

Assimilation of AMSR-E data and application to the initialization of soil moisture reservoirs in a seasonal forecasting system

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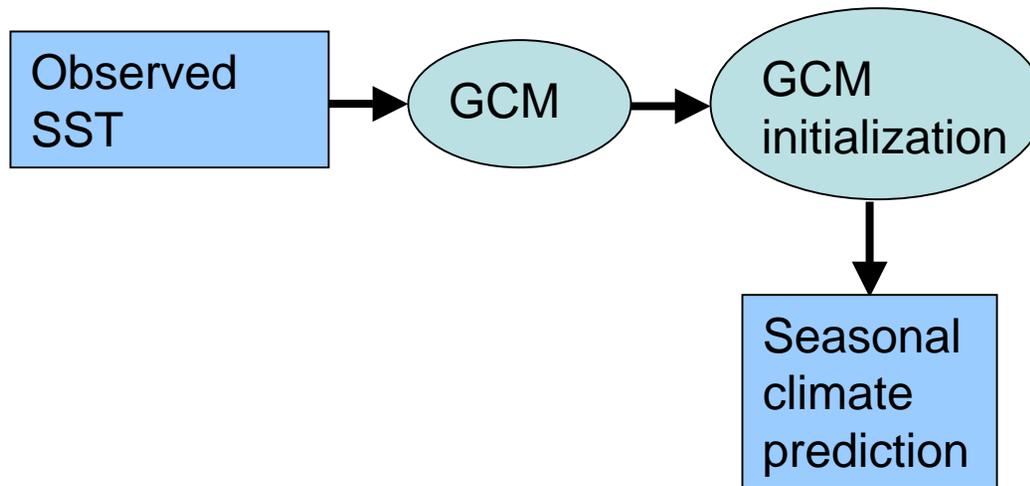
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Seasonal forecast initialization

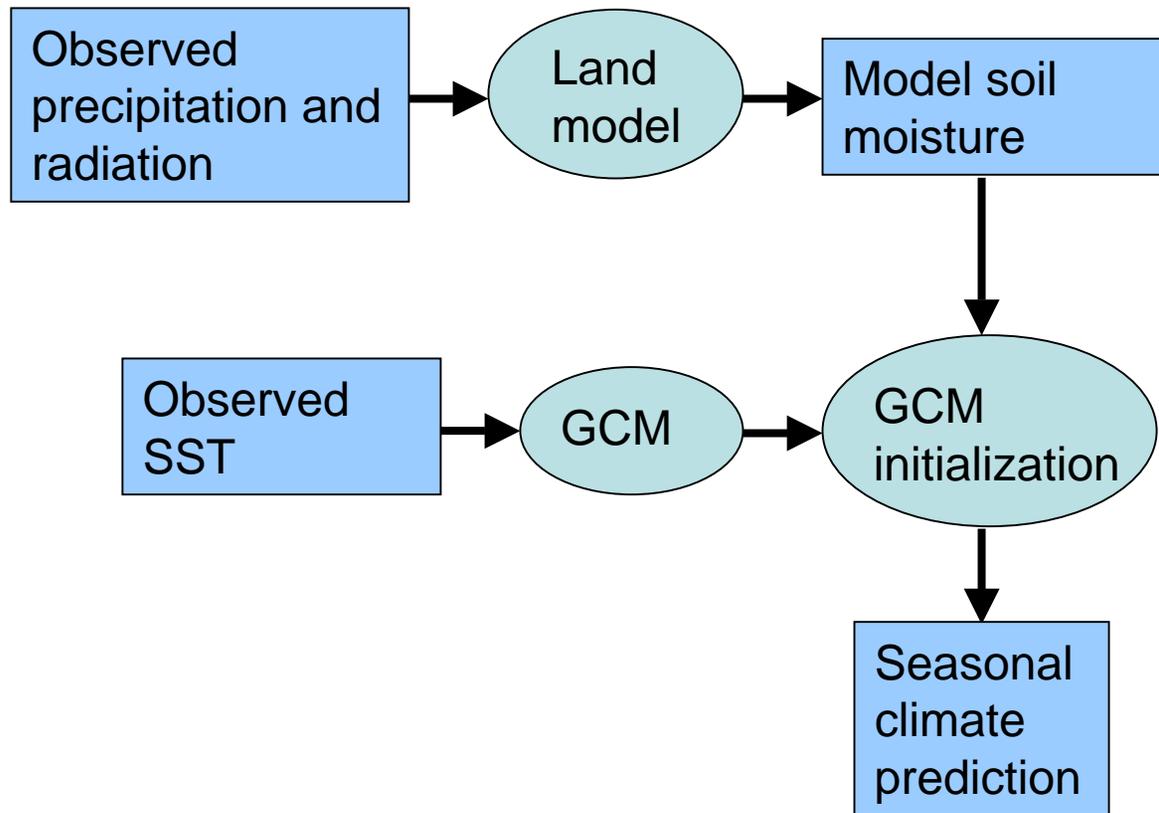
Seasonal prediction of summer precipitation over mid-latitude land depends on accurate **soil moisture initial conditions**.



