JULES in CEH

Richard Harding + ...

JULES Launch 2 October 2006

Centre for Ecology & Hydrology
NATURAL ENVIRONMENT RESEARCH COUNCIL

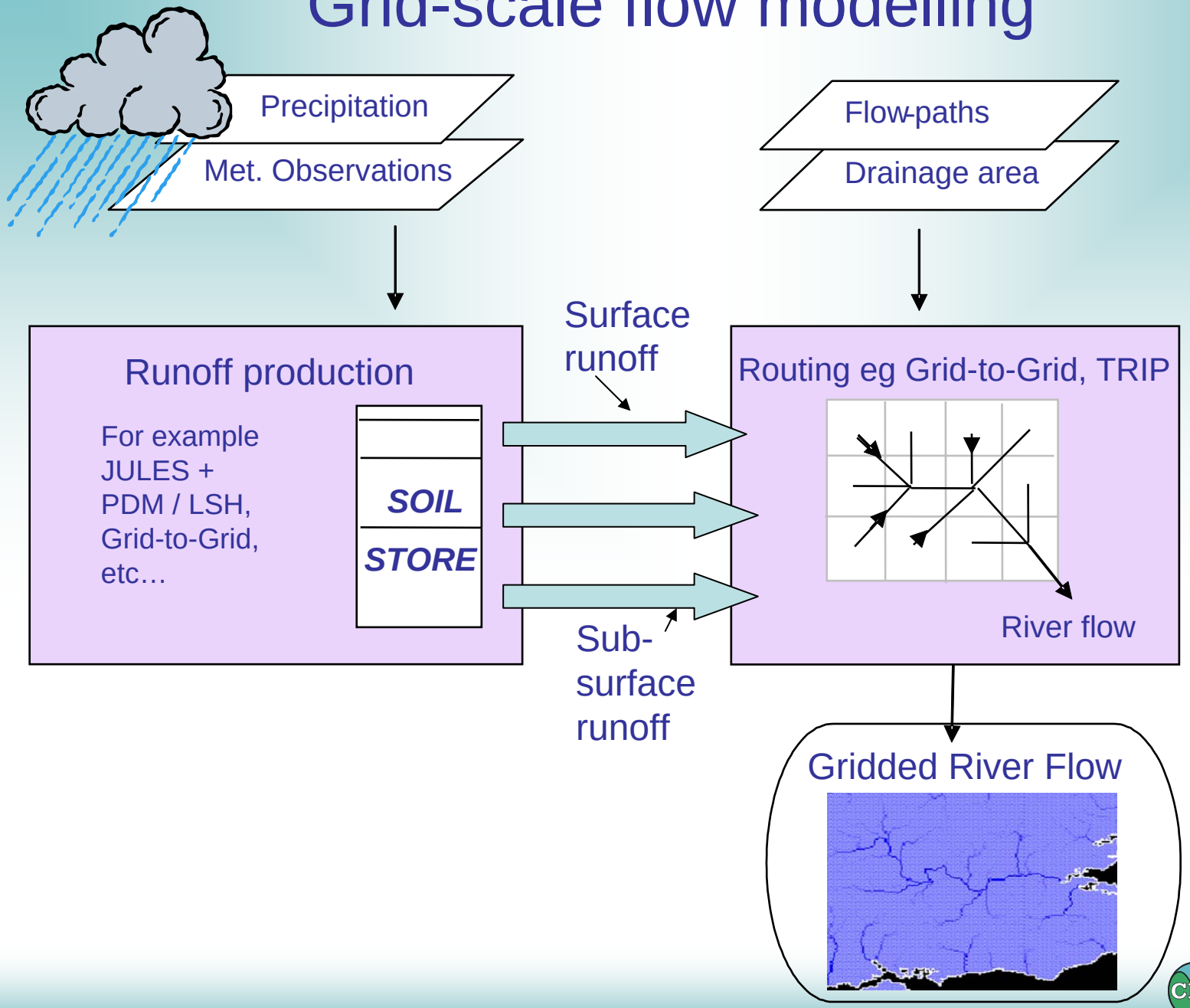
CEH Science programmes:

