

# WP5 - INDICES TIME EVOLUTION AND RELATIONS WITH THE ATMOSPHERE



*European Research Area  
for Climate Services*

Initial plans and status

Richard Allan, Len Shaffrey, Emily Black, Ed Hawkins

# STAFF INVOLVEMENT/DURATION

- PIs
  - Richard Allan ([r.p.allan@reading.ac.uk](mailto:r.p.allan@reading.ac.uk); @rpallanuk)
  - Len Shaffrey ([l.c.shaffrey@reading.ac.uk](mailto:l.c.shaffrey@reading.ac.uk))
  - Emily Black ([e.c.l.black@reading.ac.uk](mailto:e.c.l.black@reading.ac.uk); @emily\_black3)
  - Ed Hawkins ([e.hawkins@reading.ac.uk](mailto:e.hawkins@reading.ac.uk); @ed\_hawkins)
- PDRA yet to be decided, M10-M33



## Deliverables:

- **D5.1** Inventory and Catalogue of Indicators of circulation variability for comparison with the INDECIS-ISD (**M18**)
- **D5.2** Report on temporal evolution of the INDECIS-QCHDS and INDECIS-ISD, including the time-emergence of climate-change signals and relation with atmospheric patterns (**M24**)
- **D5.3** Report on the relation between INDECIS-QCHDS and INDECIS-ISD and atmospheric patterns (**M33**)

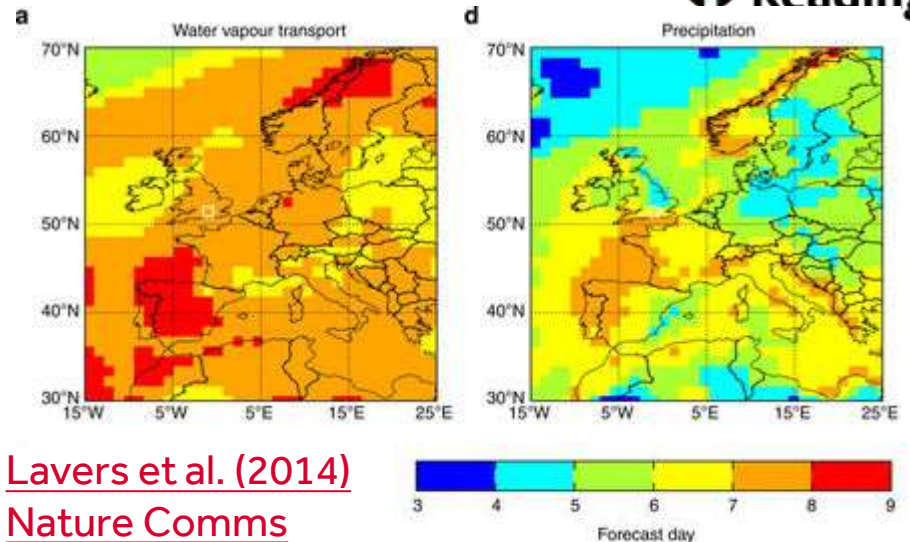
# PLANS

- **Tasks:**

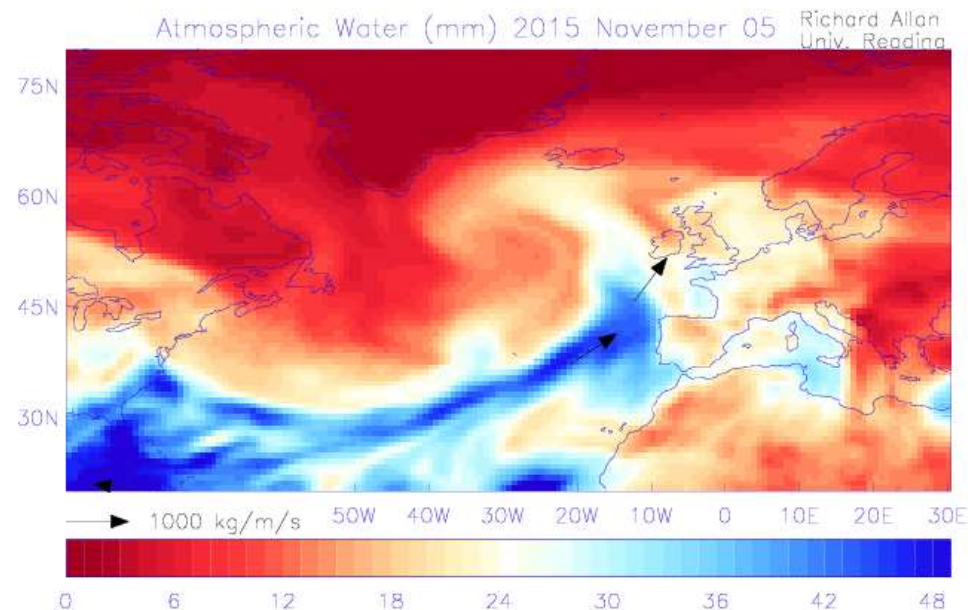
- Compilation of teleconnection indices, weather types, blocking patterns, Atmospheric Rivers and other indicators of atmospheric variability (M10-M13)
- Analysis of temporal evolution of the INDECIS-QCHDS & preliminary/ additional datasets, including derived extremes (M14-M21)
- Analysis of temporal evolution of the INDECIS-ISD (M22-M28)
- Investigation of the physical links between atmospheric variability, extremes and sectorial indices, with special emphasis on drought, heatwaves and agriculture (M24-M33)
- Investigation of time-emergence of observed climate change signal relative to variability (M24-M33)

