

Opportunities/Challenges

Science

- * Theory
- * Terrain versus mesoscale-convective processes

Observations

- * Rainfall Reanalysis – Polarimetric Radar
- * Field Campaigns – PMP Aware

Modeling

- * Terrain
- * Microphysics
- * Smethport-Like Storms

Low-level moist flow in the vicinity of a mountain range Including surface and boundary layer conditions affecting the low-level flow

The multi-scale boundary conditions determined by the terrain Barrier scale

Sub-barrier scale—important for triggering

Mechanisms of storm anchoring (reverse shear)

Role of Orography – cell enhancer / cell initiator / storm anchoring.

Challenges • Lack meso-to-microscale terrain variations that may anchor and fuel the convection • Storms inherently under-resolved, leading to systematic biases • Reliance on uncertain subgrid parameterizations

Climate-scale CPMs are a sound approach to PMP estimation, but...Substantial errors in storm development and precipitation should be expected due to uncertain parameterizations and marginal terrain/storm resolution

Estimates may have large (factor of two) uncertainties. LES can help to critically evaluate and refine approach. Simulate recent extreme cases and non-extreme cases that present similar environmental conditions

Can strengthen confidence in CPM approach and/or pinpoint critical model biases

capture offshore TC evolution, and environmental
interactions