Pacific Northwest
NATIONAL LABORATORY

Global Mesoscale Convective System Latent Heating Characteristics from GPM and IMERG Retrievals

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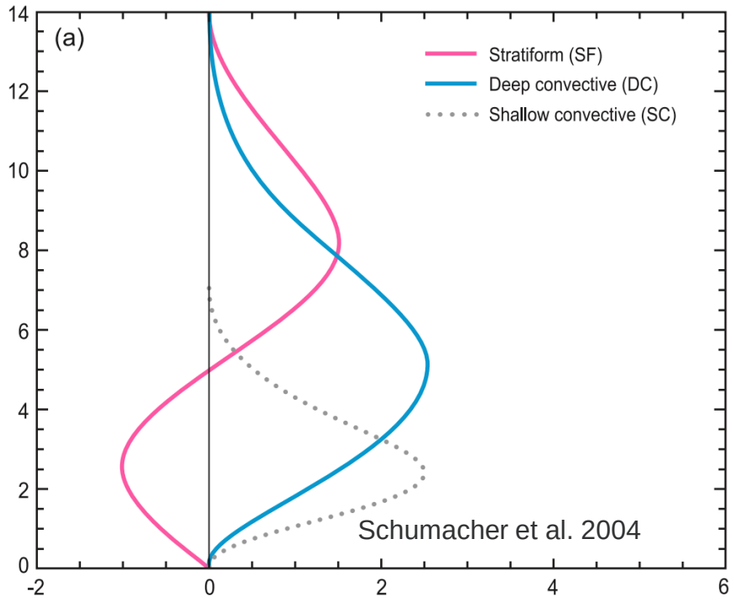
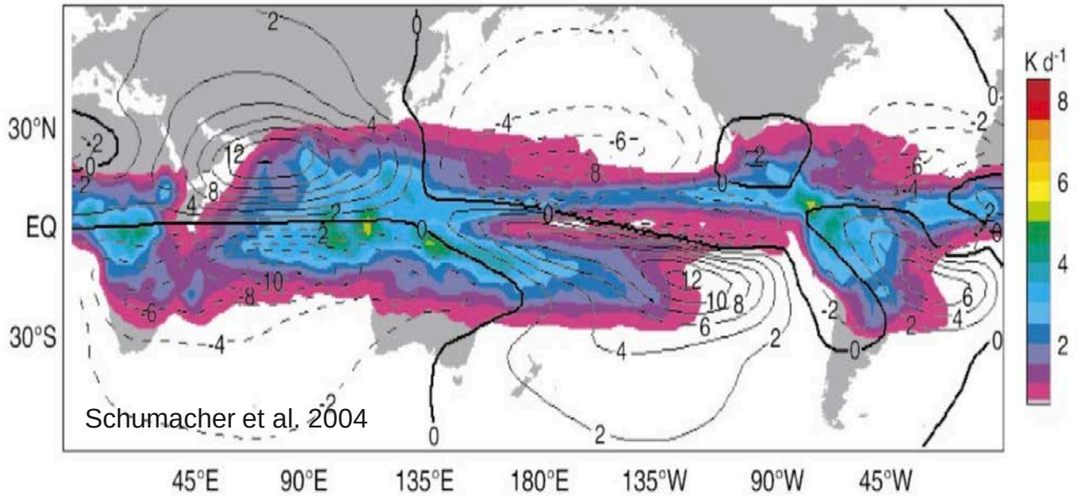
Motivation

- Latent heating (LH) is a major driver of atmospheric circulation.
- Affected by the convective and stratiform regions.
- Significant errors in models are partly related to the ability of current cumulus parameterization schemes in simulating convection and its latent heating(Krishnamurti et al. 2010).





