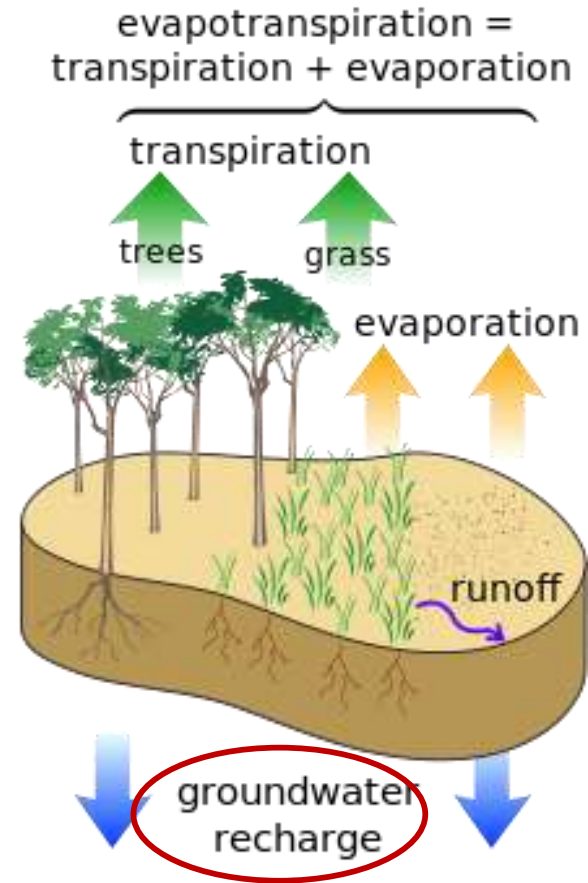# Uncertainties in groundwater recharge projections using CMIP5 data – a global study
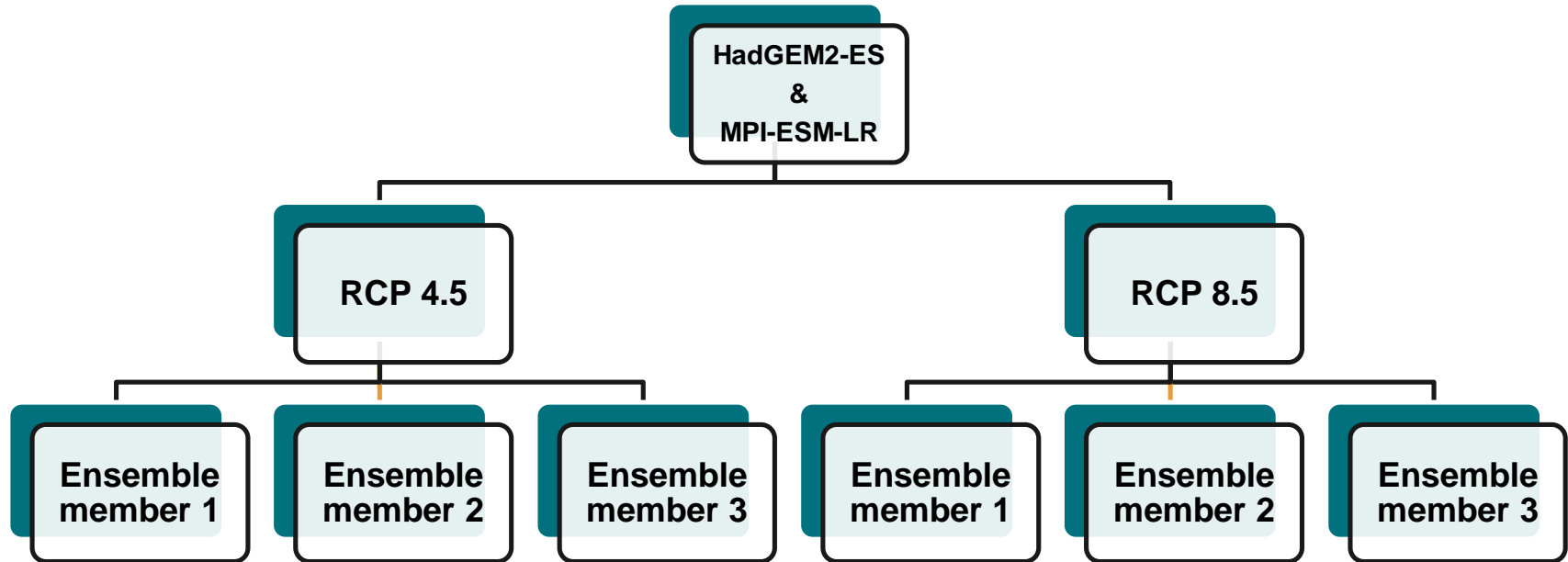