Standard seasonal prediction system

Seasonal forecast initialization

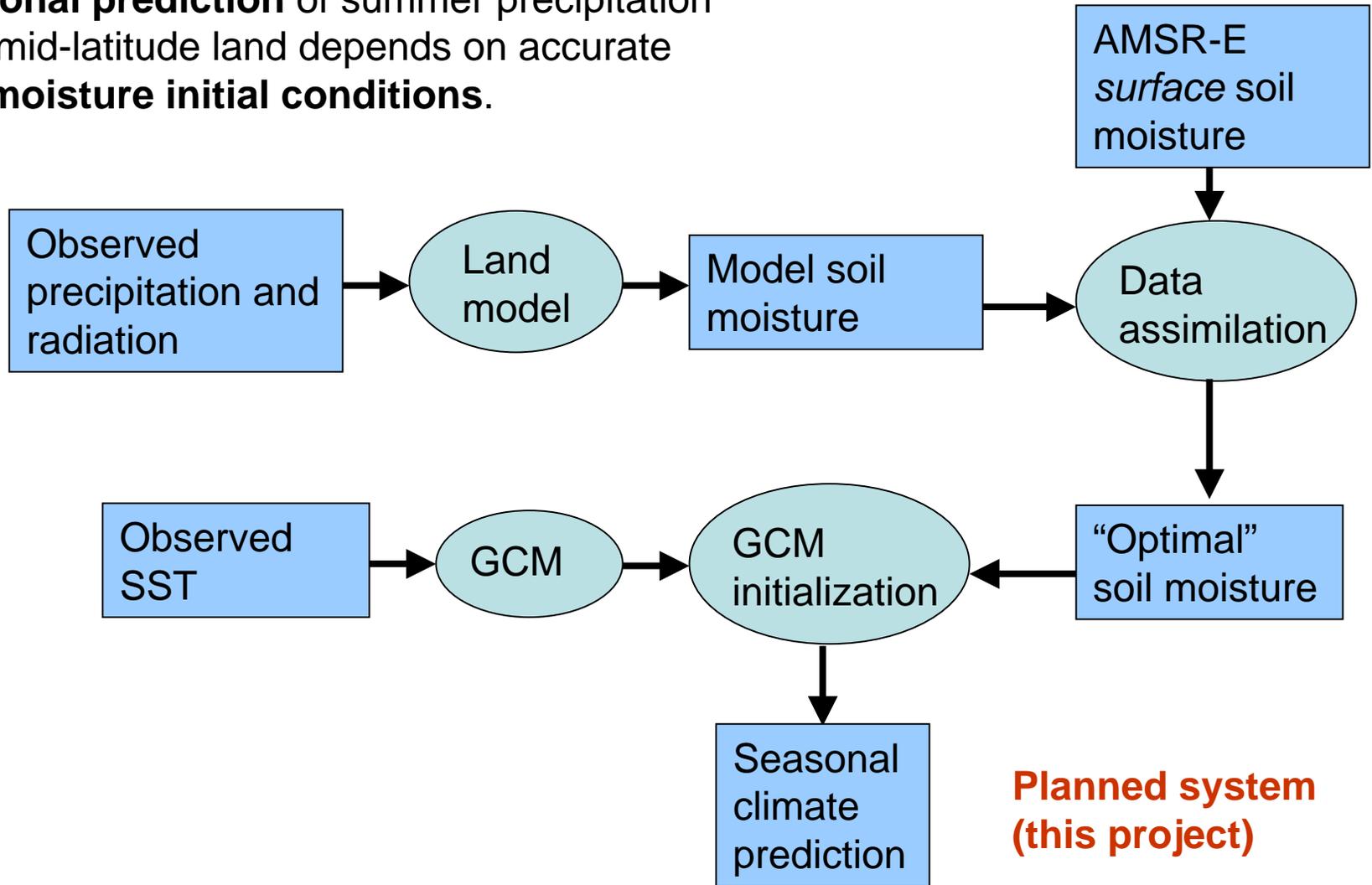
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Current GMAO system (Apr 2004)

