NCAR
NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

NCAR Water System Program

GEWEX

C3WE

Convection-Permitting Climate Modeling

A new Era for Water Research

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GEWEX side meeting at AGU 2018, Dec. 12th 2018, Washington, DC

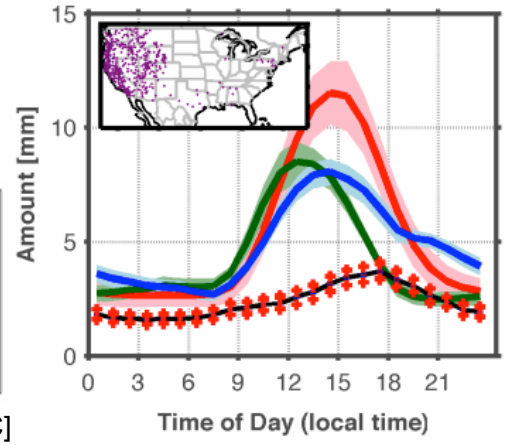
Summertime rainfall diurnal cycle in Western U.S.

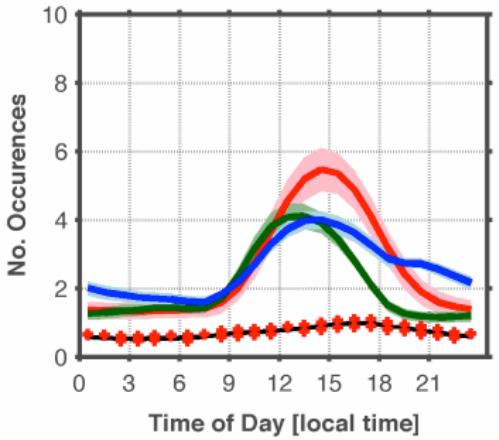
Amount

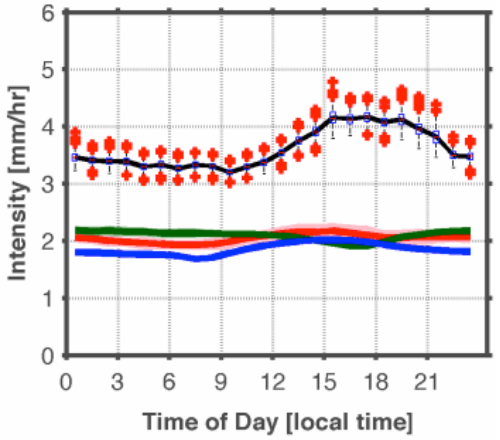
WRF 36 km

- Observations
- Kain-Fritsch
- Tiedtke
- NSAS

[Mooney et al. 2017, JoC]



