A NEON Testbed for High-Resolution Climate Assessment

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Outline

✔ Research hypothesis

✔ Literature Review

✔ Data & Methods

✔ Results

✔ Conclusions

Introduction

High resolution model improves the accuracy of water cycle prediction generally

We compared CLM HR and LR output with reanalysis grid dataset including: ERA5, MERRA2, LERI, GLEAM & SMERGE

CLM-H shows a longer soil moisture residence time, potentially impacting water cycle predictability

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Literature Review

- Chang, P. et al. compared high and low resolution CESM 1.3 model for global mean temperature, sea surface temperature and extreme events.

- Authors found improvement in HR global mean SST and extreme precipitation events & HR and LR model shows agreement in most of climate variables.

- Singh, R.S. et al. compared high and low resolution CLM4.0 model for sensible heat flux and soil moisture. NRMSE is reduced for sensible heat flux and soil moisture.

Data & Methodology

Model Experiment	Parametrization	Spatial Resolution (km)	Forcing	Analysis Period
	CLM-High	12.5	NLDAS2	1980-2018
	Noah-MP			
	CLM-Low	100		

Data & Methodology

| Reference Dataset	Compared Variables	Resolution (km)
ERA5	LHFLX, SHFLX, Soil moisture	10
MERRA2		50
LERI	LHFLX	1
NEON		Point Scale
SMERGE	Soil Moisture	12.5
GLEAM		25
VIC	Runoff	12.5

Data & Methodology

- Bias, Normalized Root Mean Square Error (NRMSE) and Correlation have been applied to compare the datasets.

- Taylor diagram is used in study which provides visual framework for comparing a set of datasets.
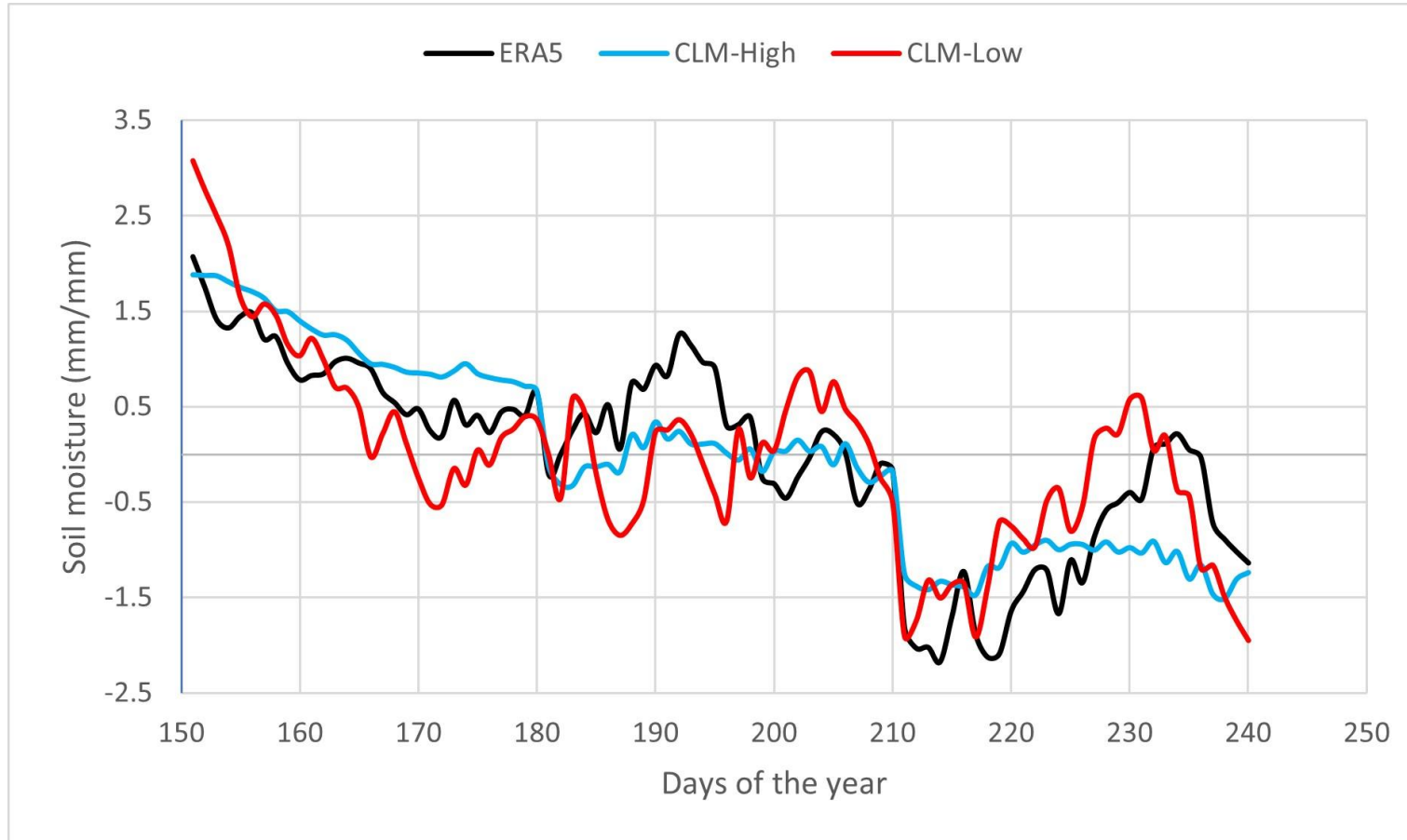