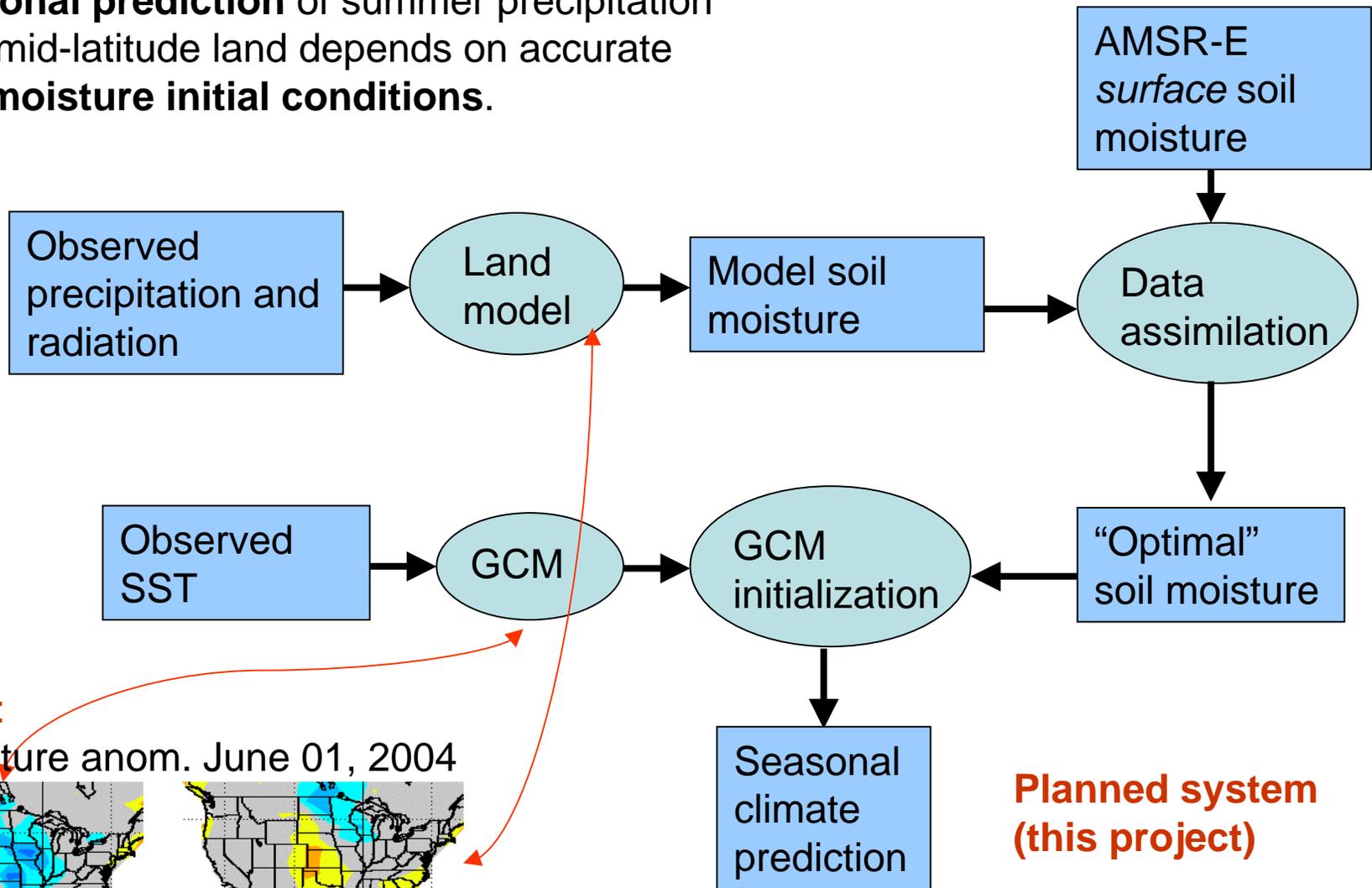
Seasonal forecast initialization

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Seasonal forecast initialization

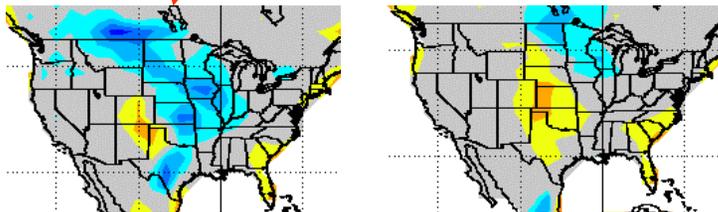
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**Planned system
(this project)**

Example:

Soil moisture anom. June 01, 2004

