

Risk posed to Global Water Availability with a 4 degree warming

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Thanks to Prof. Arnell, Dr Gosling and Gil Lizcano



Key Messages

- Valuable role of impacts assessment using large ensembles to highlight uncertainty
- Climate and hydrological variables show a strengthening of signals
- Stronger consensus in direction of change irrespective of parameterisation



Climate Model Uncertainty

- From Stainforth *et al* (2007):
- Forcing uncertainty
- Initial condition
- Model imperfection:
 - **Model uncertainty**
 - Model inadequacy



Parameter Uncertainty and Climateprediction.net

- **Explore climate model uncertainty by varying settings of poorly constrained model parameters.**
- Randomly sampled subset of 1,520 climate model runs
- Forcings:
 - 1920-2000, historic forcing
 - 2000-2079, future forcing scenarios
- Extracted decadal seasonal means for surface temperature and precipitation for global grid

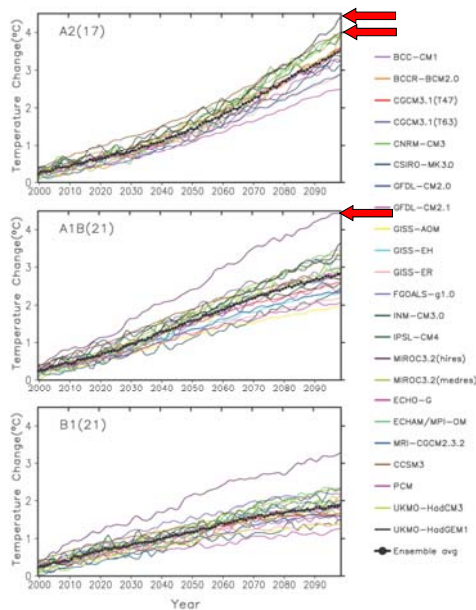


Global Hydrological Model

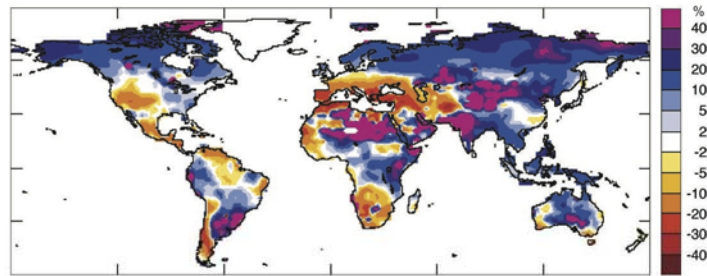
- MacPDM (Arnell, 1991)
 - Simple global water balance model
 - Parameters estimated from spatial datasets
 - Potential evaporation calculated using Penman-Monteith
- 1°x1° spatial resolution, daily time-step
- Perturb 1961-1990 baseline using observed gridded dataset (CRU) with decadal mean change factors



