HydEF Progress at Reading

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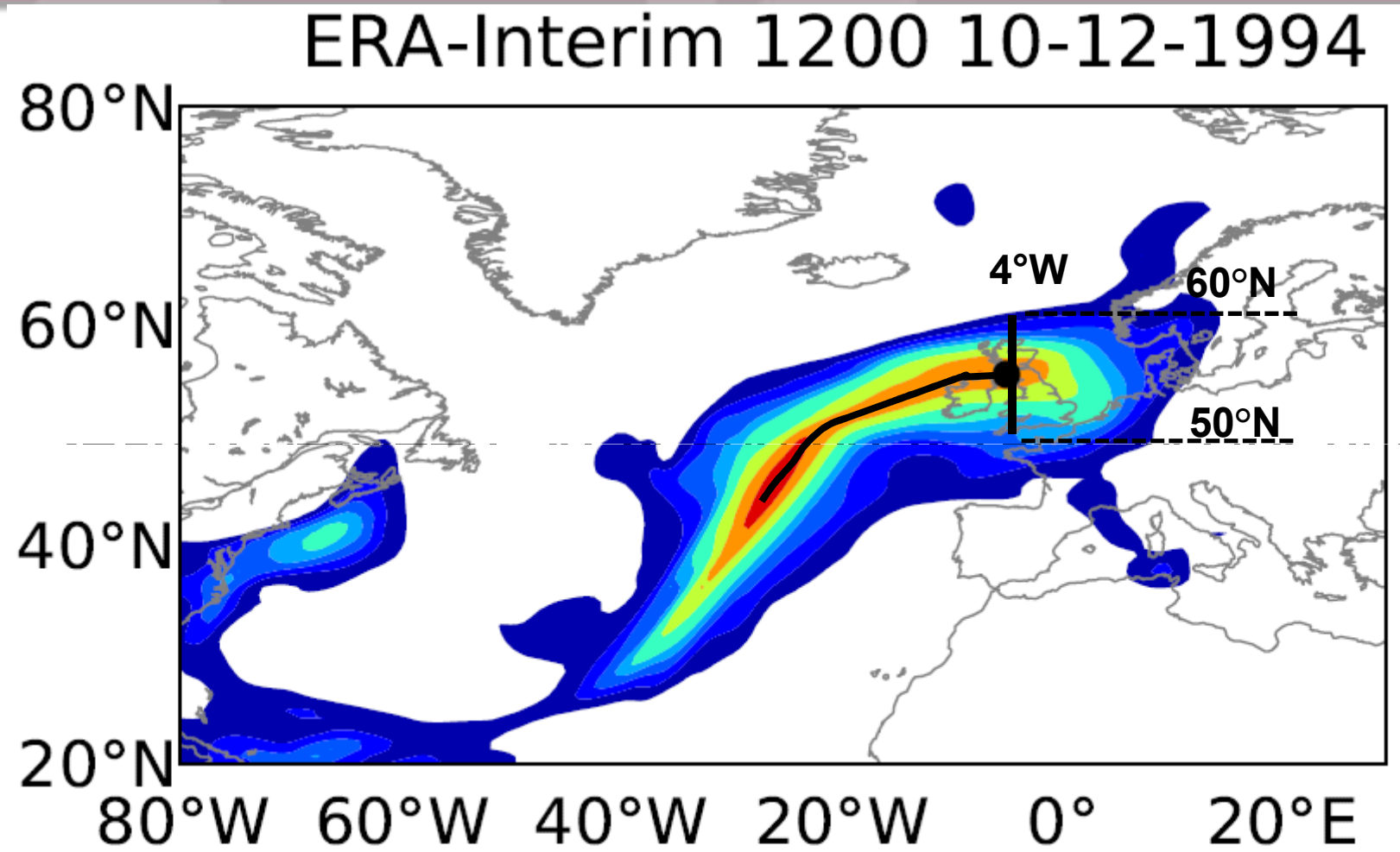
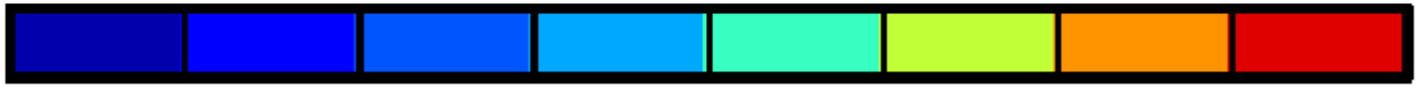
AR screening in atmospheric reanalyses