Taylor Diagram
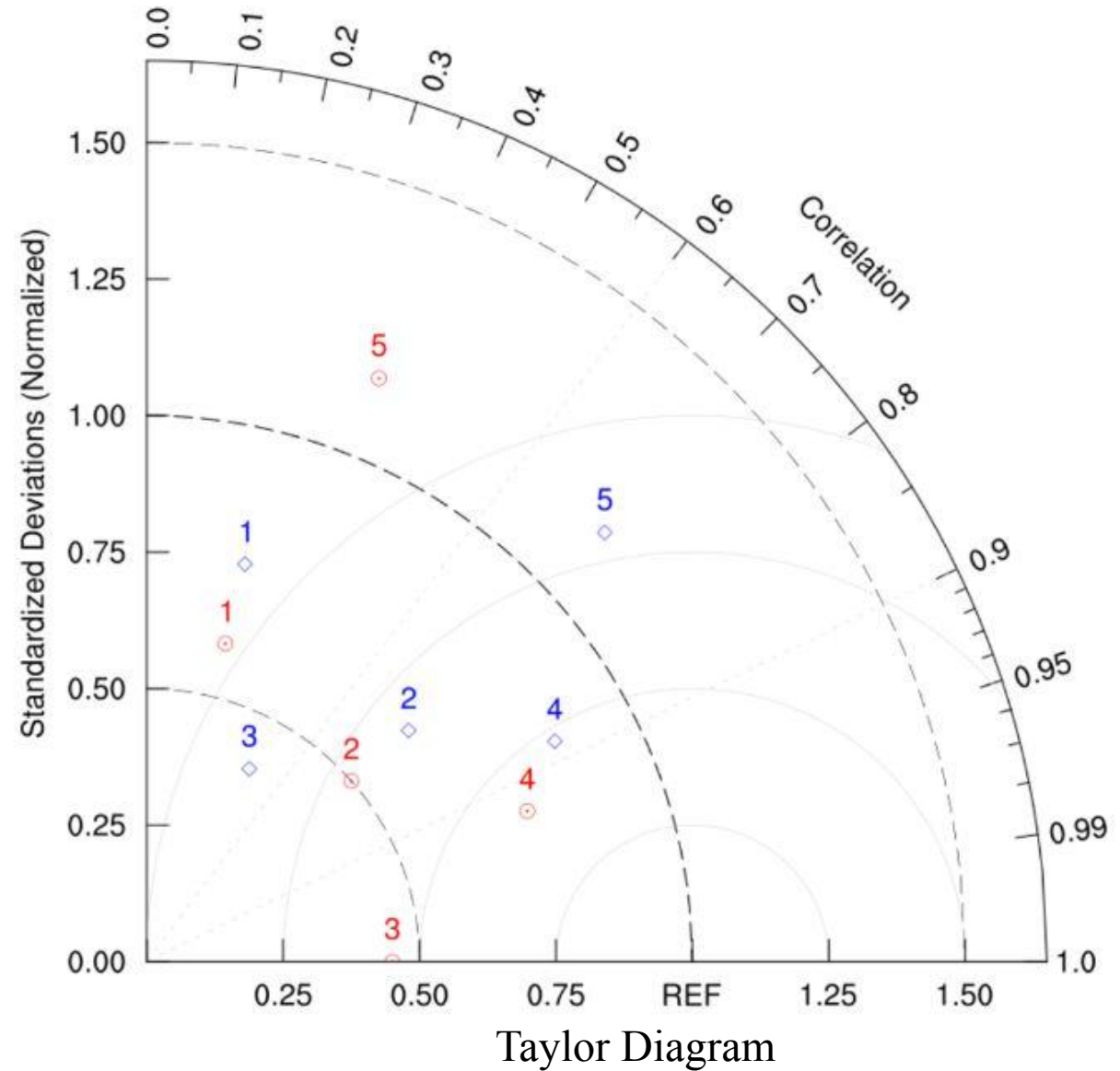
Results: ET NRMSE