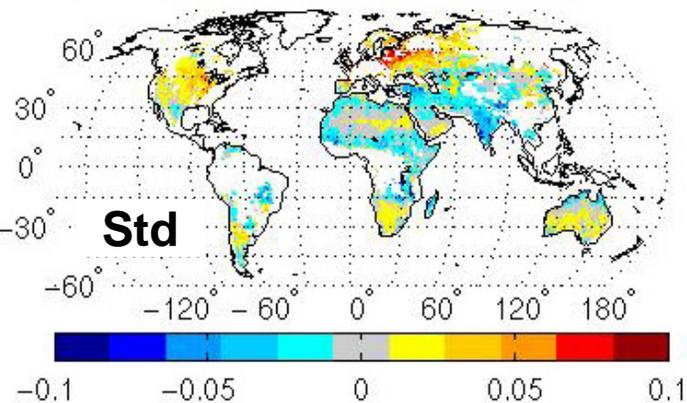
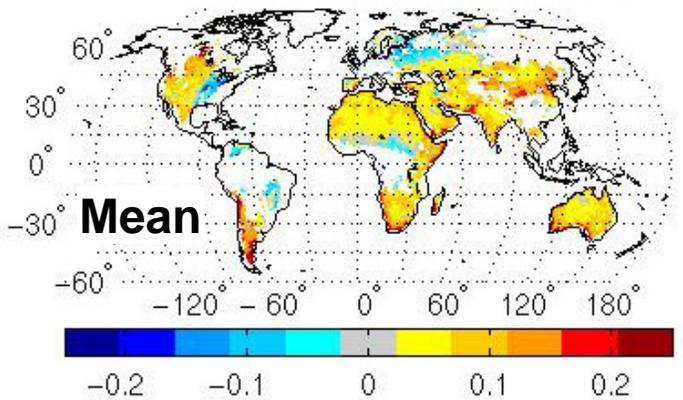


- .50 - .42 - .33 - .25 - .17 - .08 .08 .17 .25 .33 .42 .50

Bias reduction in short records of satellite soil moisture

Satellite and model soil moisture have different climatologies, “truth” cannot be established (*Reichle et al. 2004, JHM*), need scaling before data assimilation.

