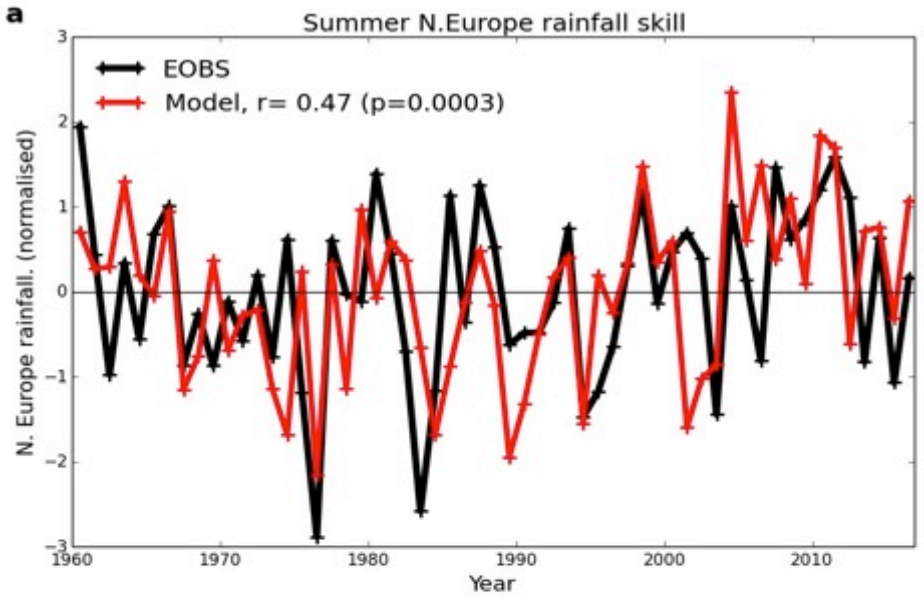
For the following 3-month period (ASO):

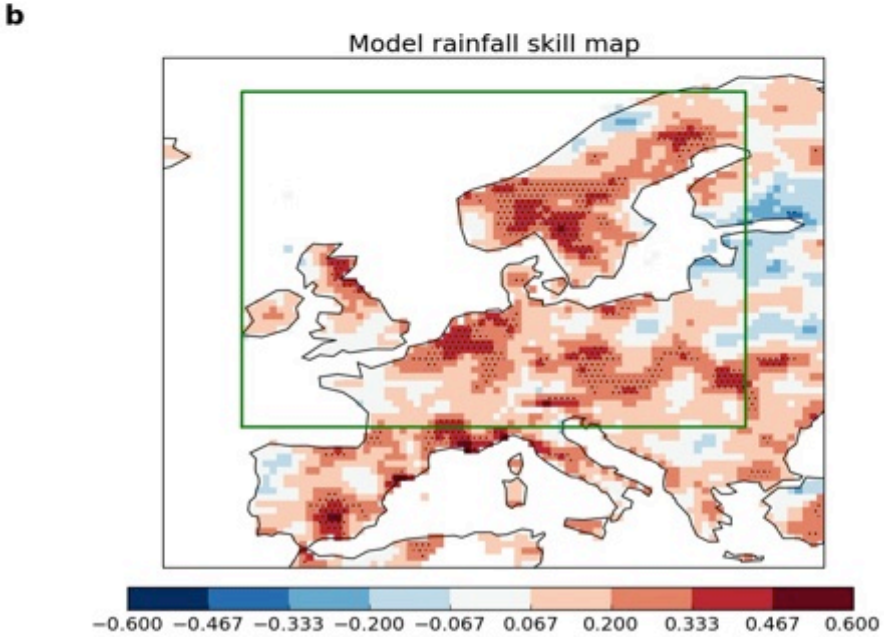
- **There is a 75% chance of above-average *rainfall*.**