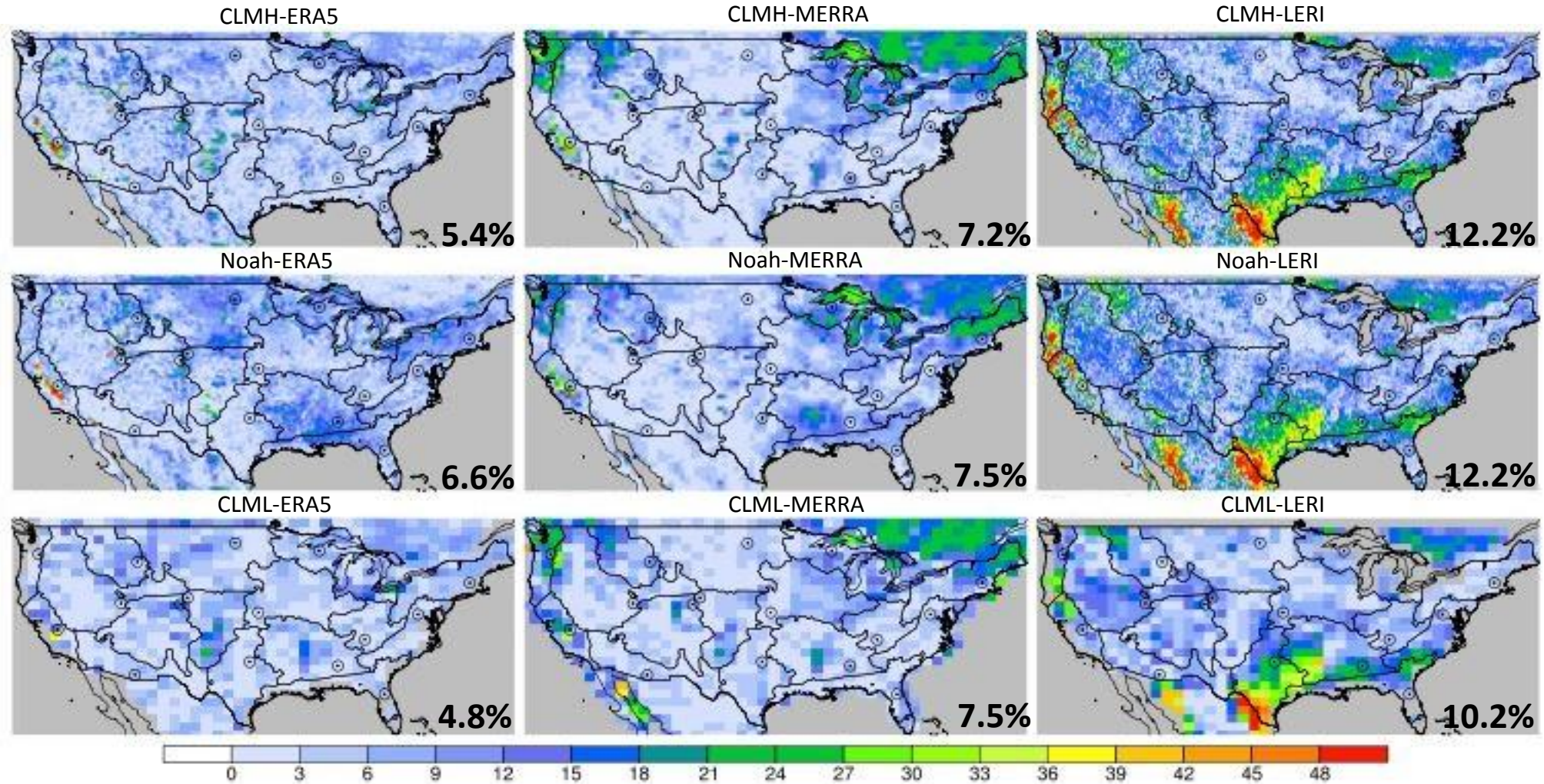
Results: Taylor Plot MERRA ET