WATER: **UK hydrological models for flood and resource management**

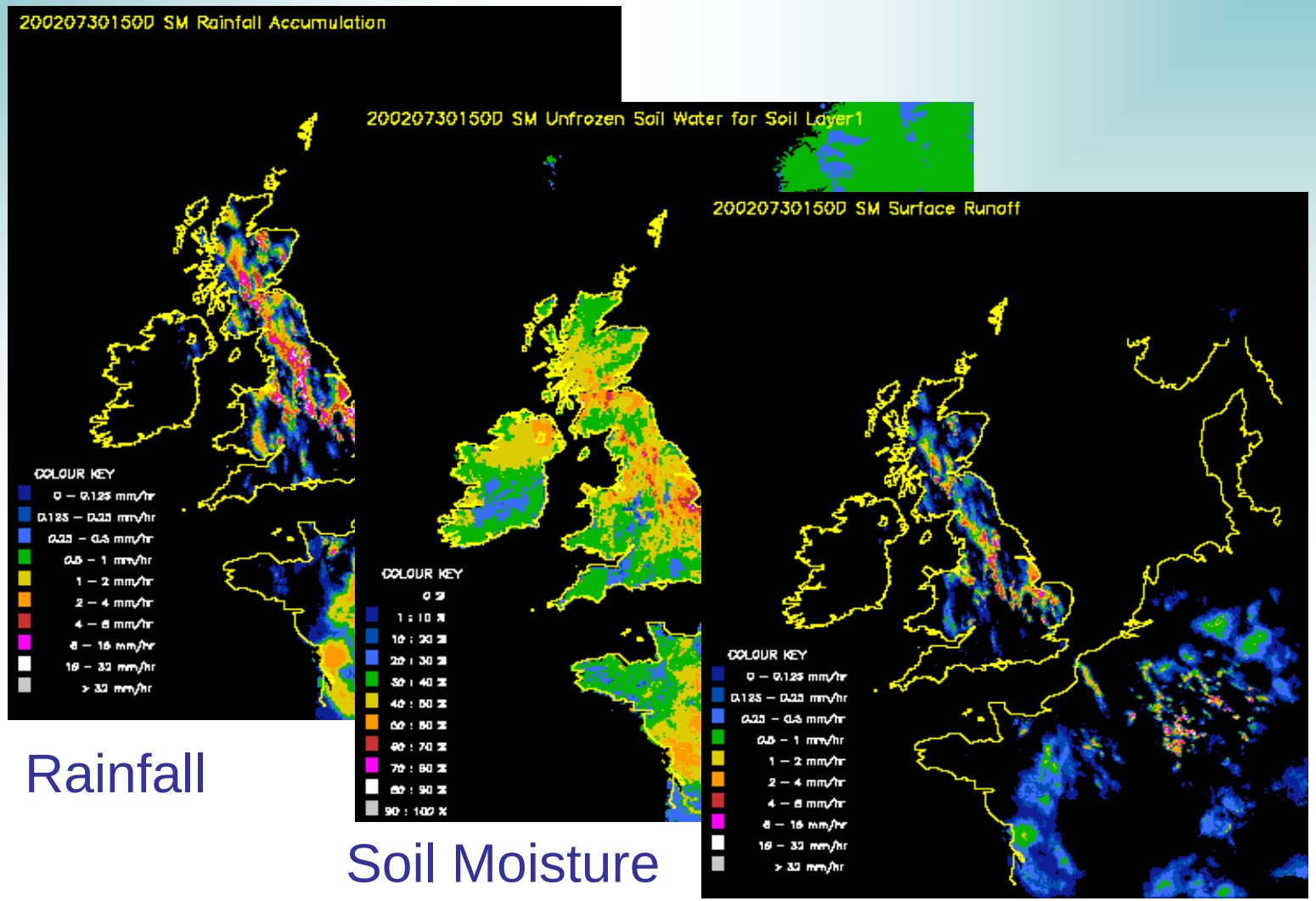
BIODIVERSITY

BIOGEOCHEMISTRY

Grid-scale flow modelling



Nimrod – real time hydrology



Rainfall

Soil Moisture

Surface Runoff

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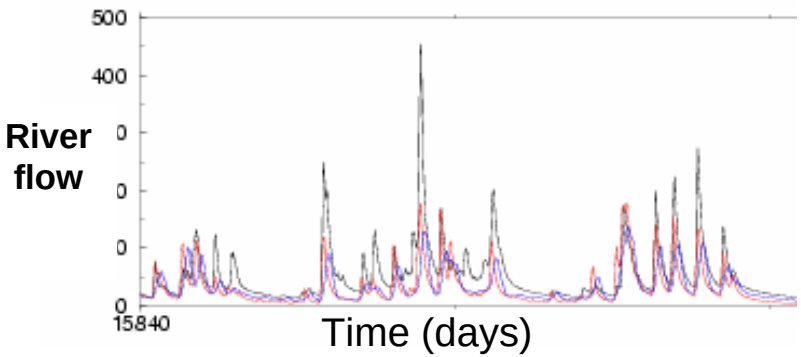
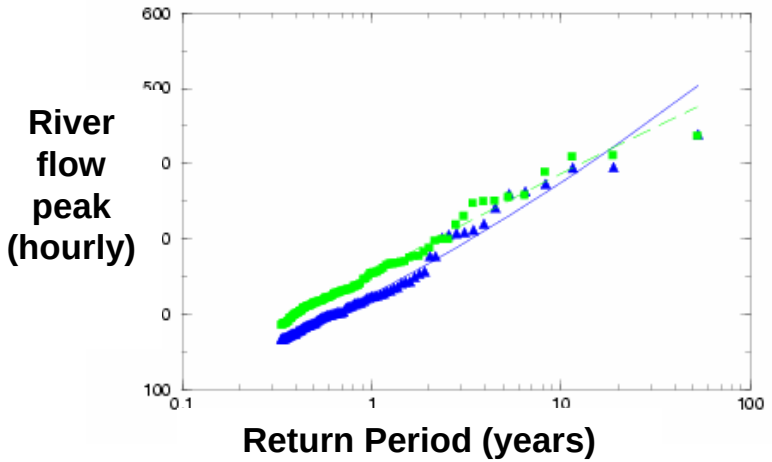
The Grid-to-grid flow-routing model ("G2G")

- The G2G now operates 'offline' at a 1 km resolution across the UK and Northern France
- A 25 km version has been included in the Unified Model (UM6.0) for modelling river flow over Europe
- Plans to include groundwater



Model hydrographs from the G2G (blue line) using ERA-driven RCM rainfall as input. Observed river flows are shown with a black line



Comparison of flood frequency curves using current (blue) and future (green) rainfall estimates