21st Century Warming for AR4



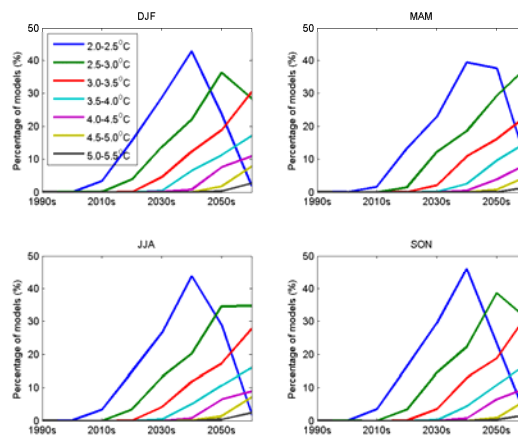
Change in Annual Runoff



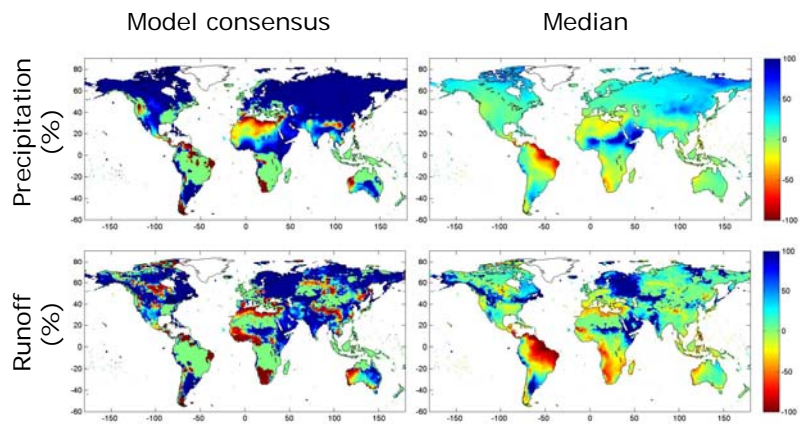
From figure 3.4 of AR4: change in annual runoff by 2041-2060 relative to 1900-70, under SRES A1B scenario



