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Improving Convective Weather Nowcasts by Coupling Convective Initiation Products to GOES-R Legacy Sounding NearCasts of the Storm Environment

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In an effort to improve and reduce over-forecasting in 0-1 h GOES-R (GOES-16) Convective Initiation (CI) products, 1-3 hour NearCasts of GOES Legacy Sounding precipitable water (PW) and equivalent potential temperature (θe) profiles are included to help differentiate areas where storms are (and are not) most likely to grow into significant convective storm elements, in a probabilistic sense. This procedure will maximize use of all capabilities of the GOES-16 Advanced Baseline Imager (ABI) visible and infrared (IR) high time-resolution (1-5 min) imagery and 15-30 min interval clear-air profiles (especially moisture). The approach is applicable to MSG SEVIRI observations, as well as future MTG-I (and MTG–S) systems.

The GOES CI and NearCast datasets are physically consistent and complimentary, with NearCasts adding improved and more contemporaneous information about evolving stability patterns in advance of storm development than is available from numerical weather prediction (NWP). NearCasts offer coherent, frequently-updated depictions of the vertical and horizontal moisture structures in the pre- and near-storm environment, while GOES-R CI products improve situational awareness of which growing cumulus cloud elements are most likely to intensify.

Fusion of CI and NearCast products offers several advantages in enhancing CI performance over using the individual products separately. Most notably, the use of full resolution satellite observations in the NearCasts provides a continuous monitor of water vapor and stability features and their movements and gradients, and thereby helps to isolate important boundaries in the near-storm environment that can either support or inhibit CI and continued upscale convective storm development.

Initial results incorporating NearCast moisture thresholds and short-range tendencies correctly reduce over-forecasting of higher-probability CI events by 30-60%. NearCast layer-PW products show larger impact than θe when using top-level-down successive elimination in the CI screening process. This is consistent with the greater sensitivity of GOES observations to moisture than temperature. NearCast products are also being considered as additional inputs in a logistic regression framework for the GOES-16 CI, algorithm itself, thereby adding real-time satellite information that is presently lacking.

For this presentation, data from the current GOES-East satellite will be used. High-impact severe weather event days in which the conventional CI algorithm produced undesirable levels of over-forecasts will be evaluated. Results will illustrate both the benefits of CI/NearCast fusion, and how the results can fluctuate by geographical location, season, time of day and dynamical forcing. Adaptations of the algorithms to GOES-16 data will also be discussed.

********Please note, this abstract may also be appropriate for Session 8.********