Approach

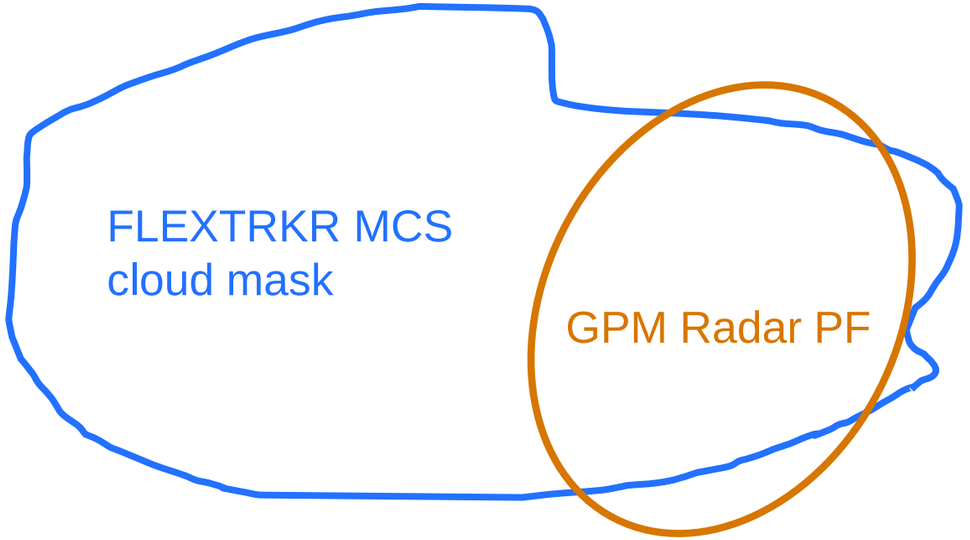
Data:

- Global Precipitation Measurement (GPM) precipitation feature (PFs)
- Spectral Latent Heating (SLH) Product (Shige et al. 2004)
- Global FLEXTRKR MCS dataset

Method:

- FLEXTRKR MCS dataset (Feng et al. 2020)
- GPM radar PF (Nesbitt et al. 200; Liu et al. 2008)

1) Grouping the contiguous area with convective precipitation derived with PR.
2) Calculate statistics in each PF.



Overlap area > 30 %

Characteristics

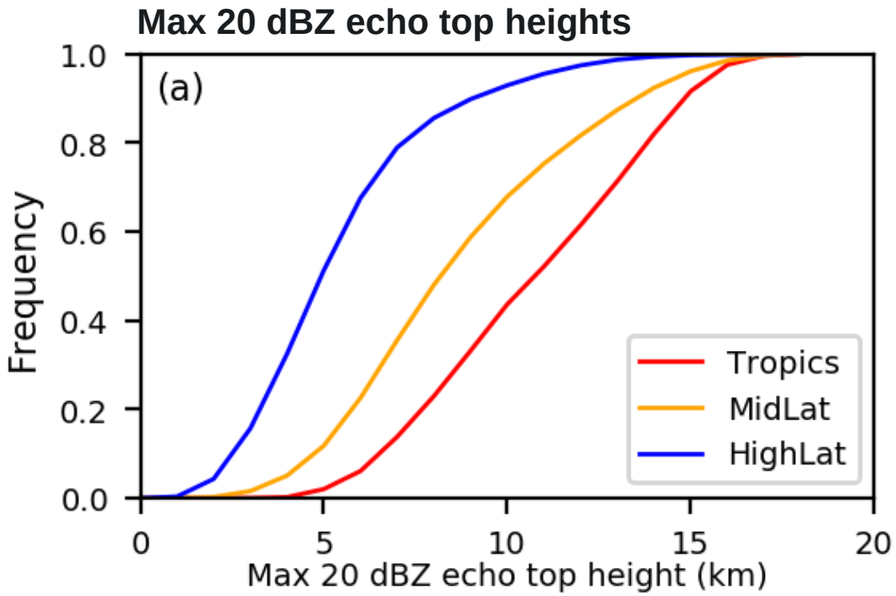
For tropics:

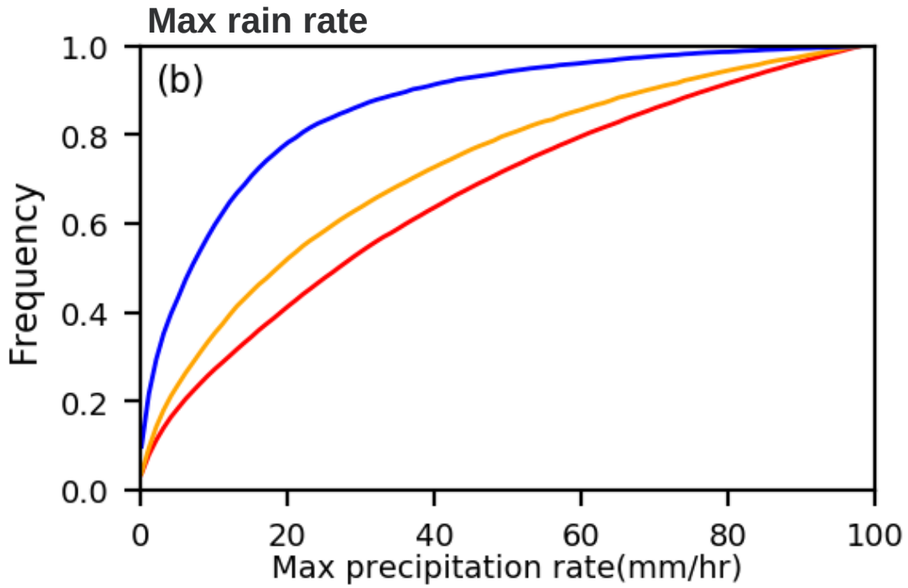
- Higher echo top heights & larger maximum rain rate
- Smaller area
- More convective

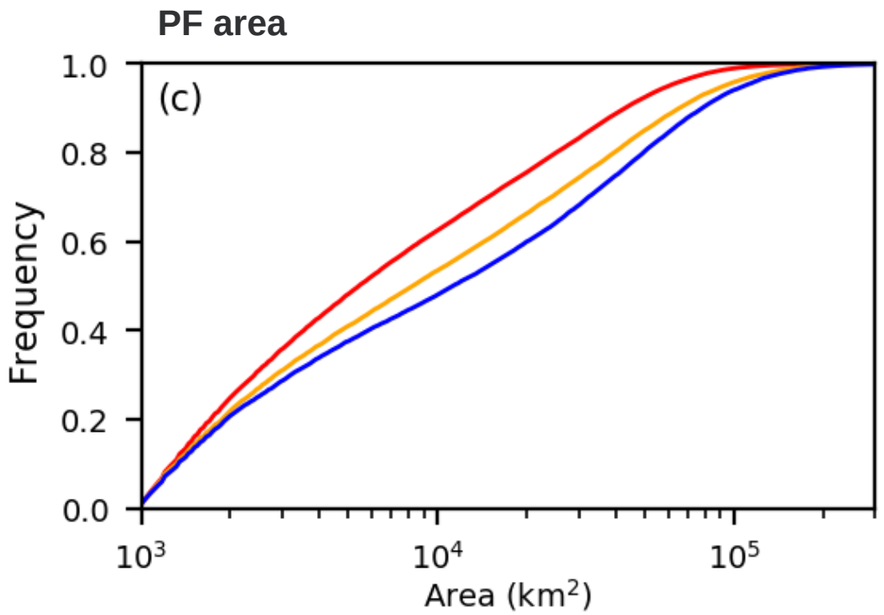
Tropics: (20°S-20°N)