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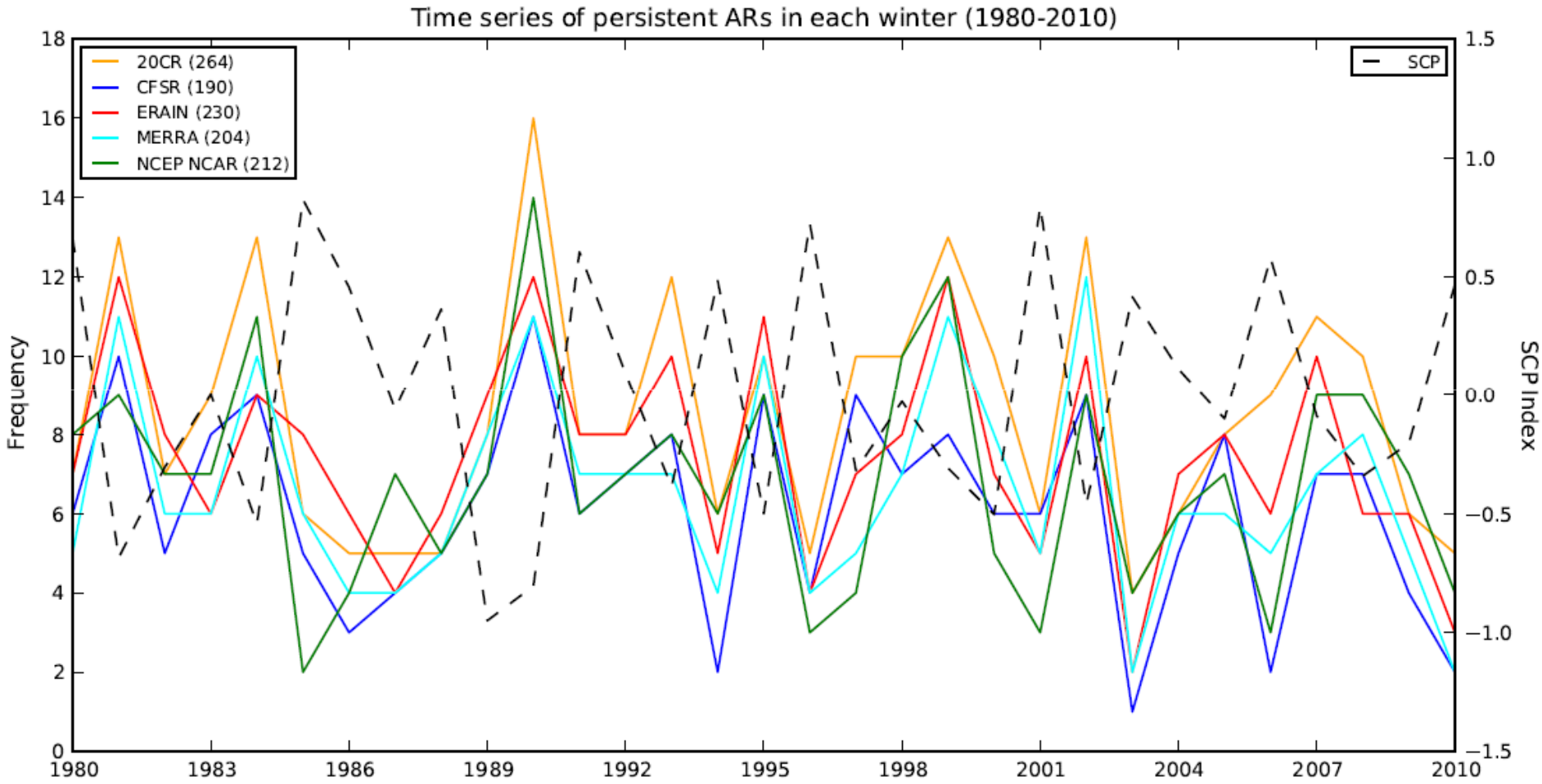
AR totals in each winter half-year

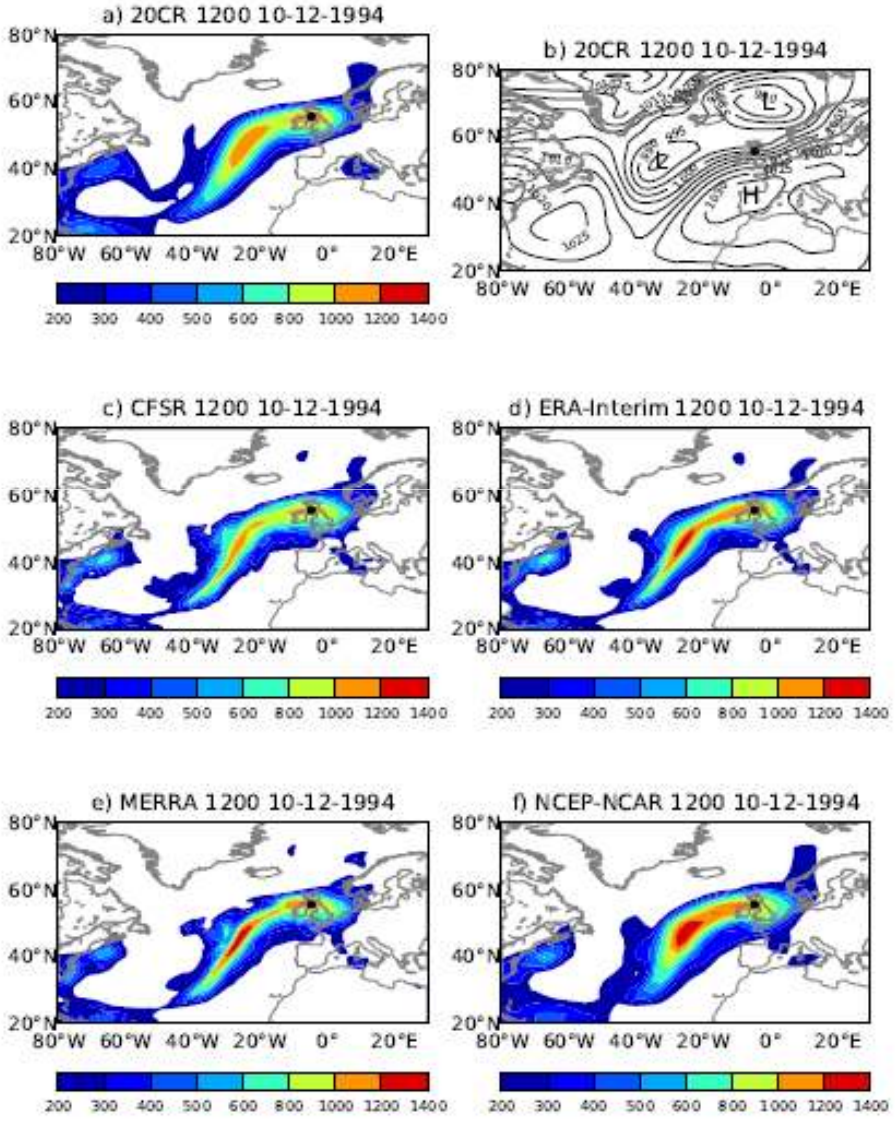


NCEP-NCAR
MERRA
ERA-Interim
CFSR
Twentieth Century

Lavers et al., 2012 JGR

An AR example

AR behind largest flood in Ayr river basin (Scotland).