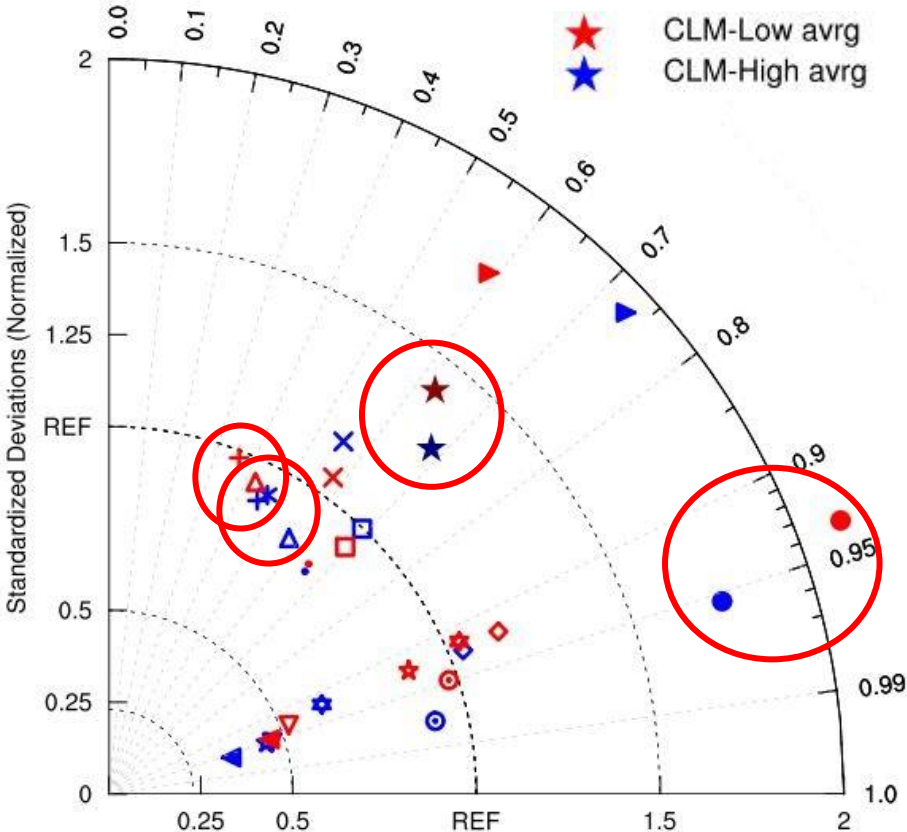
Correlation Comparison Between Models