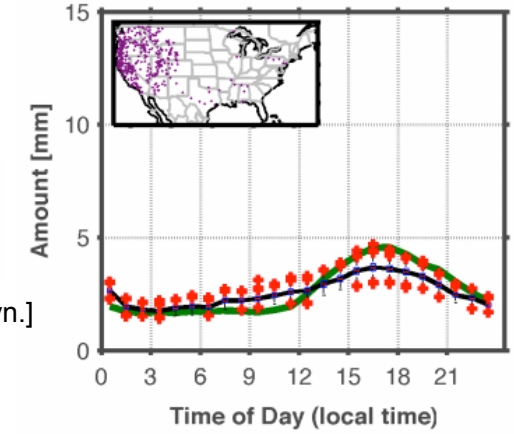


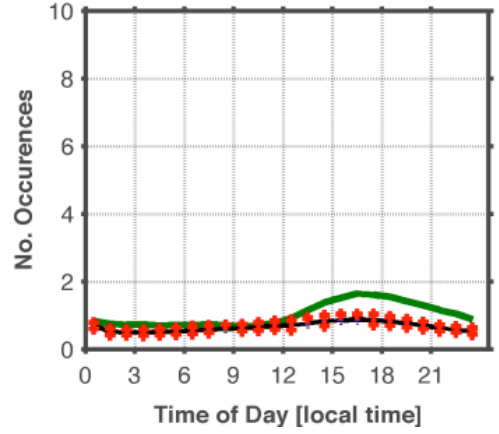


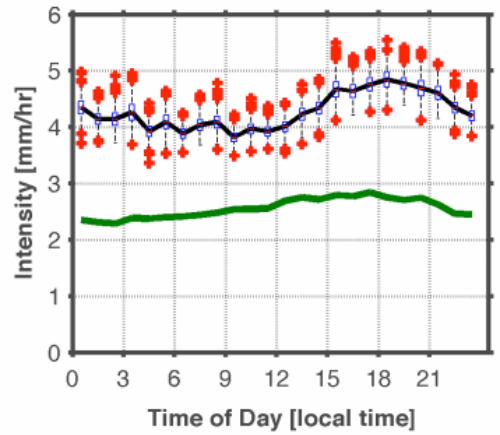
WRF 4 km

- Observations
- WRF-4km

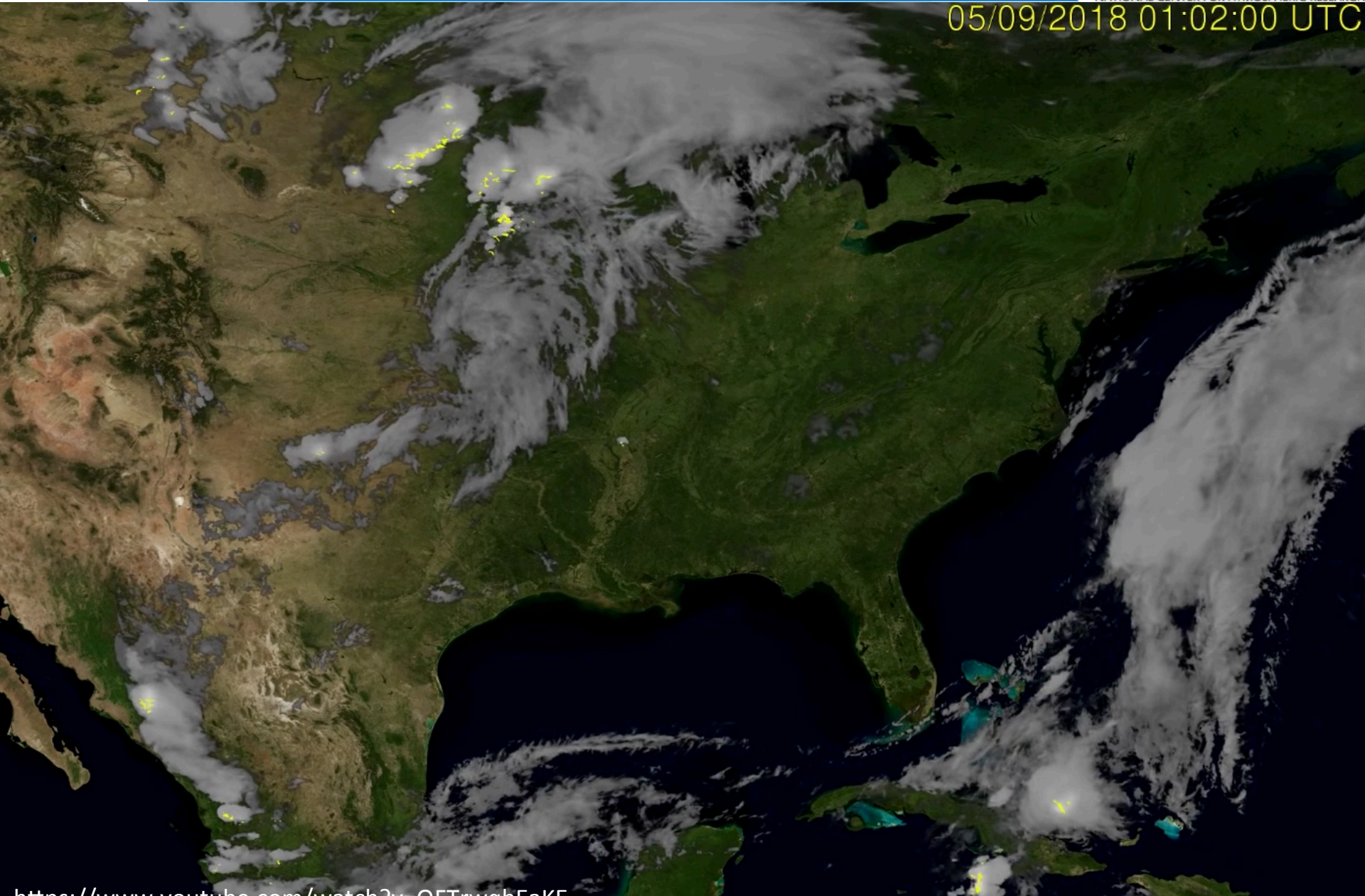
[Liu et al. 2016, Clim. Dyn.]