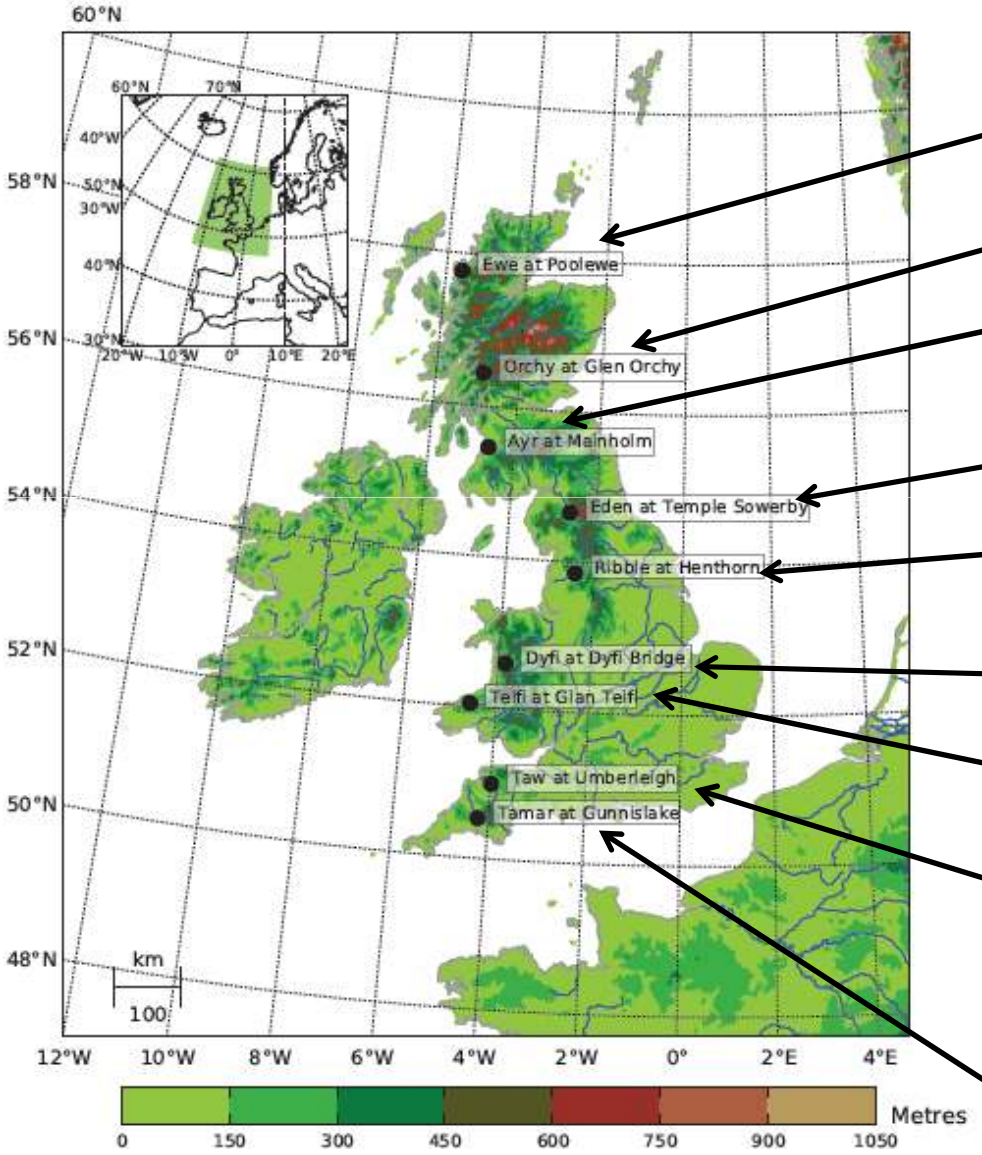


Mean Sea Level Pressure (in hPa).

IVT in kg m^{-1} s^{-1}.