Wuhan flooding, photo: Radio Free Asia

European summer rainfall





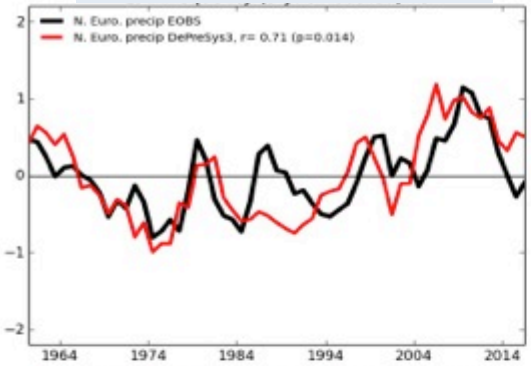
- 80 ensemble members (40 each from May and Nov)
- Every year from 1961
- r=0.47
- Captures some extreme years (e.g. 1976) and some low frequency variations (e.g. wet years 2007-2012)
- Also some skill for southern Europe (r=0.39)

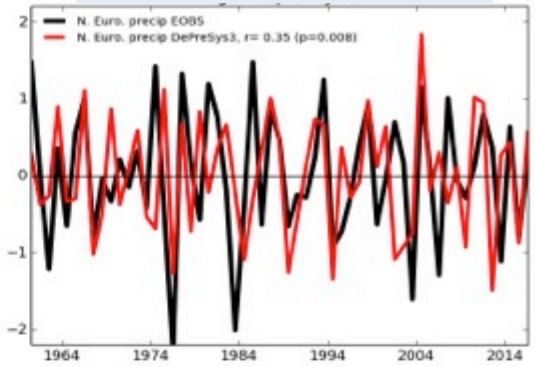
Dunstone et al, submitted

European summer rainfall

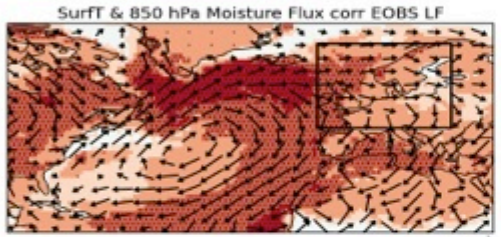
Low frequency

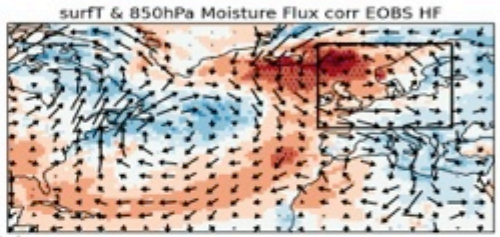
High frequency





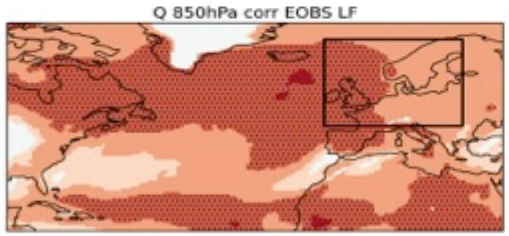
Correlation between obs European rainfall and forecast T (colours) and moisture flux (arrows)

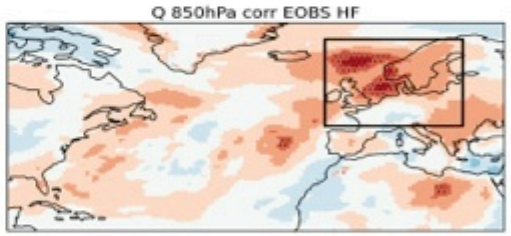




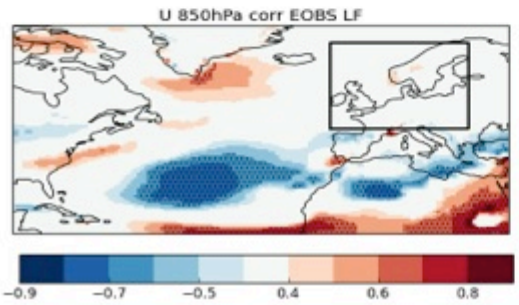
→ min. size for 95% sig.