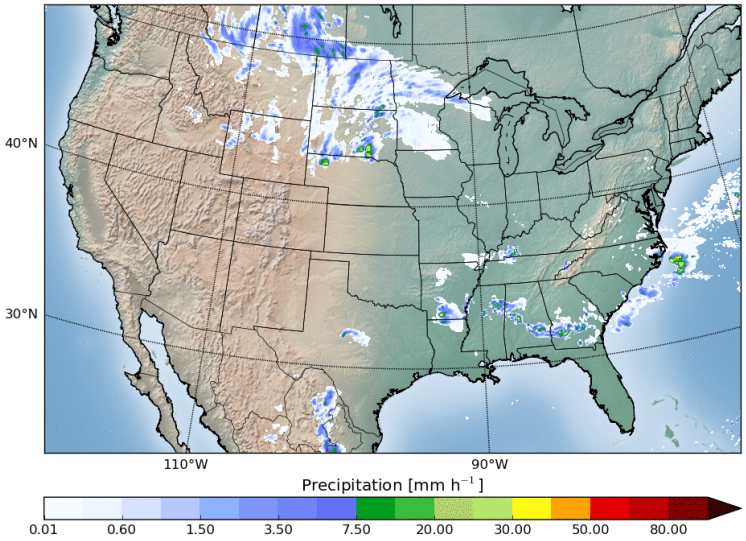


MCSs seen from GOES 17

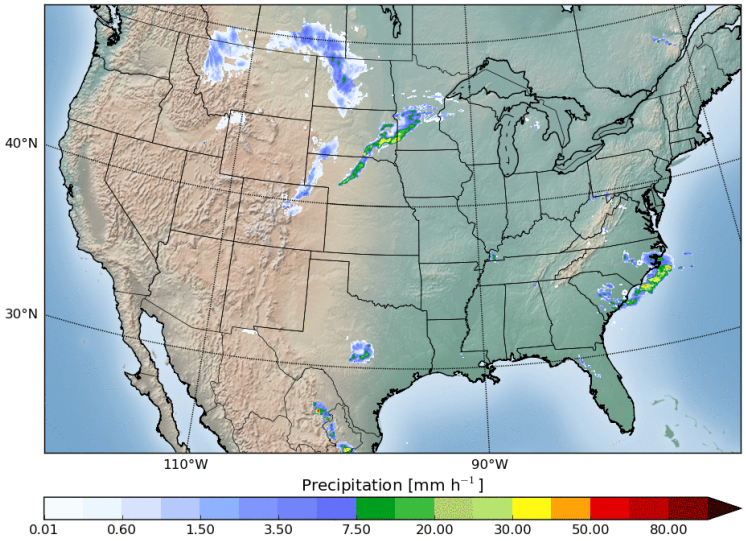


Storm-Scale Simulations

4 km Simulation



Observation



[Liu et al. 2017, Clim. Dyn.]