# MOISTURE TRANSPORT & EXTREME RAINFALL

- Example impact relevant metric e.g. Atmospheric Rivers
- Moisture transport linked with flooding
- Promising applications in forecasting and climate prediction
- Energy transport metrics can also be explored (e.g. role in drought/heatwave).

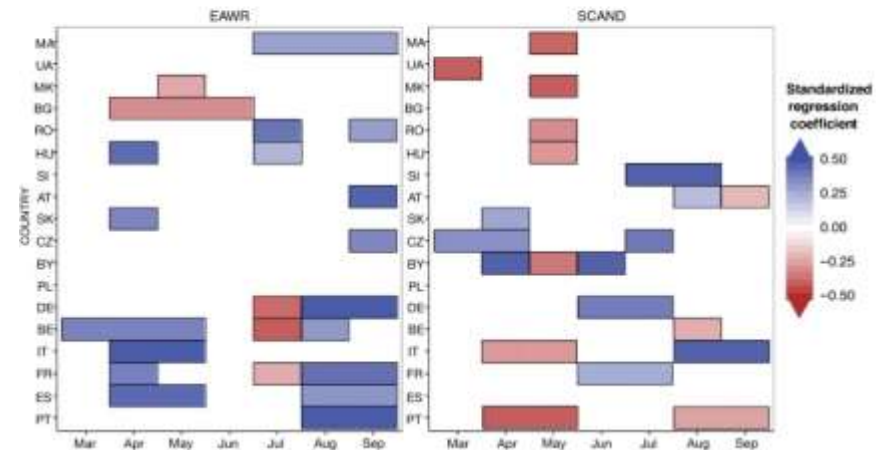
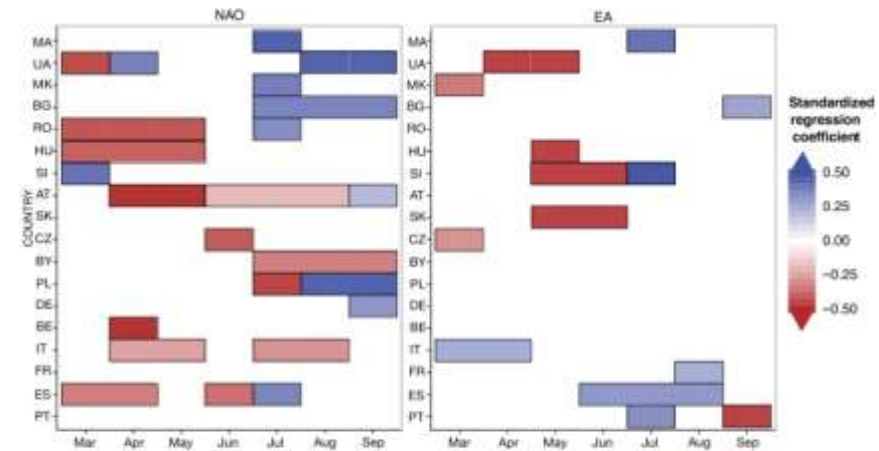
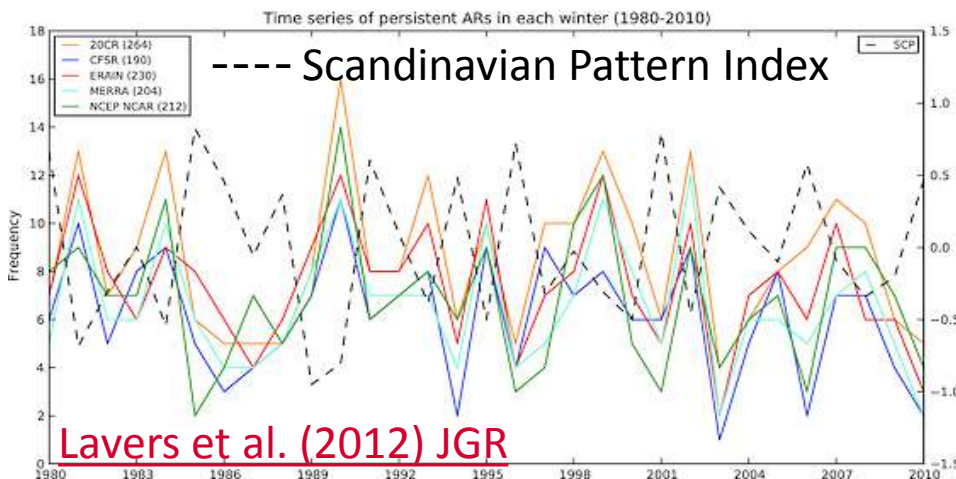