This research is part of a collaboration with the Hadley Centre, funded by DEFRA

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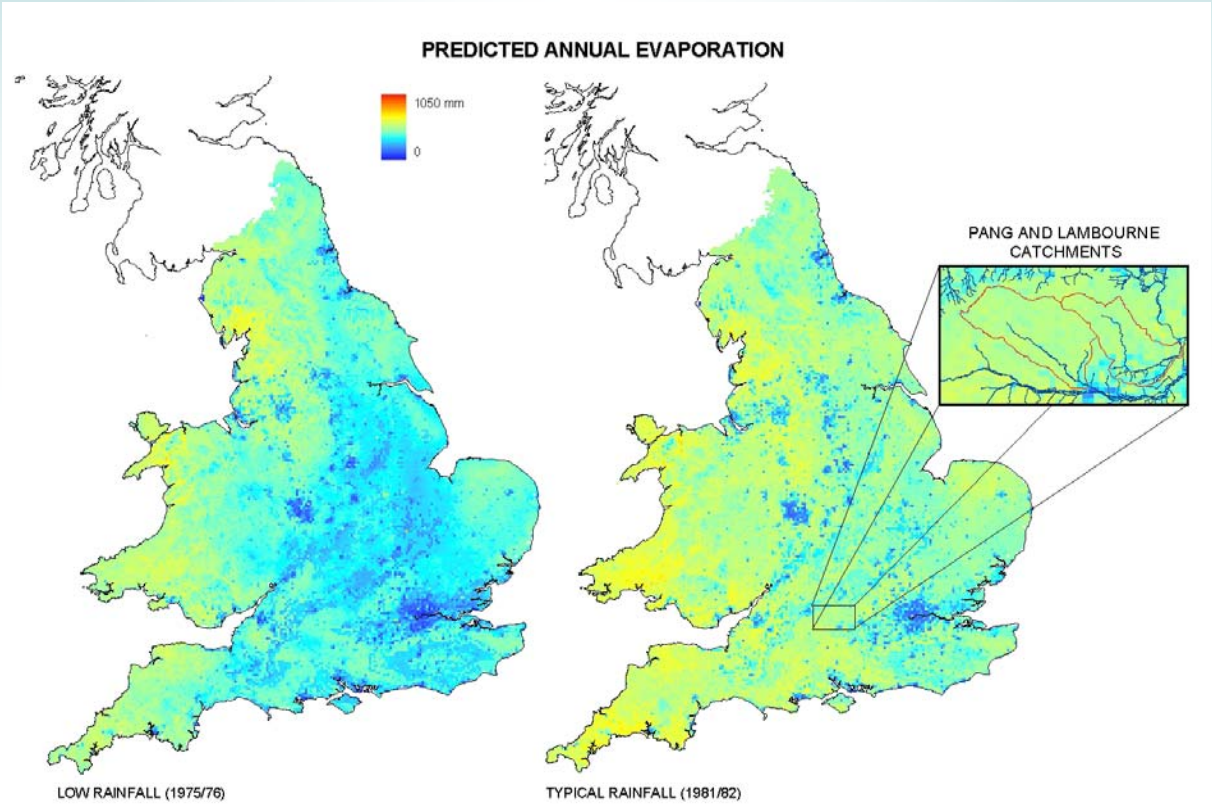
CEH Science programmes:

WATER:	UK hydrological models for flood and resource management
BIODIVERSITY	**Hydrological impacts and carbon accumulation in energy crops**
BIOGEOCHEMISTRY	

HIECroP - historic crop water use and carbon production: 1960-2000 implmentation



CEH Science programmes:

WATER:	UK hydrological models for flood and resource management
BIODIVERSITY	Hydrological impacts and carbon accumulation in energy crops
BIOGEOCHEMISTRY	**CLIMATE Change Theme**
	Modelling ozone fluxes and upscaling to the UK
	Carbon catchments

CEH Climate Change Theme

Theme CC01B. Land-surface Feedbacks in the Climate System

aims to quantify land-surface feedbacks in the climate system through energy, water and carbon cycle feedbacks, and improve the representation of the key processes in land-surface and Earth System models.

Core Programme

Datasets for land-surface science

Gridded estimates of fluxes across W. Africa
Global and regional datasets for forcing and validation of JULES
Datasets of forest fires and other disturbances from remote-sensing
Datasets of vegetation phenology from remote-sensing

Development of the JULES land-surface model

Coordination of JULES community activity
Modularisation, code maintenance and development of interfaces to ESMs
Improved treatment of hydrological and soil biogeochemical processes
Incorporation of interactive nitrogen cycling