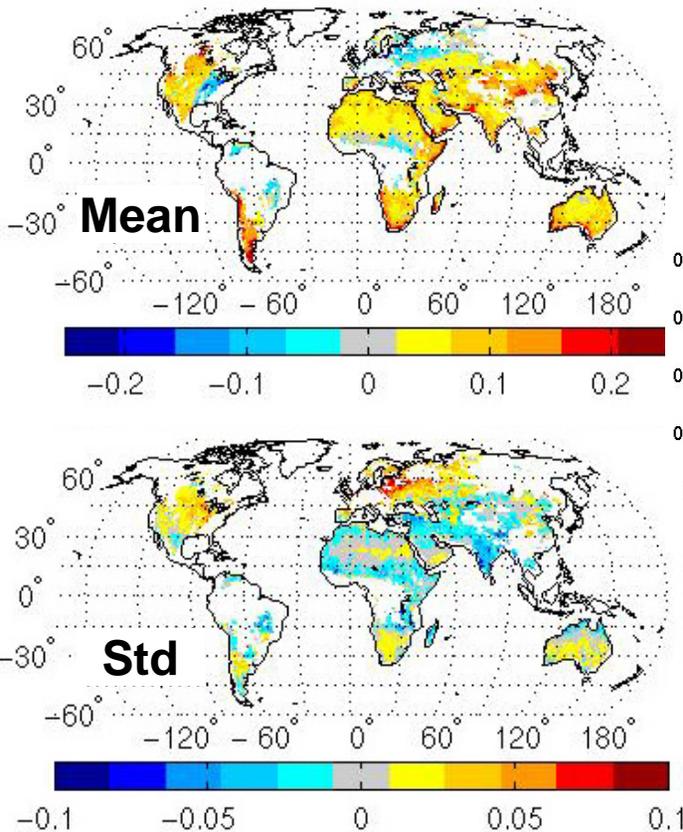
Biases of SMMR and model soil moisture



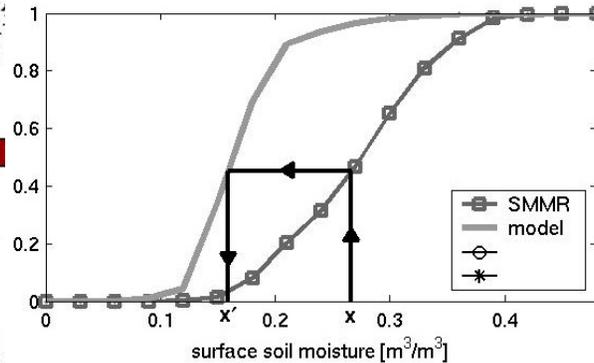
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Biases of SMMR and model soil moisture



Cdf matching (local!)