Presented by
Dr. Chinchu Mohan
University of Saskatchewan, Canada
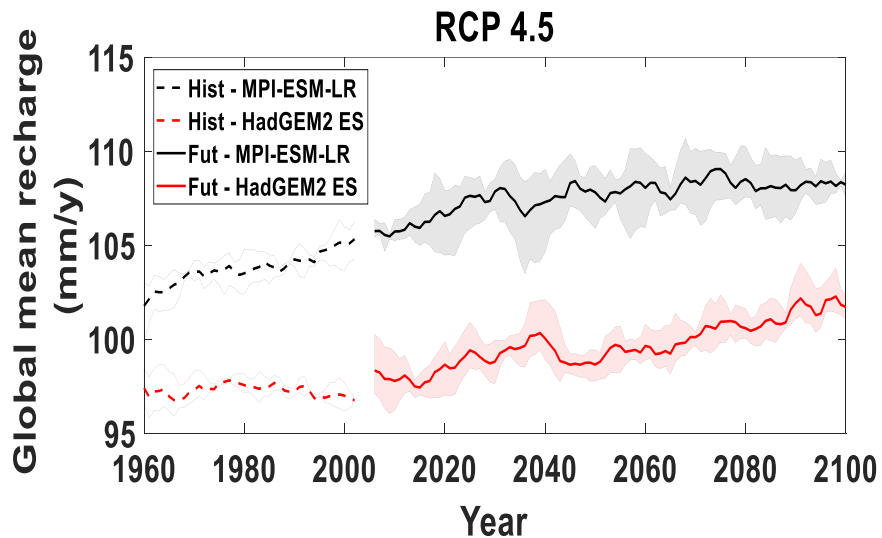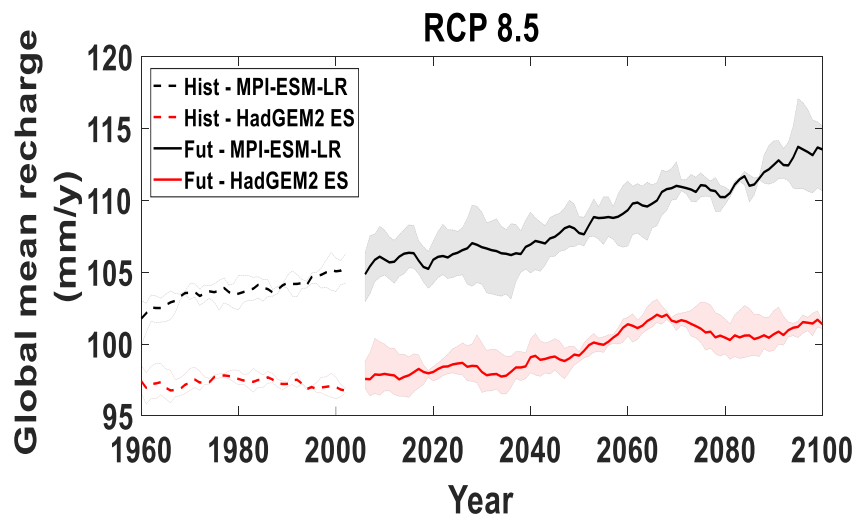
Motivation..