Lavers et al., 2012 JGR

Basins for AR-flood link assessment



Lavers et al., 2012 JGR

BFI = Base Flow Index

Ewe at Poolewe; BFI=0.64, 441.1km^2

Orchy at Glen Orchy; BFI=0.22, 251.2km^2

Ayr at Mainholm; BFI=0.29, 574km^2

Eden at Temple Sowerby; BFI=0.37, 616.4km^2

Ribble at Henthorn; BFI=0.31, 456km^2

Dyfi at Dyfi Bridge; BFI=0.39, 471.3km^2

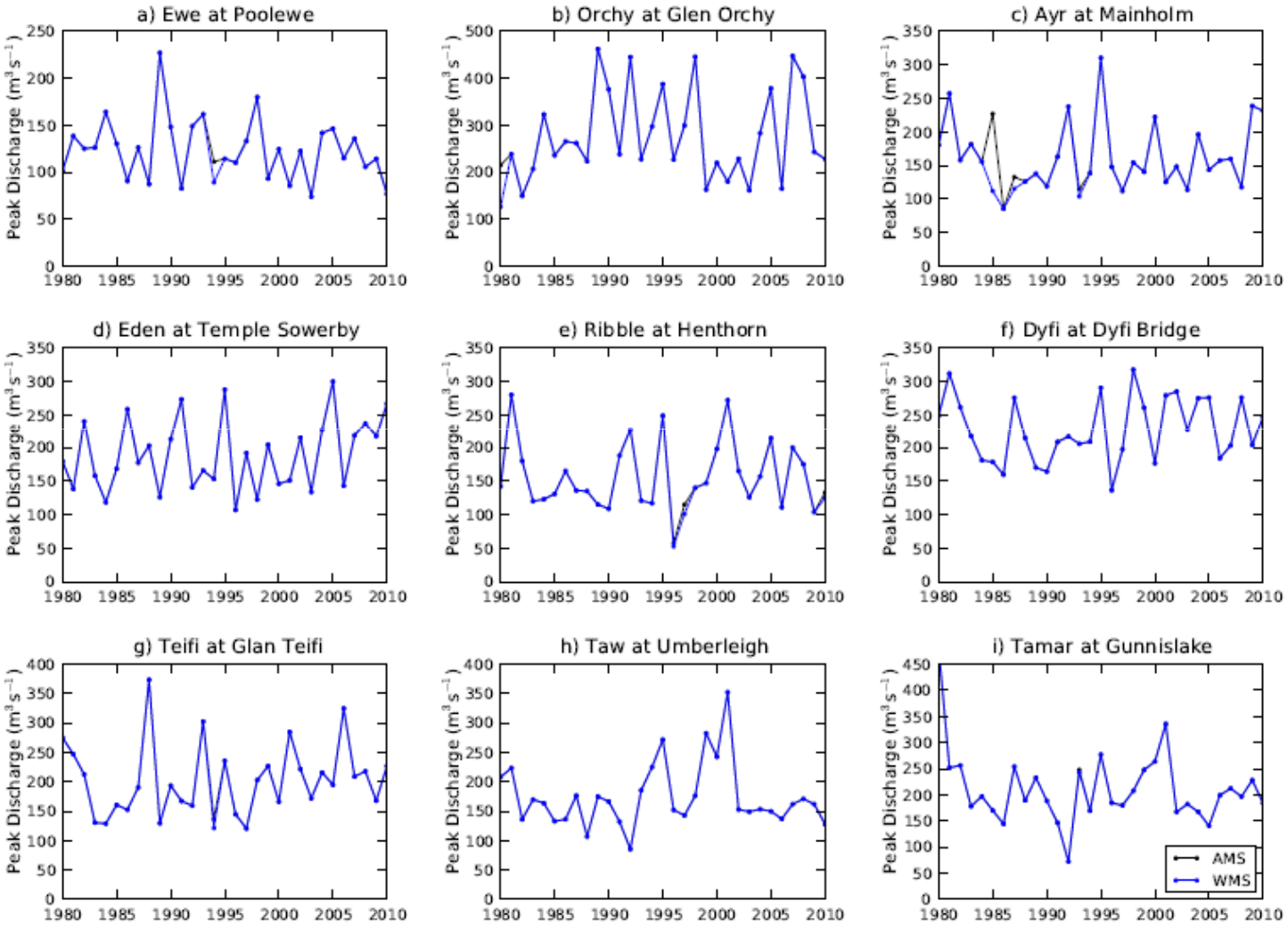
Teifi at Glan Teifi; BFI=0.54, 893.6km^2

Taw at Umberleigh; BFI=0.43, 826.2km^2

Tamar at Gunnislake; BFI=0.46, 916.9km^2

Analysis of flood record

Extract peak mean daily river flow in winter half-year (**WMS**) and water year (**AMS**). **AMS and WMS are generally equivalent.**