MCS tracks: observed vs. modeled

WRF - current climate

May - 01 - 00:00

STAGE4 - Observation

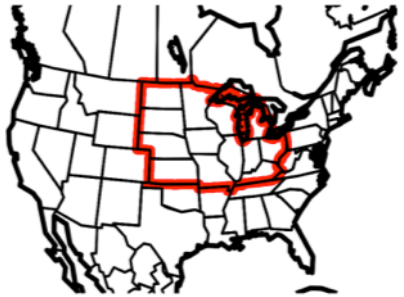
May - 01 - 00:00

All MCS tracks from 13-years (2001-2013)
Tracks fade out after 7-days

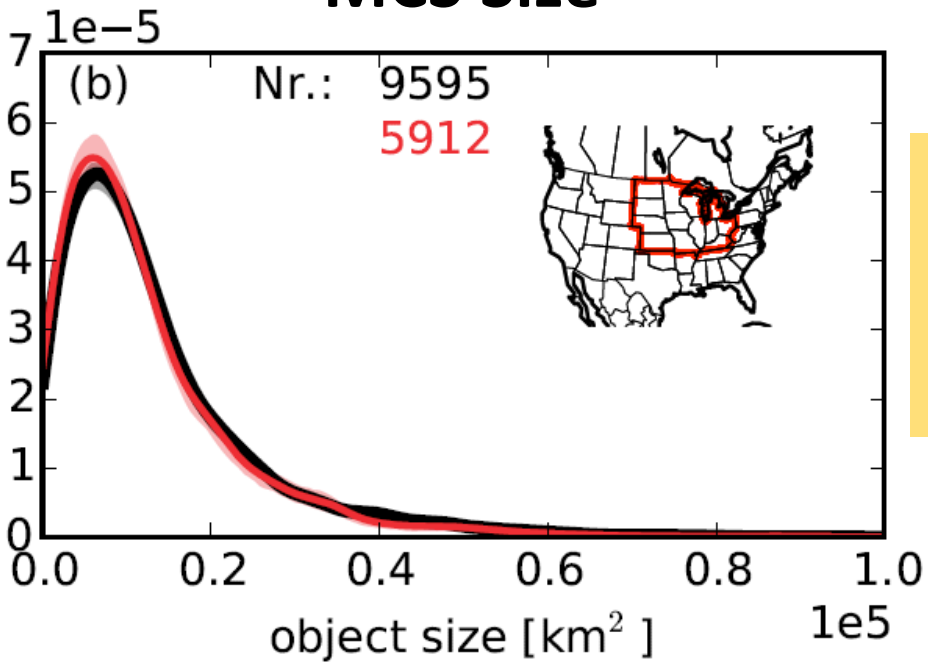
MCS attributes – JJA Central U.S.

Observation

Model



MCS Size

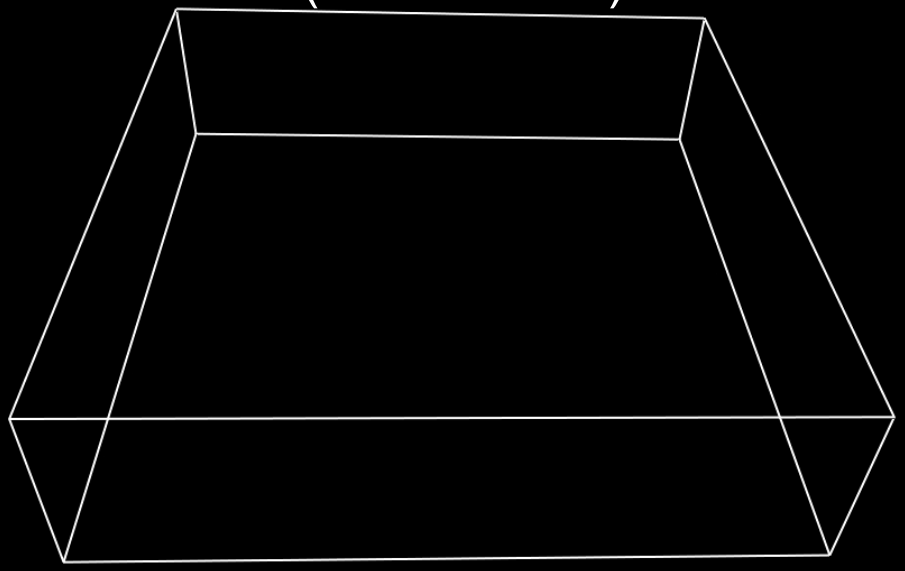


"Modeled and observed MCS precipitation cannot be statistically differentiated"

[Prein et al. 2017, Clim. Dyn.]