[Lavers et al. \(2014\)](#)  
[Nature Comms](#)



# CLIMATE METRIC LINKS TO CIRCULATION INDEX

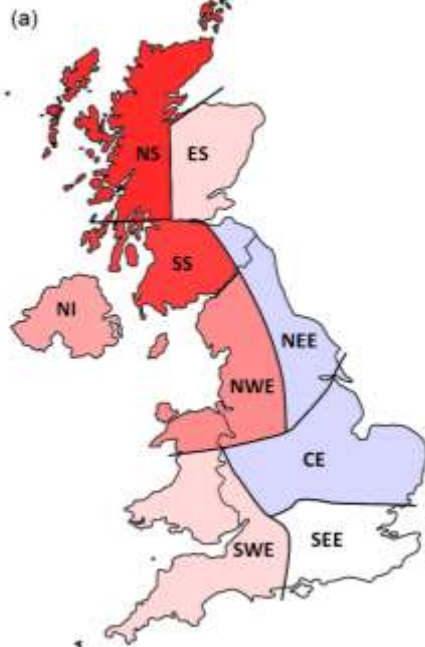
- Standard evaluation of INDECIS-QCHDS/ISDs:
- Temporal variability/trends and links to circulation pattern indices (e.g. NAO, EA, EAWR, SCAND)
- What is physical basis?



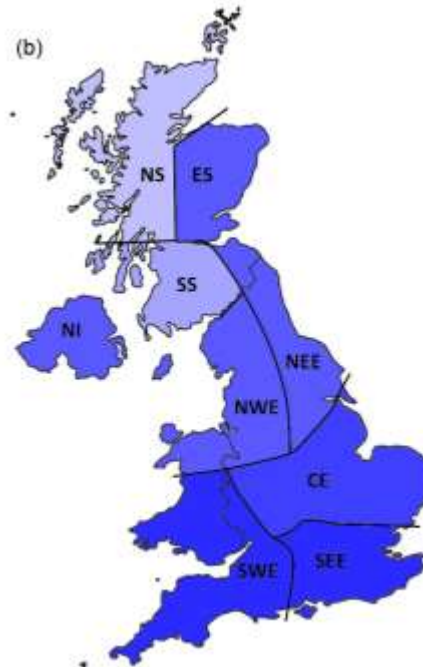
[Ceglar et al. \(2017\) AFM](#)

# UK WINTER RAINFALL AND CIRCULATION

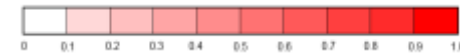
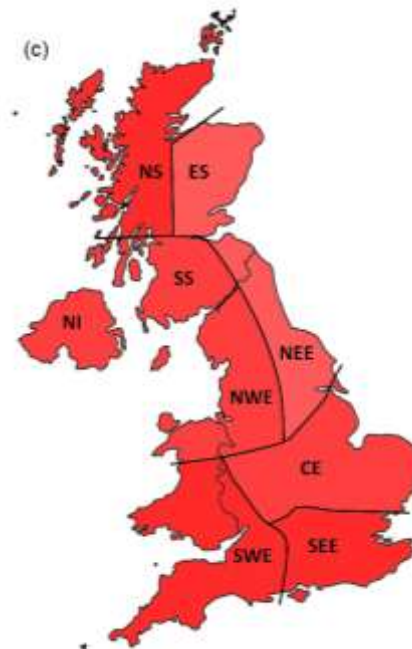
## North Atlantic Oscillation