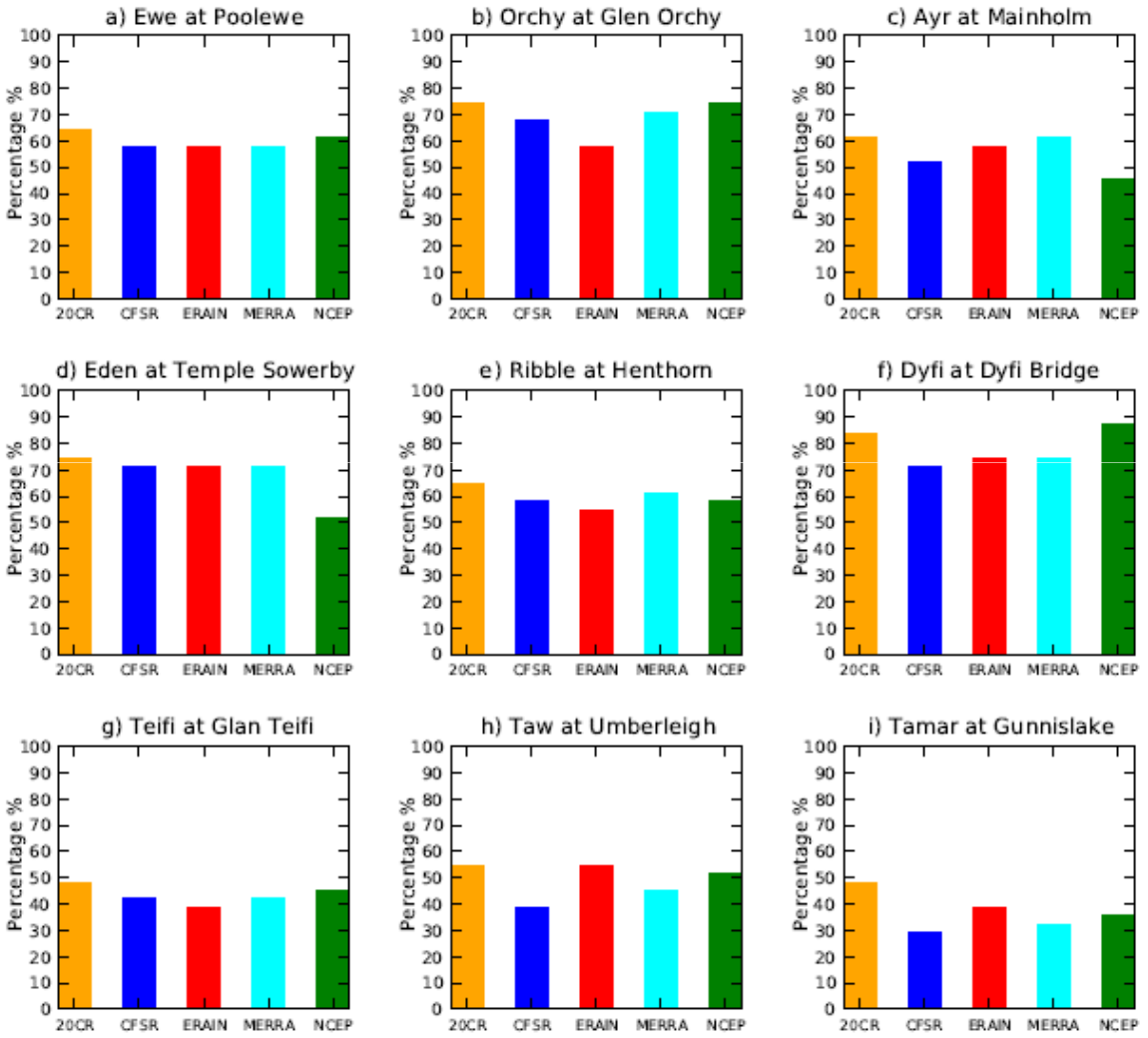


Lavers et al., 2012 JGR

ARs and POT-1 floods

1). Extract 31 largest winter floods (Peaks-Over-Threshold).

2). Persistent AR must start 3 days before or on day of flood.



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e.g., Dyfi has > 70% of POT-1 floods related to persistent ARs.

Lavers et al., 2012 JGR

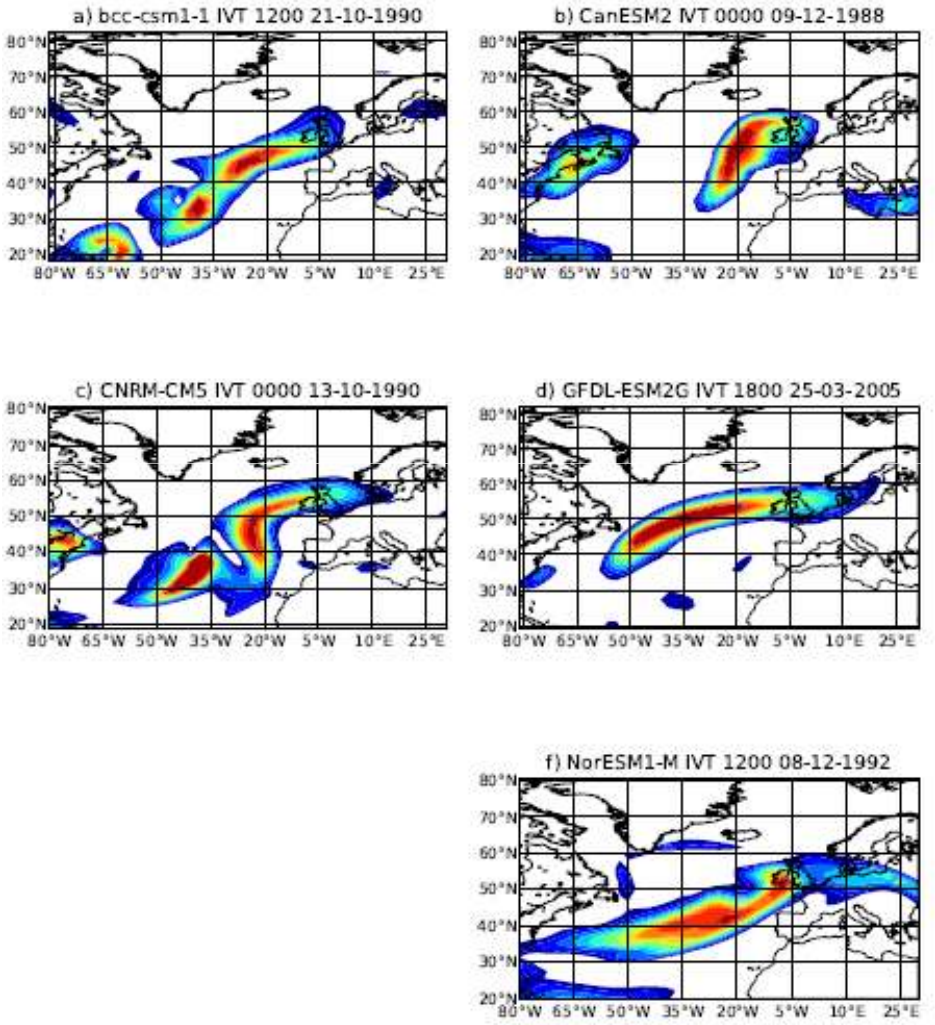
AR Conclusions

- Algorithm detects persistent ARs.
- Reasonable AR agreement between reanalyses.
- Winter floods are the largest.
- Strong connection between identified ARs and winter floods in six river basins; in Dyfi basin > 70 % of floods related to ARs.