Recharge vs Climate Change

Methodology

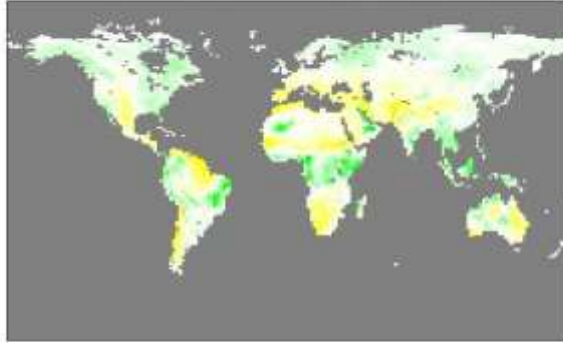# Global mean groundwater recharge was projected to increase into the future

RCP 4.5

Legend:
- Hist - MPI-ESM-LR
- Hist - HadGEM2 ES
- Fut - MPI-ESM-LR
- Fut - HadGEM2 ES

GCM – RCP	% increase in mean recharge
HadGEM – RCP 4.5	3.7%
HadGEM – RCP 8.5	3.7%
MPI – RCP 4.5	4.3%
MPI – RCP 8.5	7.5%

RCP 8.5

Legend:
- Hist - MPI-ESM-LR
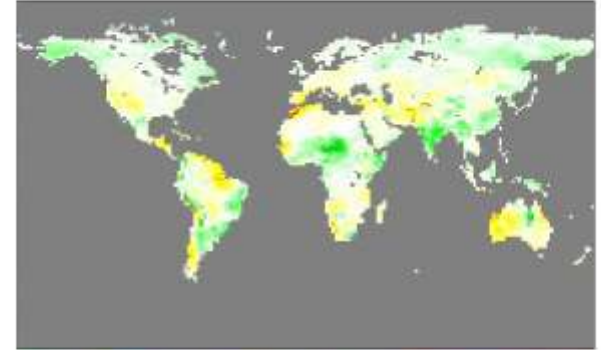- Hist - HadGEM2 ES
- Fut - MPI-ESM-LR
- Fut - HadGEM2 ES
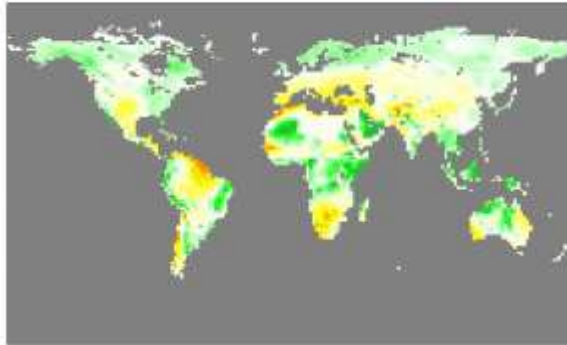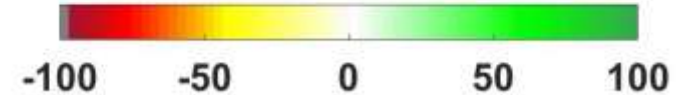
The projected change in recharge is highly region specific

MPI 45 e1

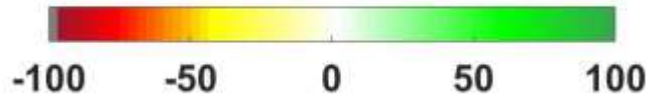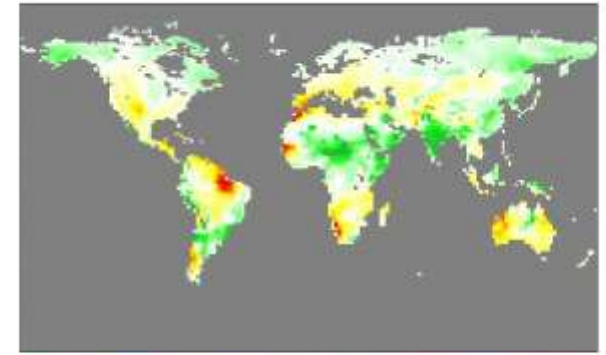HadGEM 45 e1