## East Atlantic Pattern



## Combined model



- Regional correlations of DJF precipitation with the two pressure indices (NAO and EAP) and a multiple linear regression model:

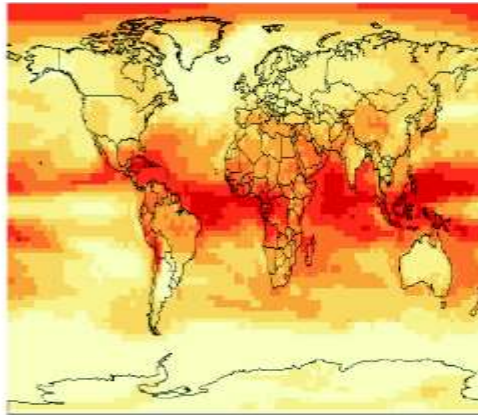
$$P_{lin} = a_i \text{MSLP}_{NAO} + b_i \text{MSLP}_{EAP} + c_i$$

- Based on observation data from 1931-1991 (training period)

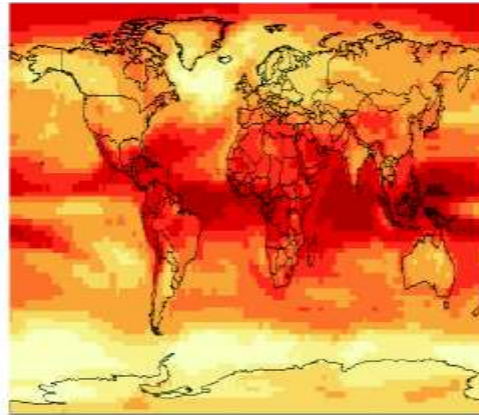
Work by Laura Baker

# TIME EMERGENCE OF CLIMATE SIGNALS

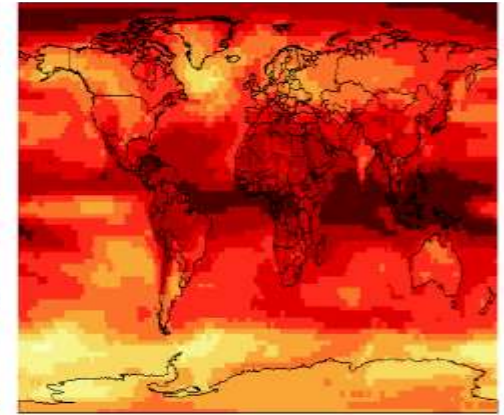
Signal-to-noise ratio at end of 21<sup>st</sup> century (RCP4.5, multi-model quantiles)



16th percentile CMIP5 ensemble



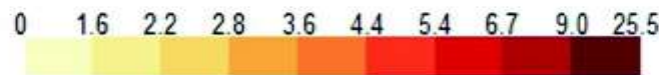
50th percentile CMIP5 ensemble



84th percentile CMIP5 ensemble



Standard (top) & “cartograms”  
(maps distorted by local  
population density, bottom)



[Frame et al. 2017](#)

# WP5 TIMINGS/CONTRIBUTIONS

WP/MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
WP1					D1.1						D1.2						D1.3																			D1.4	
WP2					D2.1						D2.2						D2.3						D2.4														
WP3					D3.1						D3.2			D3.3			D3.4						D3.5														
WP4					D4.1						D4.2		D4.2				D4.3			D4.4			D4.5														
WP5																	D5.1						D5.2												D5.3		
WP6																	D6.1						D6.2											D6.3	D6.4		
WP7																	D7.1						D7.2												D7.3	D7.4	

Figure 1. GANTT Diagram of Deliverables.

Table 1. Contributions (persons/month) to each Work Package by members of the consortium.

WP	URV-C3	UREAD	FMI	BRGM/D3E	IRPI(CNR-DTA)	UC/IHC	SMHI	MÉT EIREANN	AEMET	BSC	FFCUL	CZECHGLOBE	KNMI	RMI	METEORO	IPE/CSIC
1	36						1								1	
2	12				17		1	4	6	18			6		1	2
3	66				17		5	4	24	12	13	20	6		0	
4	60	3	25	1	17	32			3	37		24			2	105
5		40			17	75			3	39	16			10	2	
6		10	52	24		41		4		48		10			15	
7	78		25	1	10				54		11				2	8