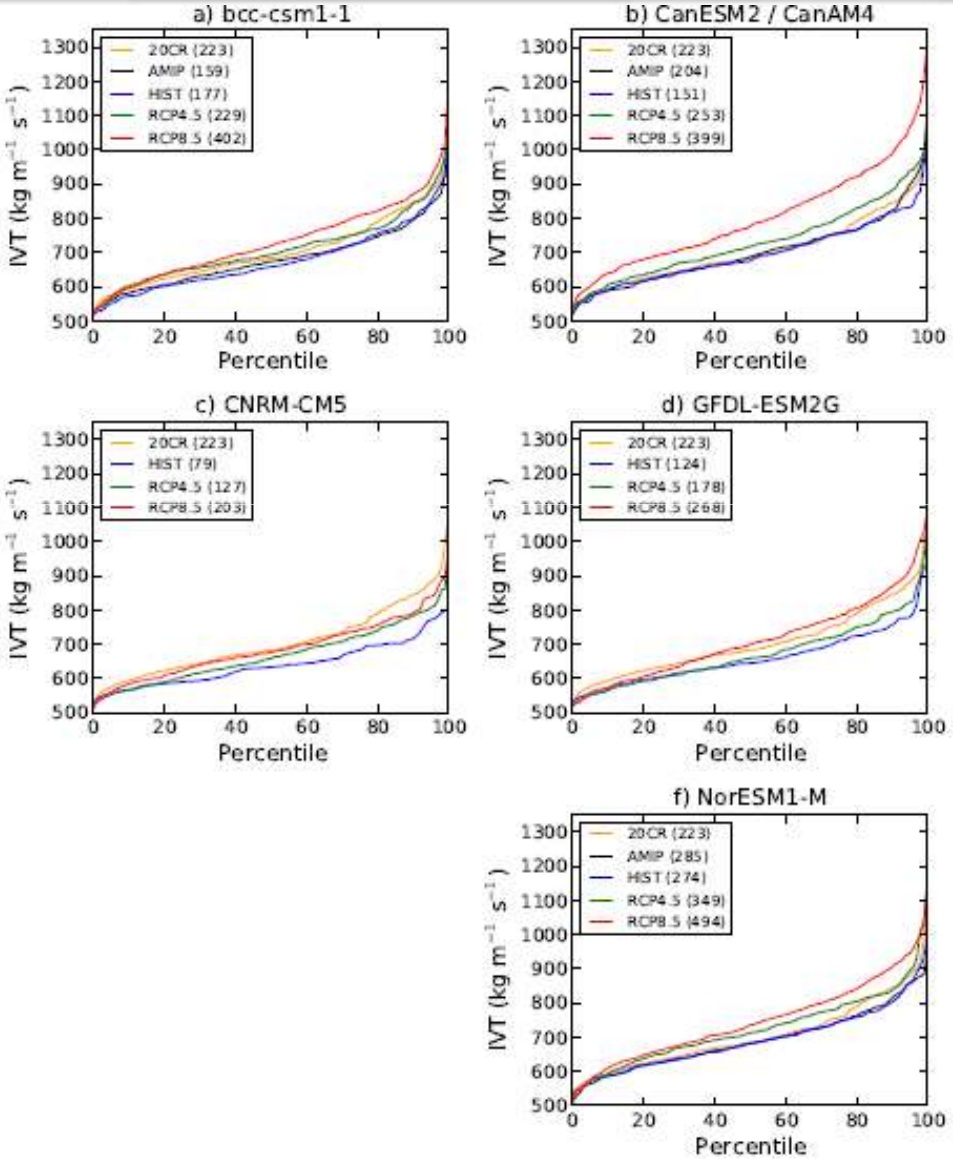
ARs and Climate Change

- ARs could transport more moisture due to increase in atmospheric water vapour content with temperature (Clausius-Clapeyron) $\longrightarrow$ change in hydrological cycle and enhancement of extremes.
- Change in AR frequency will affect number of extreme winter floods. This depends on changes to the large-scale circulation.