MPI 85 e1
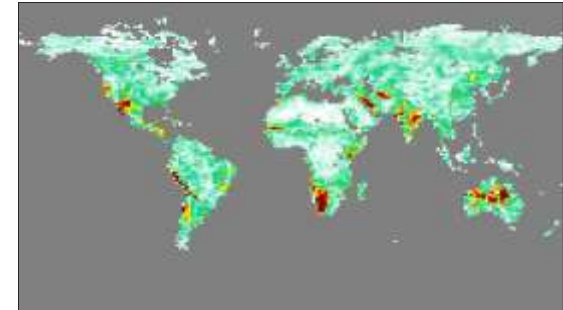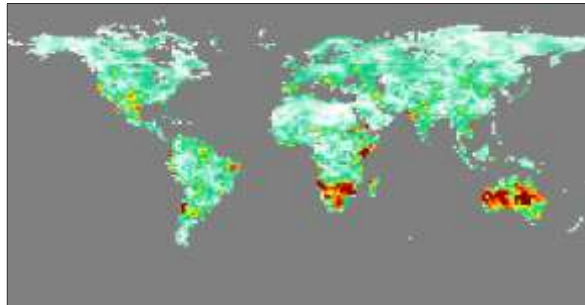
HadGEM 85 e1

-100   -50   0   50   100

-100   -50   0   50   100

Relative sensitivity = $(R_{2080} - R_{present})/ R_{present}) \times 100$

Southern hemisphere have higher Uncertainty – ensemble members

MPI-ESM-LR
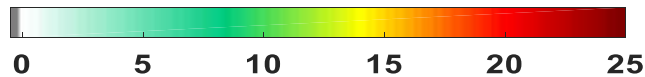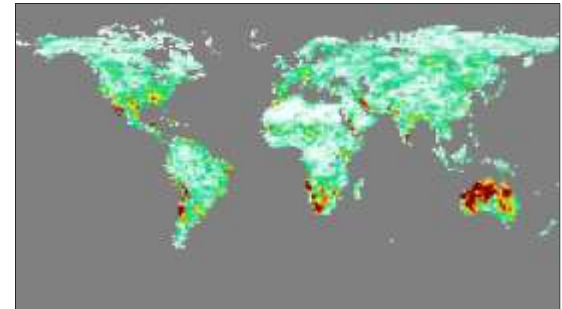
HadGEM2-ES

RCP 4.5

RCP 8.5
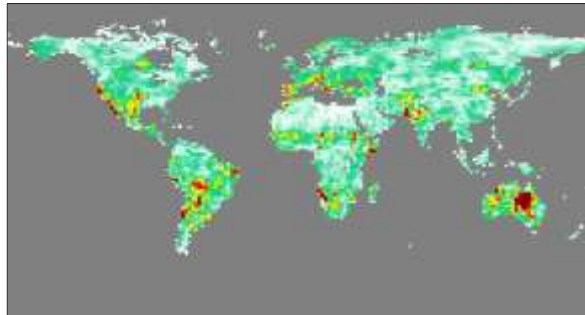
Cv increases with increase in change in recharge projected

% change in Recharge	HadGEM2-ES		MPI-ESM-LR	
	RCP 4.5	RCP 8.5	RCP 4.5	RCP 8.5
-50% to -25%	11.98	9.31	9.54	8.99
-25% to -1%	5.06	5.98	6.05	6.34
-1% to 1%	2.03	2.19	2.49	2.29
1% to 25%	3.98	4.08	4.35	4.98
25% to 50%	6.85	5.42	8.43	6.29
50% to 100%	16.73	7.58	11.29	8.31