Research programme

Land carbon cycle feedbacks on climate change

Coupled land carbon cycle-climate modelling including uncertainty analysis

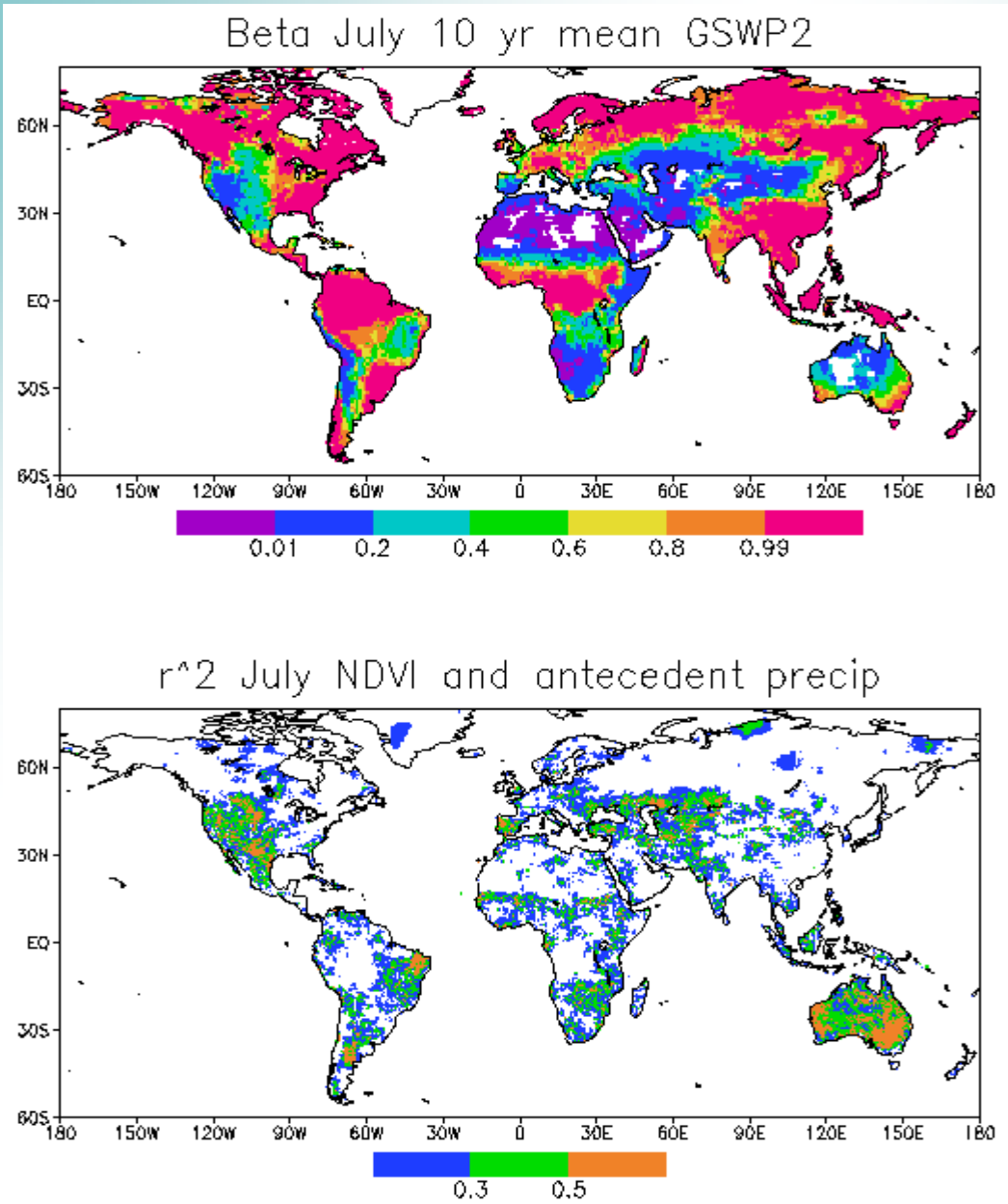
Assessment of sensitivity of Tropical and Boreal forests to climate change

Land-surface feedbacks through energy and water cycles

Quantification of feedbacks between the water and energy exchange and the response to expected changes in climate.