MCS in 12 km and 4 km Model

Δx = 12 km
(K-F scheme)



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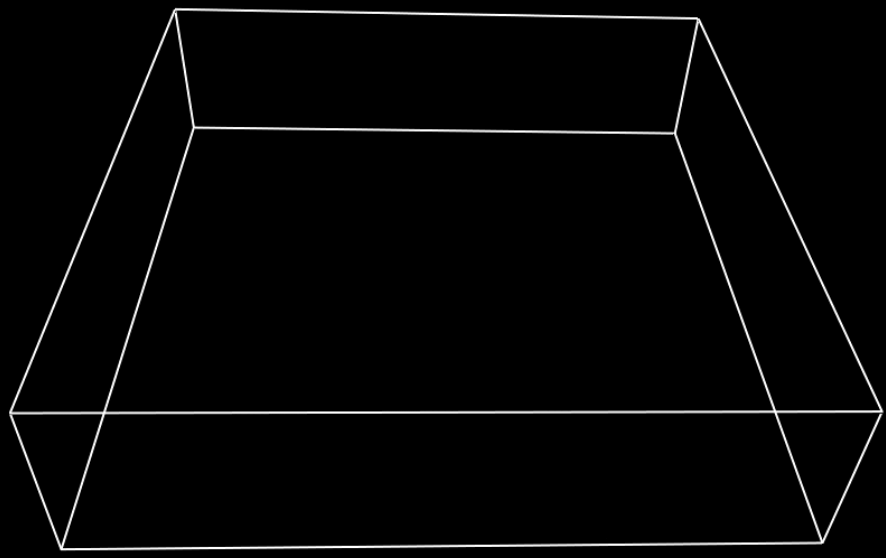
Δx = 4 km



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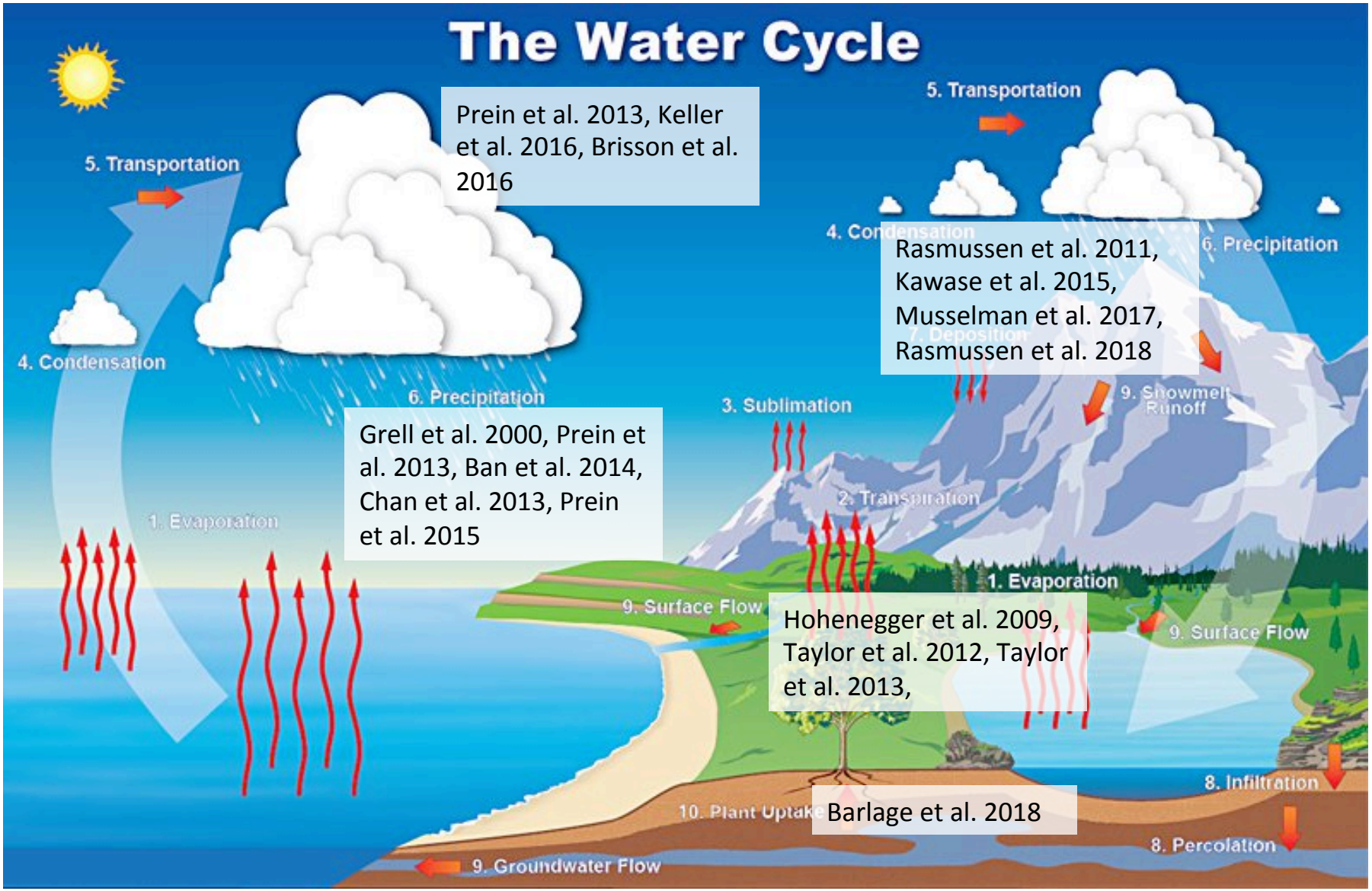
Simulating the Hydrologic Cycle