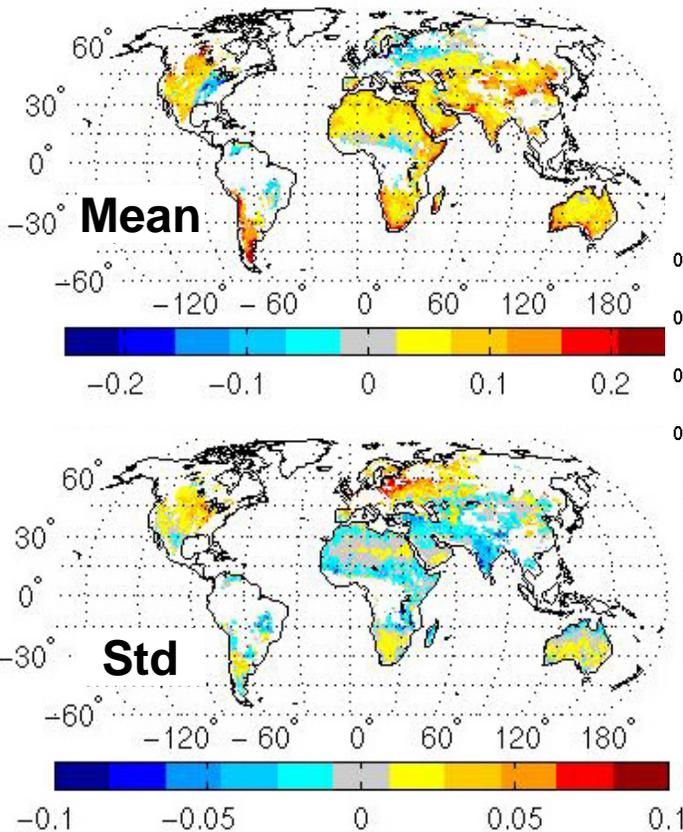


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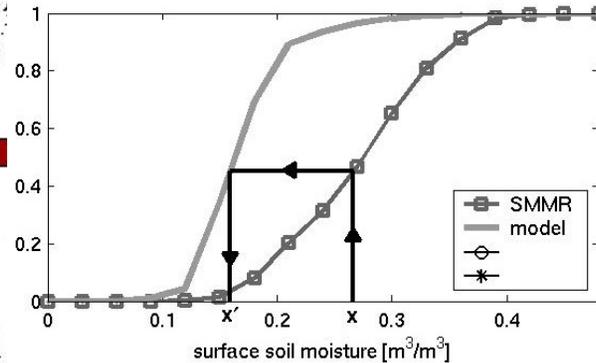
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Long-term satellite record for scaling not available (AMSR launch only 2002).