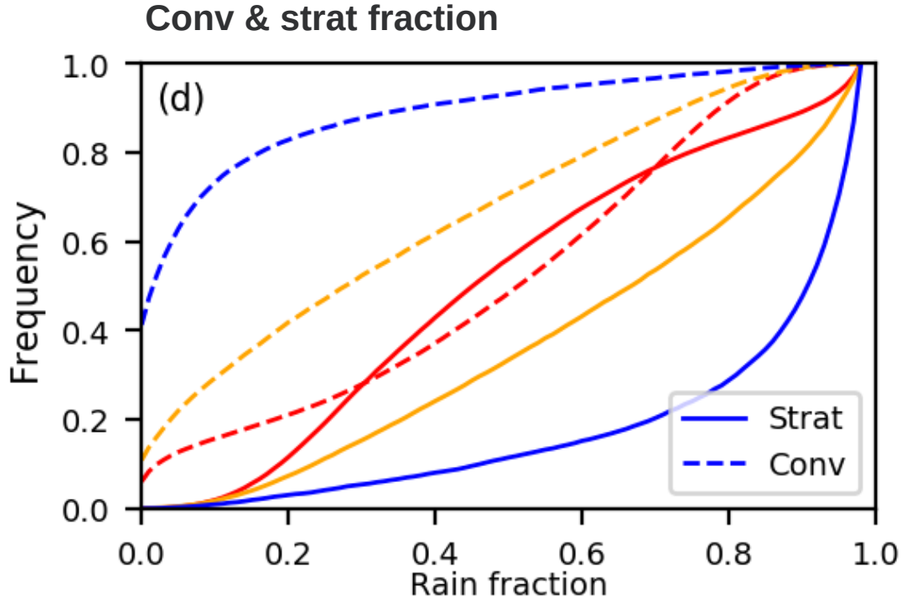
MidLat: 20-40°S & 20-40°N

HighLat: 40-60°S & 40-60°N



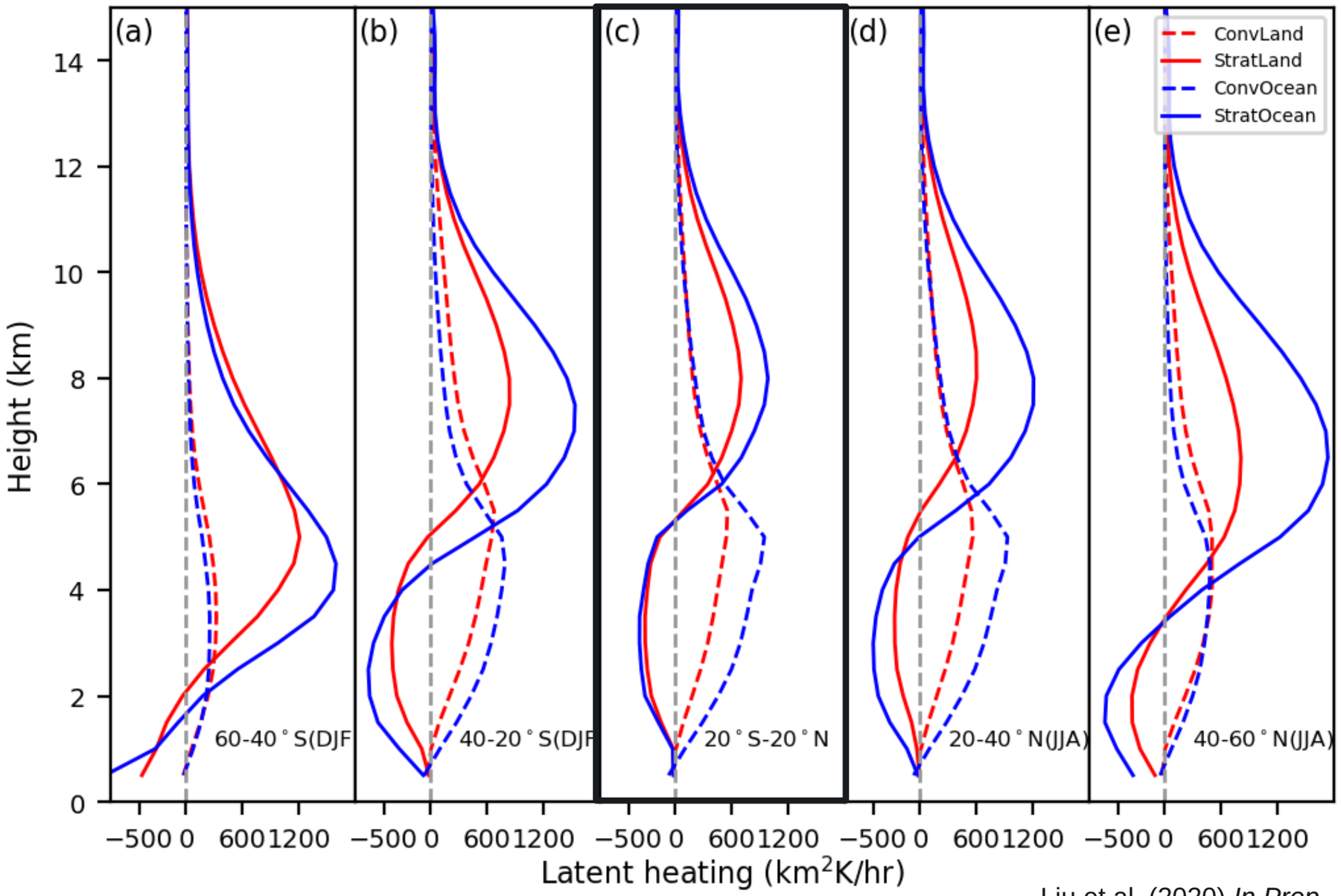






Liu et al. (2020) *In Prep.*

LH profiles



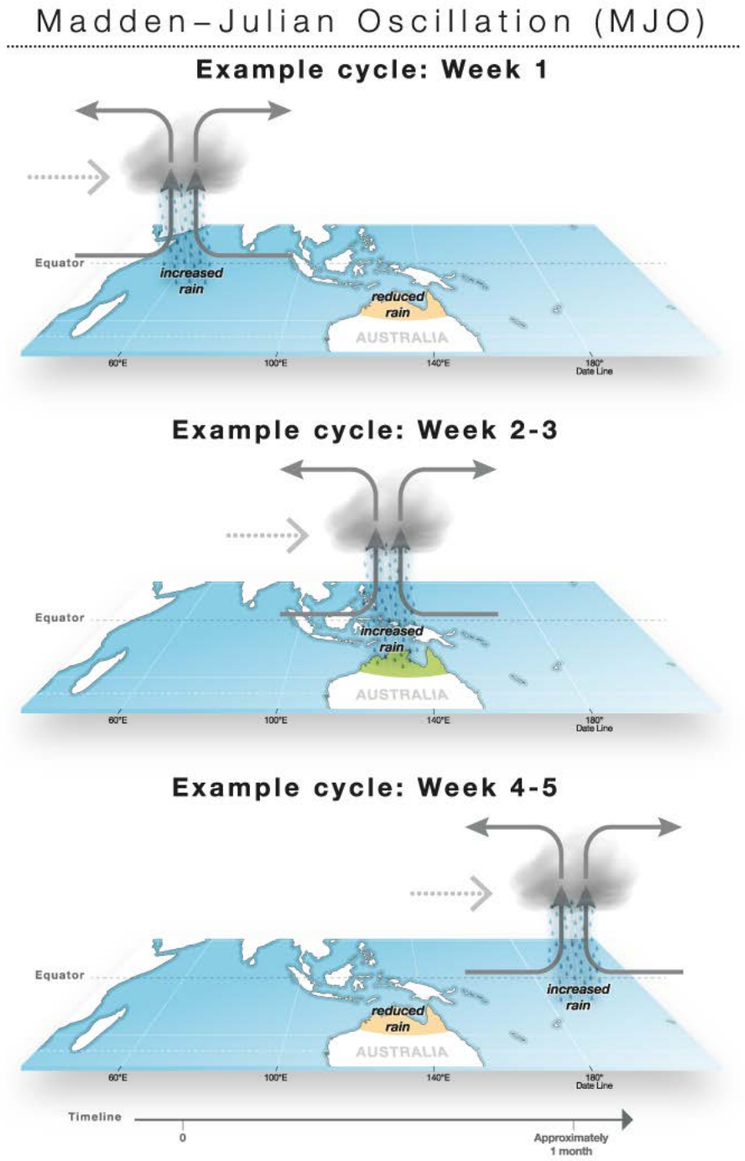
Mid & high latitudes:

- More top-heavy stratiform profile
- Lower peak height

Liu et al. (2020) *In Prep.*

Research opportunity

- Provide global horizontal and vertical distribution of latent heating for model validation.
- Test whether model predict convective heating processes correctly.
- Investigate the variability of LH at different stages of the MJO.
- Improve prediction of the MJO by using the 4D knowledge of latent heating distributions.



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https://phillyweatherauthority.com/madden-julian-oscillation-2/