Prein et al. 2013, Keller et al. 2016, Brisson et al. 2016

Rasmussen et al. 2011, Kawase et al. 2015, Musselman et al. 2017, Rasmussen et al. 2018

Grell et al. 2000, Prein et al. 2013, Ban et al. 2014, Chan et al. 2013, Prein et al. 2015

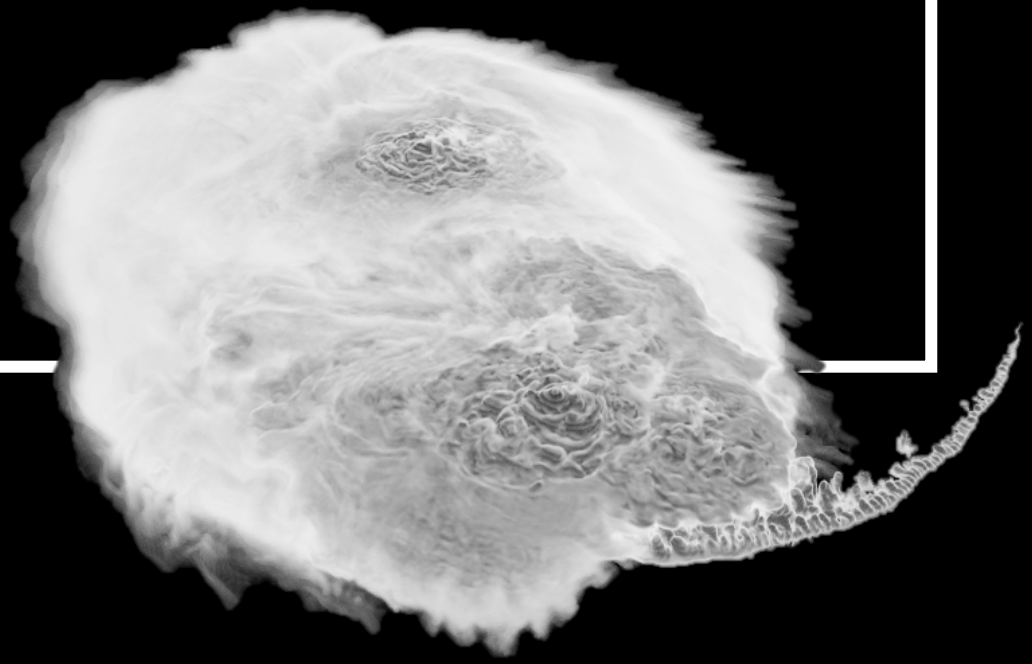
Hohenegger et al. 2009, Taylor et al. 2012, Taylor et al. 2013,

Barlage et al. 2018

http://www.filtersfast.com

Key Points

1. Convection-permitting models represent a **step change** in modeling the hydrologic cycle
2. This includes **feedback processes** such as soil-atmosphere interactions
3. These models will **accelerate scientific discoveries**



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