Contents

• AR detection in atmospheric reanalyses and links with British winter floods
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AR screening in atmospheric reanalyses

ERA-Interim 1200 10-12-1994

for specific
AR totals in each winter half-year

Time series of persistent ARs in each winter (1980-2010)

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

BFI = Base Flow Index

Ewe at Poolewe; BFI=0.64, 441.1km²
Orchy at Glen Orchy; BFI=0.22, 251.2km²
Ayr at Mainholm; BFI=0.29, 574km²
Eden at Temple Sowerby; BFI=0.37, 616.4km²
Ribble at Henthorn; BFI=0.31, 456km²
Dyfi at Dyfi Bridge; BFI=0.39, 471.3km²
Teifi at Glan Teifi; BFI=0.54, 893.6km²
Taw at Umberleigh; BFI=0.43, 826.2km²
Tamar at Gunnislake; BFI=0.46, 916.9km²

Lavers et al., 2012 JGR
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.

NCEP-NCAR
MERRA
ERA-Interim
CFSR
Twentieth Century

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 could transport more moisture due to increase in atmospheric water vapour content with temperature (Clausius-Clapeyron) → 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
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

David Lavers  (d.a.lavers@reading.ac.uk)
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