ARs in the latest climate projections



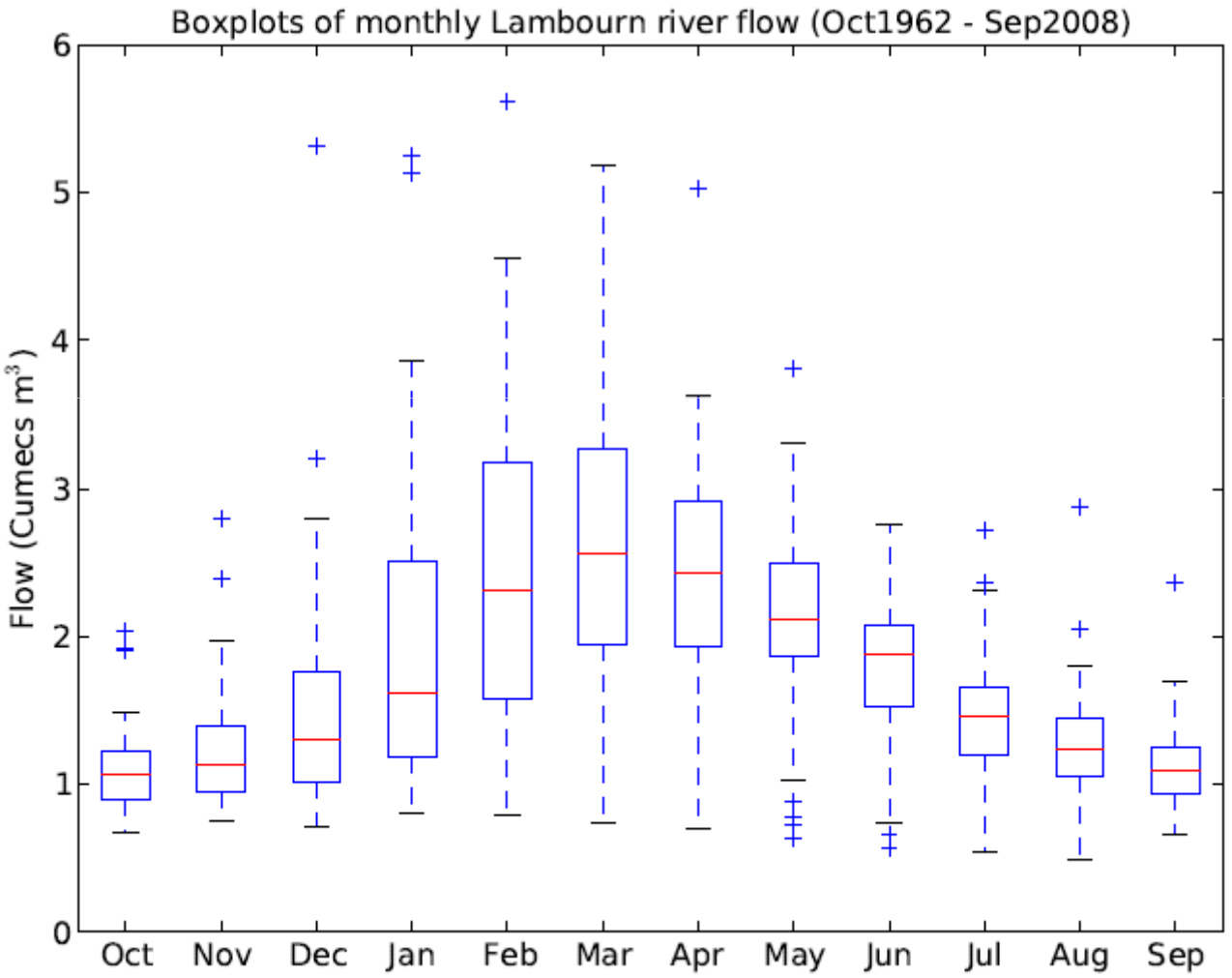
ARs in the latest climate projections



CDFs of the IVT in ARs affecting Britain at 4-5W.

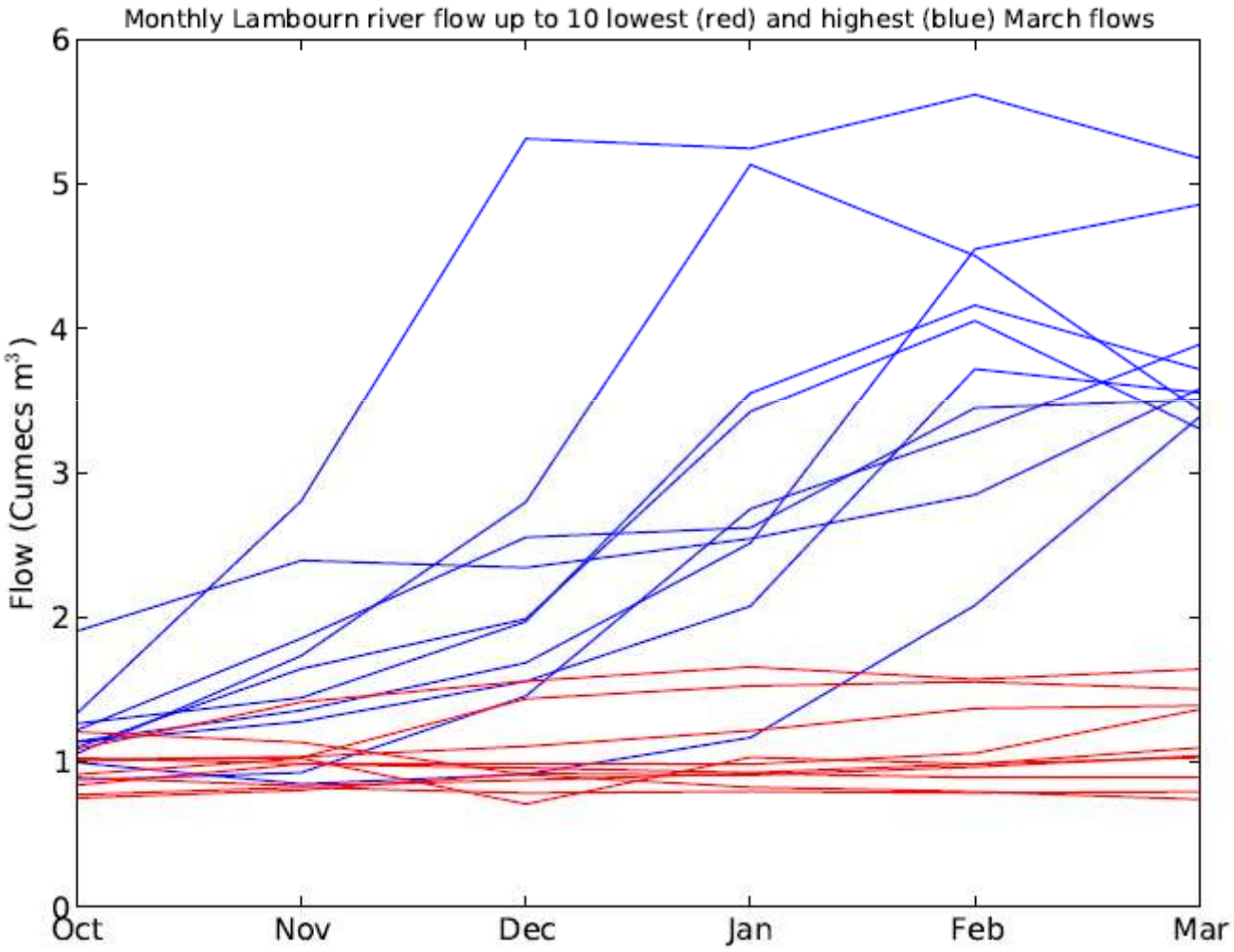
Reanalysis (20CR)
Historical (1979-2005)
AMIP (1979-2005)
RCP4.5 (2073-2099)
RCP8.5 (2073-2099)

