

A prognostic-stochastic and scale-aware closure for representation of cumulus convection in the convective grey-zone in NOAA's Unified Forecast System.

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The project is funded under Hurricane Supplemental: IFAA Project Number: **1A-2-4: Accelerating process level stochastic physics development. Project leads: Fanglin Yang, Vijay Talapagada.**

Project scope

- Findings in the project has demonstrated that a prognostic-stochastic equation for the cumulus convection closure is more efficient at propagating uncertainty upscale, compared to local parameter perturbations or diagnostic process perturbations.
- A prognostic-stochastic closure, based on an equation for the updraft area fraction, has been developed and implemented in a research branch of the GFSv16 saSAS convection scheme. Tests with the new stochastic closure are ongoing, both for ensemble applications and deterministic simulations.
- The closure is scale-aware, making it attractive for convective grey-zone resolutions as it exhibits **memory**, **horizontal (3D) communication**, **stochasticity** and **scale-awareness**, features that are not included in traditional bulk mass-flux convection schemes.

Readiness level and transition to operations

- The components of the new closure has been developed and it is currently being tested with GFSv16 as a baseline. Could be a candidate for GFSv18 - pending evidence based results of improved representation of cumulus convection and ensemble spread.
- In addition to more testing and evaluation - missing technical aspects for transition to operations include: updated tracer file (field_data), cycling of new prognostic variable, restart capability, code commit (and review) to ufs_weather_model and subsequent submodules.
- Code can be committed in the coming 6 months, as an alternative closure in the current saSAS scheme.
- Manuscript is in preparation.