Region	CLM-H MERRA2	CLM-L MERRA2
03-OSBS	0.45	0.33
08-TALL	0.60	0.42
17-SJER	0.96	0.93

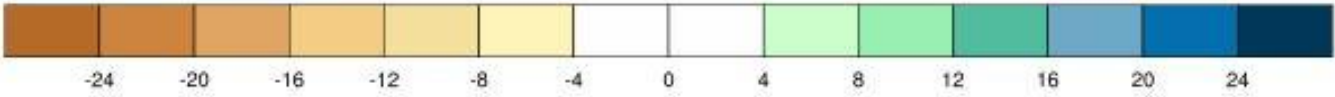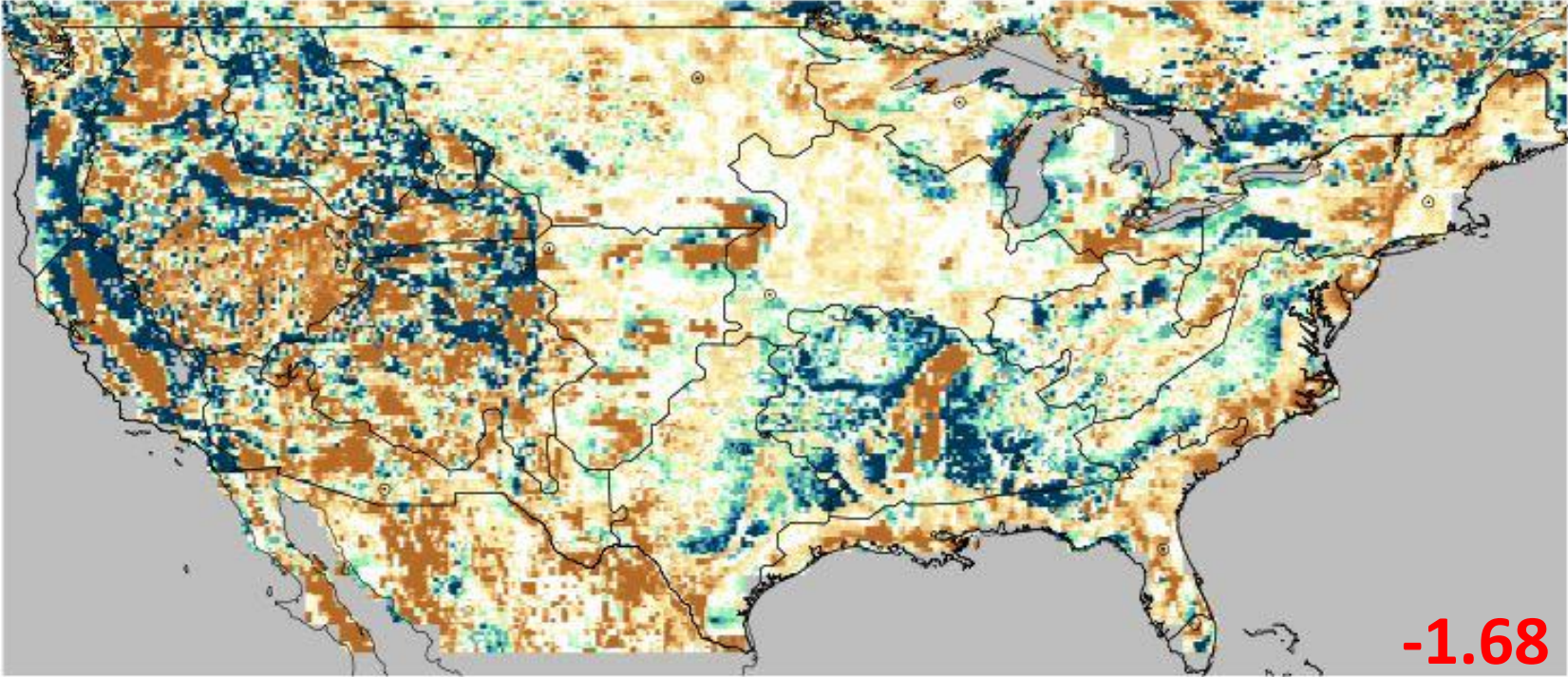# Results: Daily Soil Moisture Timeseries of 08-TALL (JJA)

