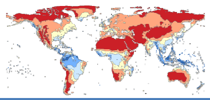
Centre for Ecology & Hydrology
NATURAL ENVIRONMENT RESEARCH COUNCIL

NATURAL ENVIRONMENT RESEARCH COUNCIL

WATCH Water and Global Change

SIXTH FRAMEWORK PROGRAMME

# How the world's water is changing from the 20th - 21st C



Dr. Tanya A. Warnaars

**Introduction** Too often the knowledge of research scientists are under exploited because the culture and language used by research scientists are alien and often confusing to stakeholders.

## Data Availability

WATCH aimed to clarify the vulnerability of global water resources to climate change. Its data rich legacy that is publically available.

Assessed for the first time the global water cycle on a daily timeframe for the 20th and 21st C.

20th C WATCH Forcing Data : 1901 – 2000 (a global 50 x 50 km grid)

21st C WATCH Driving Data : 2001– 2100 (2scenarios, 3GCMs)

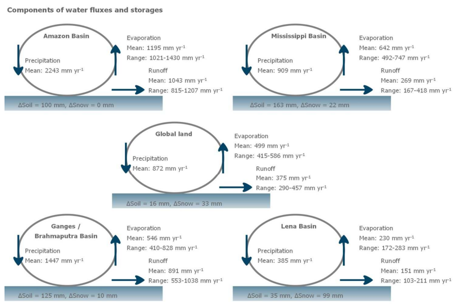
Model output data for 20th and 21st C

The 20th C **WATCH Forcing Data**: 8 variables at the daily time-step for 1901-2001

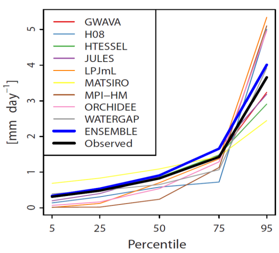

## Water Model Intercomparison Project

13 models used to generate global water balance estimates for the end of the 20th C

Results show large variations in estimated global mean annual runoff values, with a range of nearly 30,000 km³ year⁻¹, which will influence any impact study based on model simulation results




*Components of water fluxes and storages for global terrestrial land surface (middle) and four major basins representing different climate regimes for the period 1985 – 1999. The numbers represent simulation results of eleven models participating in WaterMIP.*



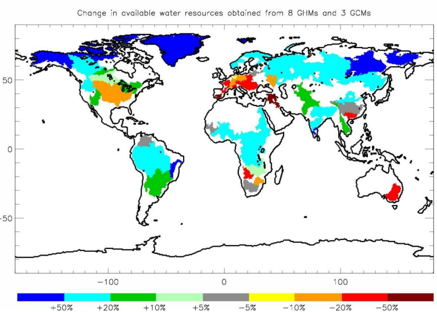

A multi-model ensemble was compared to independent runoff observations from 426 small catchments in Europe

The large spread contrasted by overall good performance of the ensemble mean

## Future Water Availability

Change in available water resources; comparison of end 20th C to end 21st C over selected large-scale catchments projected by an ensemble averaged for all 3 GCMs

Up to 30% decrease forecast for Europe

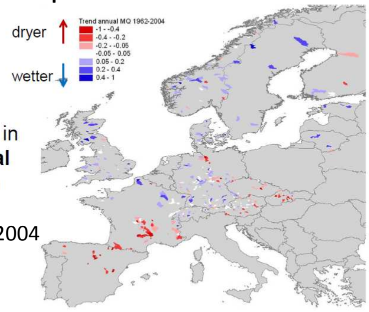



**Drought and Climate Change:** Are we seeing an increase in the frequency and severity of drought? If so what can we attribute it to? A key stop is to improve our process understanding of extreme events (Droughts and Floods). Basins in Europe have been selected which experience different climate and catchment control.

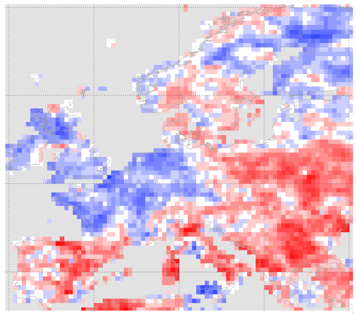
- A near-natural dataset developed for examining trends in low flows and water availability
- Drying in the south and the summer; wetter in the north and the winter.
- Models did capture broad patterns of temporal change

**Observed pattern** from 426 catchments

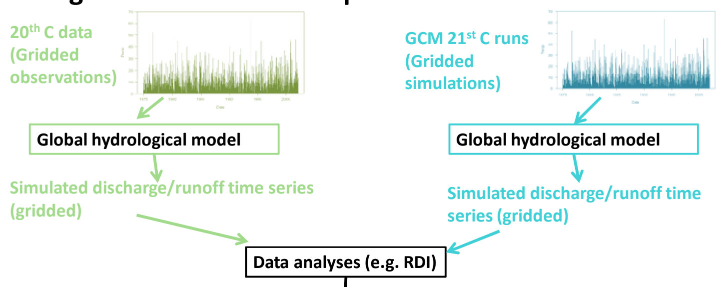
Trend in **annual mean** flow 1962-2004

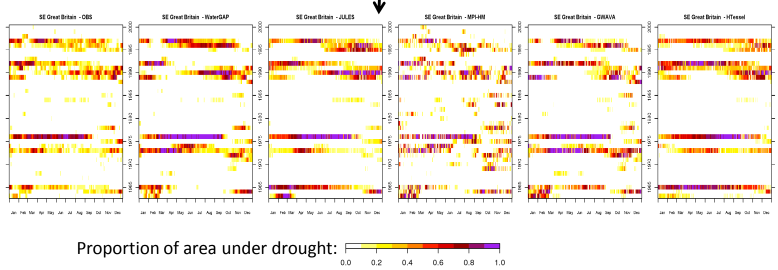



**Ensemble mean** for whole of Europe



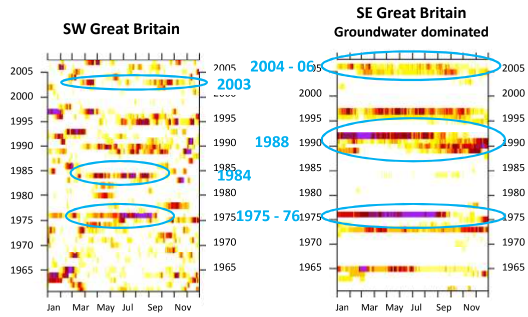
## How well do large-scale models reproduce regional hydrological extremes in Europe?




Days along bottom, years up side & colour-coded according to intensity: white = no drought in region purple = highly spatially coherent drought

Can immediately see very different drought characteristics, between neighbouring regions or different models




**Conclusion**: There is an urgent need to bring resent research findings to industry, stakeholders and other operations. Drought and Flood atlases corroborated for the 20th C are useful tool for understanding future change in length and severity of drought and flood events.

The consequences of changes to processes of precipitation and evaporation is higher localised rainfall (floods) or failure (droughts). These are 2 extremes of a range of expected changes, but frequency and location of these events are also dependent on feedbacks between climate and hydrological processes.

Water scarcity is an issue facing many end-users and the tools for prediction and management need to be based on the most recent and relevant science available.