Applying AI/ML methods to identify controls on the occurrence and organization of precipitating deep convection and extreme rainfall in the tropics

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AI/ML methods for tropical rainfall

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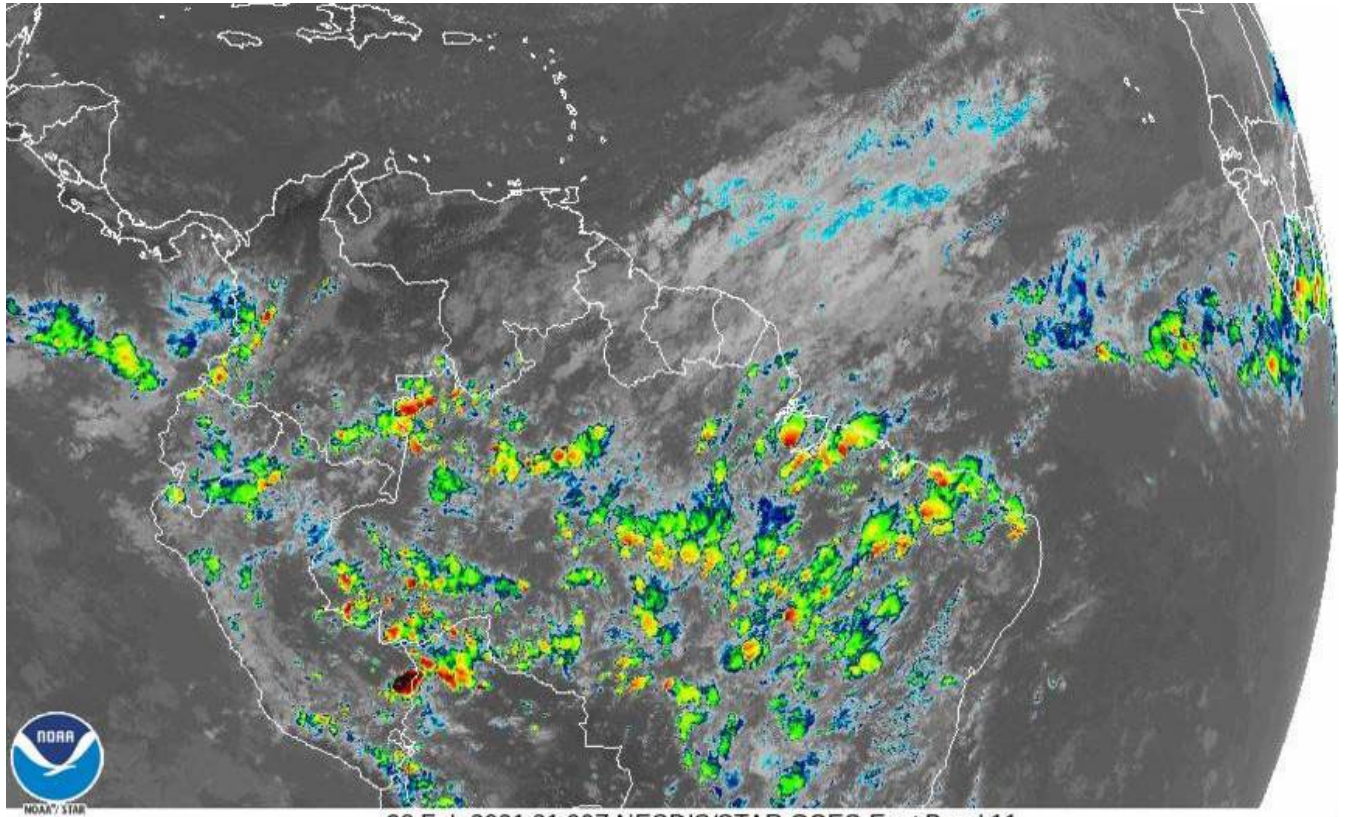
Why does it rain where it does, when it does, and how much is does (in the Tropics)?

- Tropical rainfall exhibits rich multiscale variability in space and time
- Tropical rainfall remains one of the key challenges in model simulation
- The controls on tropical rainfall often appear to be quite subtle, and many fundamental questions remain, e.g., how rainfall aggregates.



28 Feb 2021 21:00Z NESDIS/STAR GOES-East Band 11

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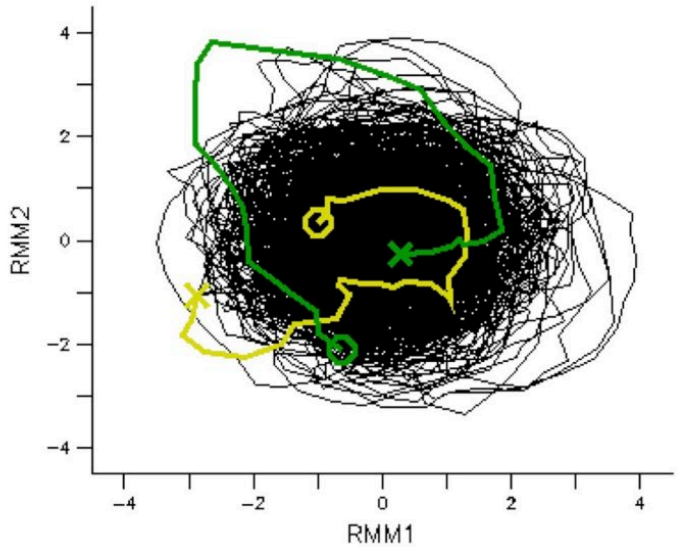
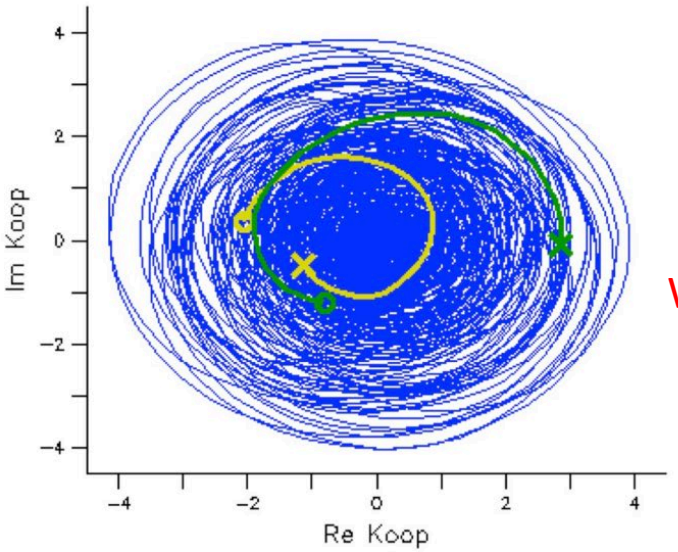
Ongoing and planned research

- Data-driven Koopman operator theory to capture intrinsic modes of tropical variability
- Clustering to isolate coherent spatial patterns of diurnal rainfall behavior and associated dynamics and thermodynamics
- Convolutional neural networks to identify key phenomenological drivers of extreme rainfall



Conventional MJO Index



Koopman MJO Index

Wiggins et al., GRL, 2023.