CLMH RMSE 0.028 mm/mm

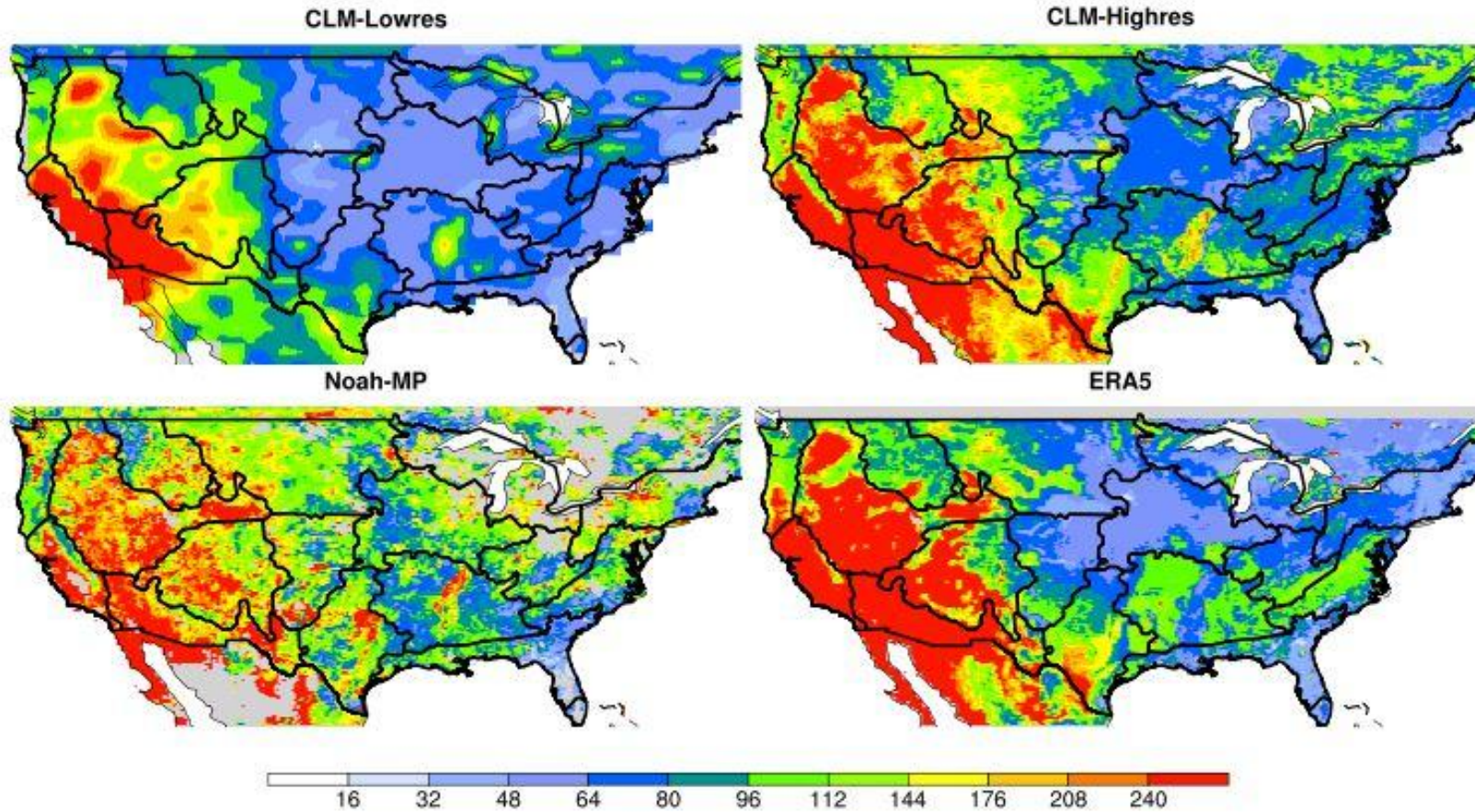**CLML RMSE 0.048 mm/mm**

CLML shows faster SM decay than CLMH

Results: Daily Soil Moisture (JJA) Variability

-1.68

CLMH-CLML (%)

Results: Soil Moisture Residence Time (SMRT)

Findings

- The improvement of High resolution is not very significant

- The improvement also varies on reference datasets

- Overall improvement in ET is not consistent

- CLM-H and Noah-MP shows higher SMRT

- Higher resolution shows less soil moisture variability