Aquifer ranking

Between GCMs
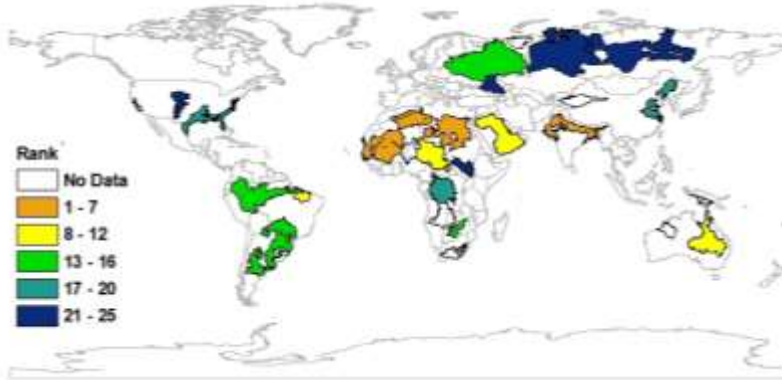
Between RCPs
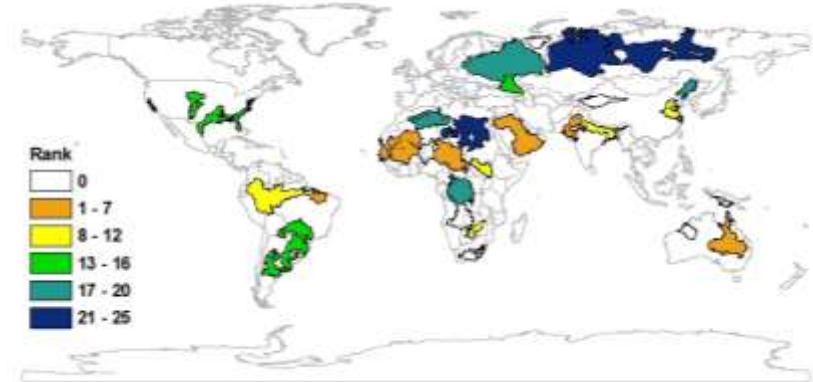
Between ensemble members

Conclusions

- Global groundwater recharge is expected to increase by 2080 – but not uniformly
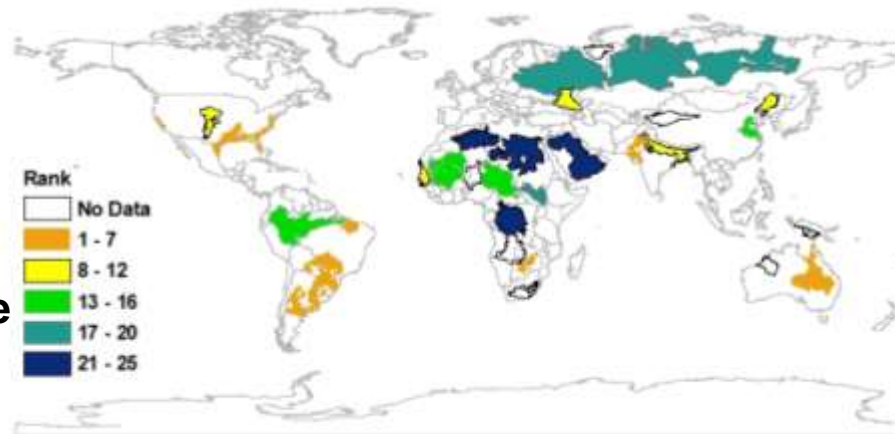
- Uncertainty in global groundwater recharge projection due to different ensemble members are comparable to other uncertainties

How good are our insights about the future???

Recommendation: Use multiple ensemble members of the same GCM along with multiple GCMs and RCPs to better estimate the groundwater recharge projection uncertainty

Thank you

chinchu.mohan@usask.ca

Case Description			Coefficient of variation		
			Recharge	Precipitation	ET$_0$
Between ensembles	HadGEM2-ES	RCP 4.5	4.30	3.47	1.20
		RCP 8.5	4.87	3.65	0.68
	MPI-ESM-LR	RCP 4.5	4.66	4.34	3.26
		RCP 8.5	5.28	4.30	2.83
Between RCPs	HadGEM2-ES		6.82	8.00	8.46
	MPI-ESM-LR		6.80	7.34	8.68
Between GCMs	RCP 4.5		12.82	22.29	19.80
	RCP 8.5		15.58	22.78	20.62