Groundwater-Climate links



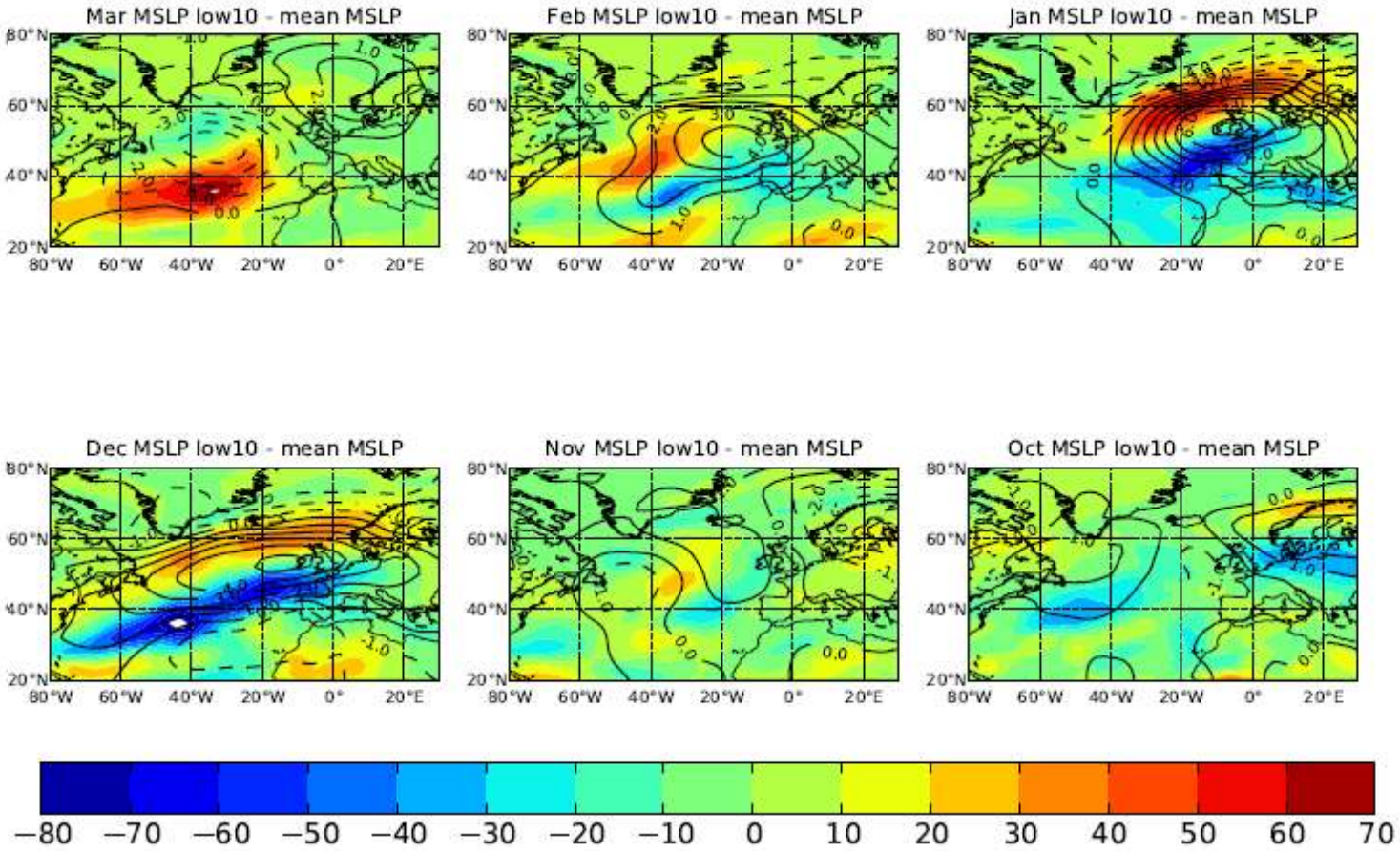
Highest Lambourn monthly flows tend to be in March

Groundwater-Climate links



Years with the 10 highest and lowest March flows generally have comparable flows in October

Groundwater-Climate -- composites



MSLP anomalies (1962-2008 mean) - contours

IVT anomalies (1962-2008 mean) – filled contours

Thank you for listening

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