Assessment of the impact of improved land-surface descriptions on the simulation of water energy and carbon exchange in Africa.

New climate and hydrological simulations for Boreal regions with improved representation of snow, soil processes and vegetation dynamics

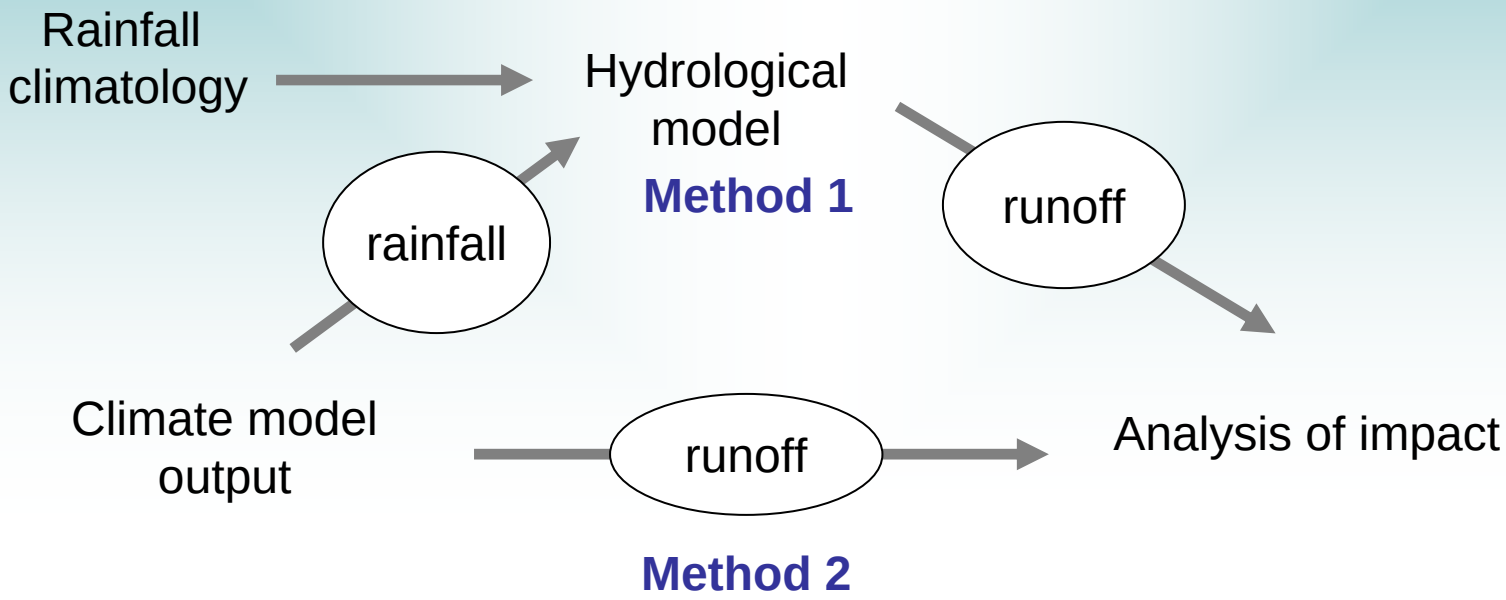


Compare global JULES simulation of soil water stress with areas of significant correlation between NDVI and antecedent precip

a perfect model would show no pixels in lower panel when beta=1 (ie unstressed, pink in top panel)

Globally v encouraging agreement, model simulates beta less than 1 in regions where NDVI is correlated with precip

WATCH IP: calculating the impact of climate change on runoff



Offline (method 1)

Avoids systematic errors
Easily accessible results

Coupled (method 2)

Physically consistent
Neglect many feedbacks
Immediate output from climate models
Include changes in variability?

Contributions to JULES