Biases of SMMR and model soil moisture



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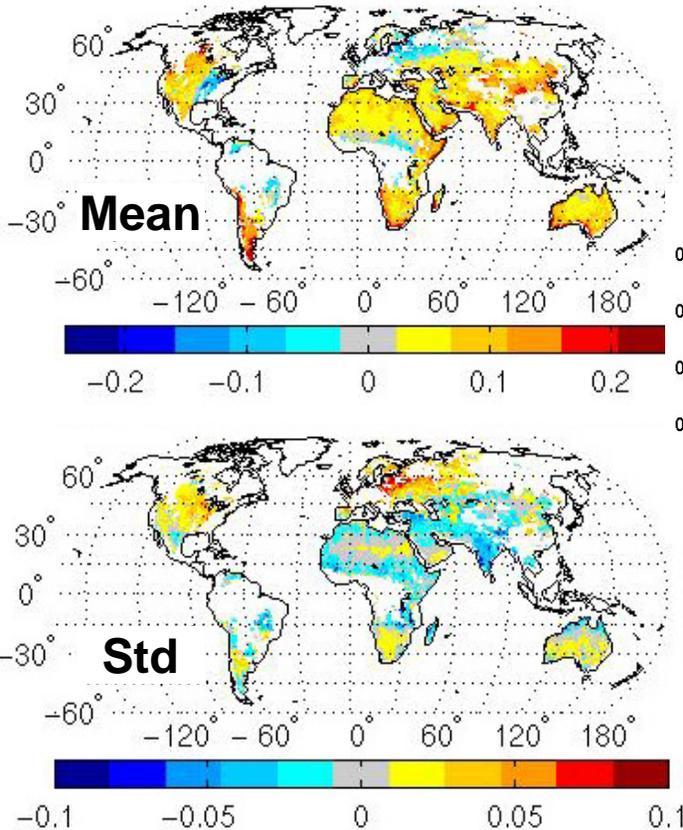
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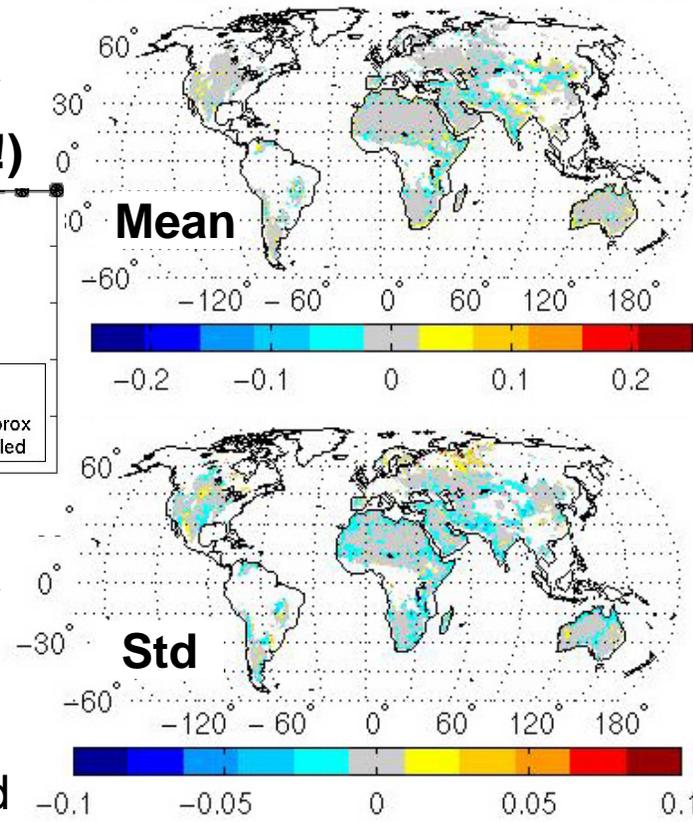
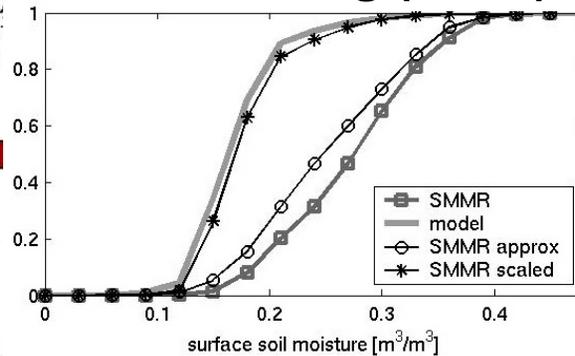
Single year of SMMR sufficient for approx cdf estimate (use spatial sampling)

Biases of SMMR and model soil moisture



Biases of SMMR scaled w/ approx cdf

Cdf matching (local!)



Reichle & Koster,
GRL 2004, submitted

Validation of global SMMR assimilation (1979-87)

Corr. coeff. with ground data (95% confidence interval ~ .03)	SMMR	Model (no assim)	Assimilation
Surface soil moisture	.44	.43	.50
Surface anomalies	.32	.36	.43
Root zone soil moisture	n/a	.46	.50
Root zone anomalies	n/a	.32	.35

Assimilation product agrees better with ground data than SMMR or model alone.

Work Plan

TASK I – Preparation of input data sets

TASK II – Assimilation and analysis of soil moisture data

Prepare four different *soil moisture datasets*: Integrate land model with

1. GCM-produced precip./radiation (GCM forced with observed SST)
2. observed precip./radiation
3. GCM-produced precip./radiation + assimilation of AMSR-E soil moisture
4. observed precip./radiation + assimilation of AMSR-E soil moisture

Assess impact of AMSR-E data on soil moisture estimation.

TASK III – Experimental prediction

Ensemble *seasonal forecast experiments* with initial conditions from TASK II.

Assess impact of observed precip./radiation and AMSR-E assimilation on seasonal forecasts.

Establish routine AMSR-E land assimilation in operational GMAO seasonal forecasting system.