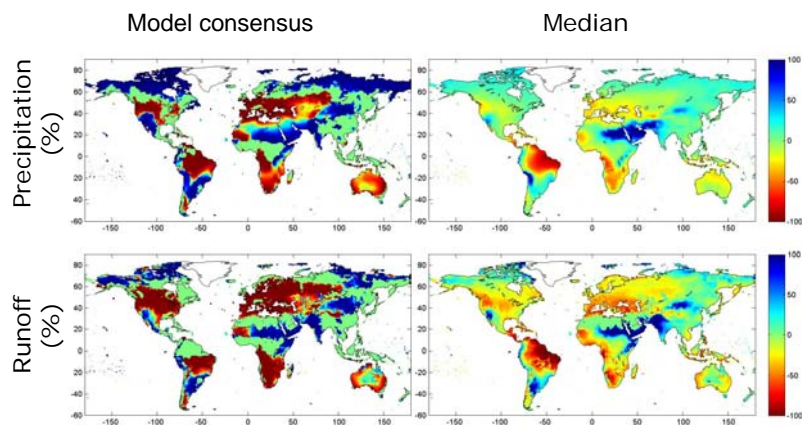
21st Century Warming, CP.net



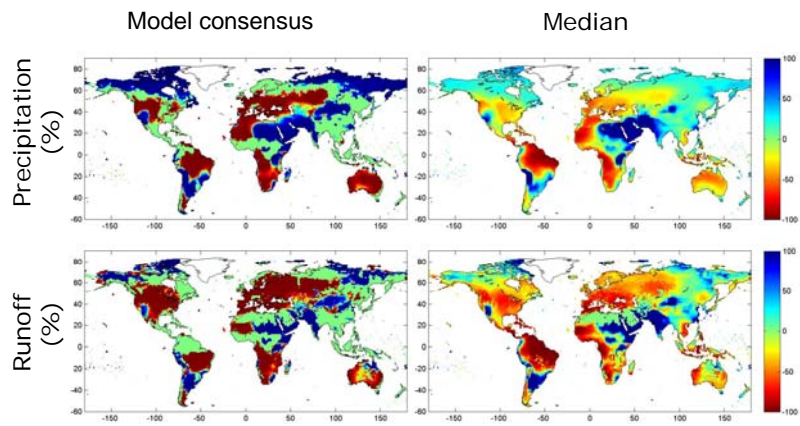
Impacts of 2-3°C warming in DJF, 2050s



Impacts of 2-3°C warming in JJA, 2050s

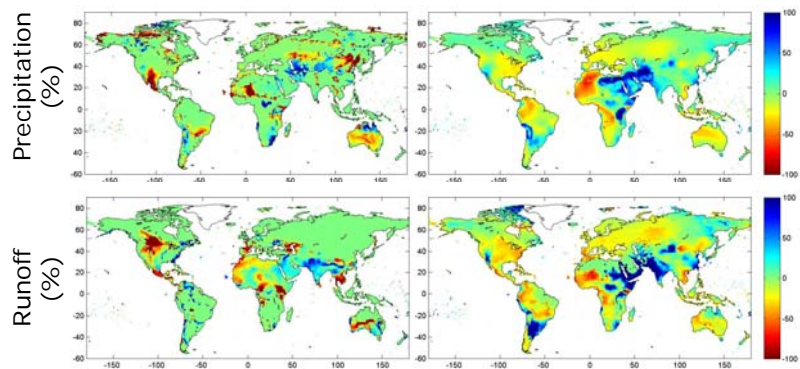


Impacts of 4-5°C Warming in JJA, 2050s



+2-3°C vs +4-5°C Warming, JJA, 2050s

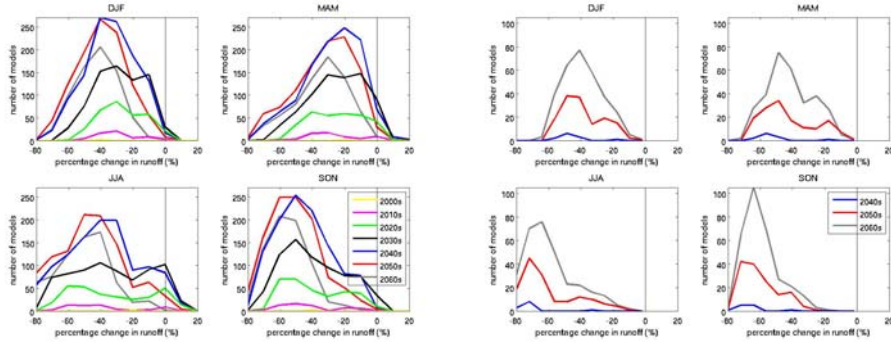
Difference in Direction of Change Difference in Median



Seasonal Runoff in the Amazon

+2-3° C

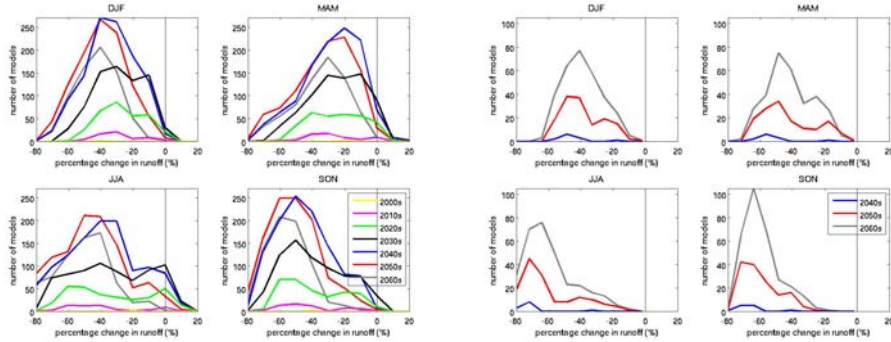
+4-5° C

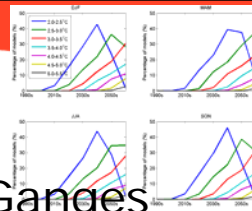


Seasonal Runoff in the Amazon

+2-3° C

+4-5° C

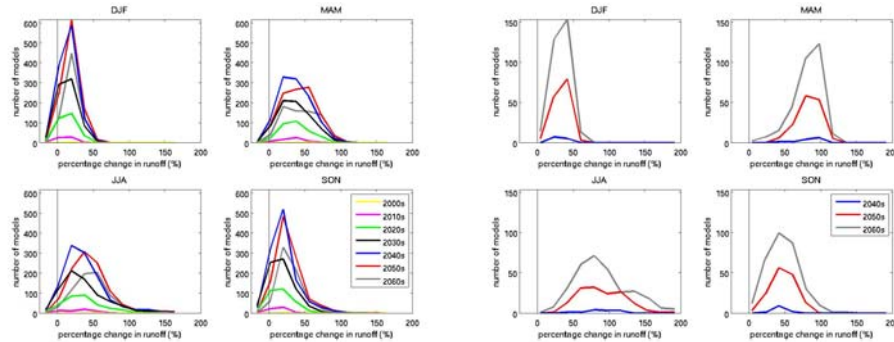




Seasonal Runoff in the Ganges

+2-3° C

+4-5° C



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4-5°C Warming in JJA, 2050s vs 2060s