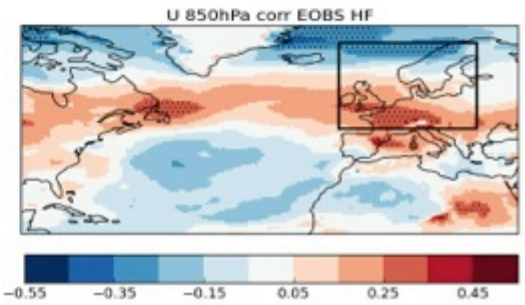
Correlation between obs European rainfall and forecast Q





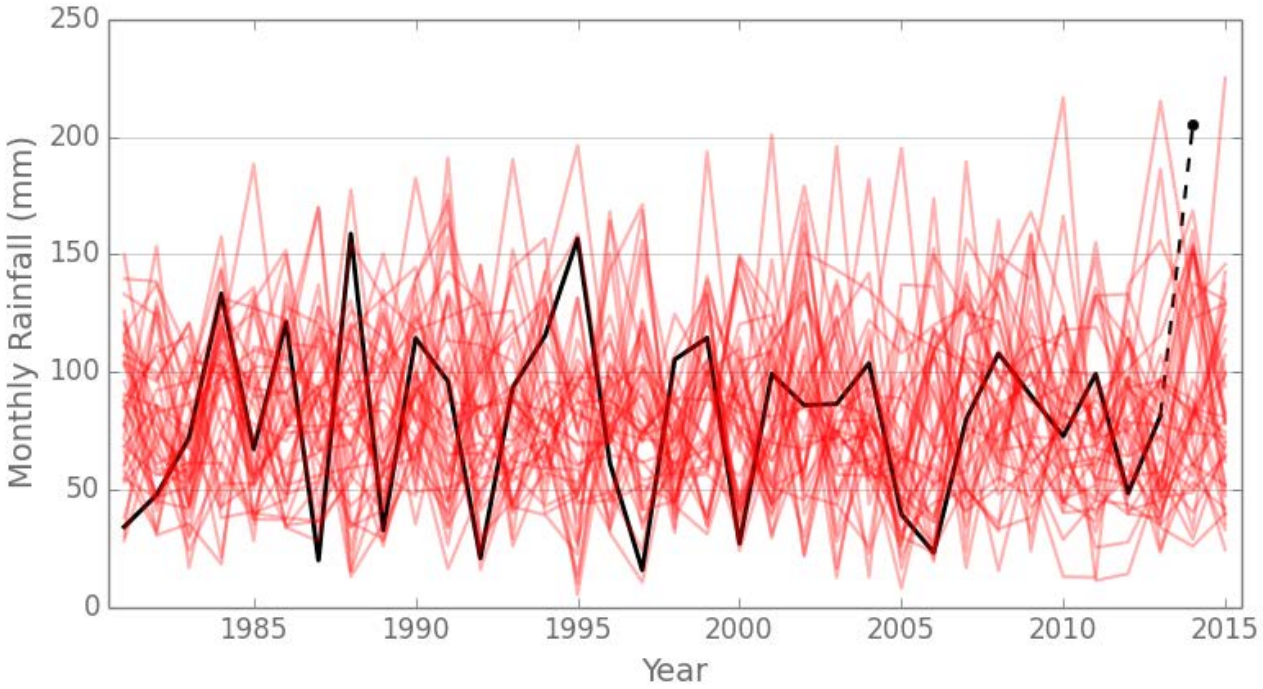
Correlation between obs European rainfall and forecast U

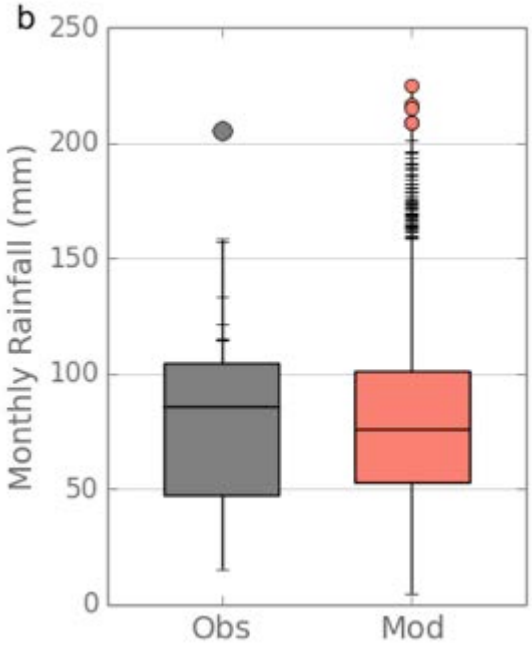




Dunstone et al, submitted

UNSEEN: Unprecedented Simulated Extremes in ENsembles





Thompson et al, 2017 (also Kent et al 2017 for application to maize production)