

GOES-14 SRSO Experiment Support for GOES-R Risk Reduction

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Background: The GOES-R Algorithm Work Group in partnership with the GOES-R Risk Reduction Science Program and Proving Ground Demonstration Program have developed a number of products and decision aids undergoing evaluation and feedback with NWS forecasters across the country at select forecast offices and at national service centers collocated with NOAA Testbeds (Hazardous Weather Testbed, Aviation Weather Testbed, National Hurricane Center). In the GOES-R Proving Ground, Baseline and Future Capability Products are demonstrated with and receive feedback from forecasters using proxy and simulated data sets. Some of the key products that are very useful for high impact weather forecasts and warnings include:

- Cloud and Moisture Imagery
- Hurricane Intensity Estimate
- Convective Initiation
- Overshooting Top Detection
- Lightning Detection

A deficiency in these product demonstrations is our inability to more fully demonstrate the added utility of the GOES-R imagery products at the higher 30 sec - 1 min mesoscale refresh rate that will be routinely possible with the Advanced Baseline Imager (Schmit et al., 2005). In the testbed demonstrations, NWS forecasters evaluate the planned and future capabilities of GOES-R in the context of their current and planned suite of observing systems and numerical weather prediction models (Goodman et al., 2012). For example, at the HWT in Norman, OK the forecasters have access to the WRF simulated cloud and moisture imagery products, convective initiation (Mecikalski and Bedka, 2006; Mecikalski et al., 2010), overshooting tops, cloud top cooling rate, and 1-min Oklahoma total lightning mapping array density maps while at the same time having access to dual polarization radar and National Weather Radar Testbed Multi-function Phased Array Radar (MPAR) rapid refresh 1-min volume scans. Therefore, a unique data set can be collected in central Oklahoma consisting of the GOES-14 SRSO proxy data for the GOES-R ABI and the Oklahoma LMA proxy data for the GOES-R GLM concurrently with the radars forecasters rely on for nowcasting and warning of high impact and severe weather. Outside of Oklahoma there are a number of GLM Testbeds having experimental total lightning mapping systems (Goodman et al., 2005) collocated with NEXRAD and research radars that can provide additional opportunities to collect rapid update ABI and GLM proxy data with conventional observations and in-situ data for high impact weather forecast and warning improvement. The accompanying PowerPoint Slides showcase the types of products and integrated analysis that can be performed with these special data sets.

Goal: While GOES-14 is out of storage during the period August-October 2012, we desire to acquire true 1-min SRSO super rapid scan imagery to showcase the benefits of high-temporal

resolutions in an environment of both total lightning and phased-array radar. This will allow us to better prepare for GOES-R.

Statement of Need: While other special 1-min datasets exist, none are during times of the next generation MPAR (Multi-function Phased Array Radar). Also, the SRSO from operational GOES-East and –West offer only limited “spurts” of 1-min data. (e.g., http://cimss.ssec.wisc.edu/goes/blog/wp-content/uploads/2012/05/120517_g15_vis_srso_anim.gif)

Details: The special 1-min imagery would be called for a 24-hour period, (ideally) 2 days prior to start. There would be six possible center points with five having fixed site locations with the MPAR at Norman being primary. All fixed site locations provide total lightning mapping using ground-based VHF time-of-arrival systems (<http://branch.nsstc.nasa.gov/PUBLIC/DCLMA/>; <http://branch.nsstc.nasa.gov/PUBLIC/NALMA/> ; http://lightning.nmt.edu/nmt_lms/index.html) and NEXRAD radar coverage. A sixth relocatable center point is requested to cover hurricane activity which may have access to concurrent observations from the NASA Hurricane and Severe Storm Sentinel (HS-3) Earth Venture-1 Mission (<http://espo.nasa.gov/missions/hs3>).

Location	Total Lightning	Radar	Notes
Norman, OK (primary)	OKLMA	MPAR, NEXRAD	1-min rapid update, x-band dual-pol radar
Sterling, VA	DCLMA	TDWR, NEXRAD	1-min rapid update c-band radar
Greeley, CO	NCLMA	CSU-CHILL, NEXRAD	Complex terrain, dual pol, dual frequency radar (http://www.chill.colostate.edu/w/CSU_CHILL)
Huntsville, AL	NALMA	UAH-ARMOR, MAX, NEXRAD	Dual-pol k and c-band radar, profiler (http://vortex.nsstc.uah.edu/mips/)
Melbourne, FL	LDAR II	NEXRAD	Dual-pol radar
Atlantic Basin/GulfMex	-	Global Hawk HS3-HIWRAP	Doppler radar, S-HIS IR sounder, wind and cloud profiling lidars, microwave radiometer

Exact center points would be provided. Ideally, a test day would be called early in the experiment, to test data flow, etc. Consecutive day SRSO operations are not expected but might be possible if warranted by synoptic conditions (e.g., tropical cyclone development, days with potentially severe weather).

When the center point is Norman, OK, the PAR at the National Weather Radar Testbed (NWRT) in Norman, Oklahoma will collect ~1-min volumetric data during the 24-h collection. Given the project’s focus on convection initiation, data collection will begin in clear-air conditions using a clear-air-focused scan strategy. Once a first echo forms one of two scan strategies will be used: EnhancedVCP12_CLEAN_AP or EnhancedVCP12_CLEAN_AP_uniform. The CLEAN_AP

extension indicates the number of pulses is chosen to optimize performance of the real-time ground-clutter contamination mitigation filter developed by Warde and Torres (2010). The EnhancedVCP12_CLEAN_AP scans 18 elevations from 0.51° to 52.9°, employs split-cut sampling through 6.4°, and has a minimum observation range of 10 km. The scan time is 64 s. This scan strategy will be used when storms exist outside of the maximum unambiguous range (117 km) to mitigate second trip returns. Otherwise the uniform-PRT version of the scan strategy will be used to decrease the minimum observation range from 10 to 3 km and the scan time from 64 to 46s. The NWRT will run the adaptive digital signal processing algorithm for PAR timely scans (ADAPTS; Heinselman and Torres 2011) on both scan strategies. ADAPTS conducts a complete volumetric scan periodically (every 10 minutes by default, definable by user). In between the complete scans, beam positions that are deemed to be devoid of significant weather are turned off based on continuity criteria in order to speed up the scan update rate.

Outcomes: This GOES-14 SRSO dataset, along with ground-based LMA and MPAR will offer a truly unique dataset for preparing for the routine rapid-scan imagery of the GOES-R era. A number of products can be derived from these data to showcase the benefit of high-temporal resolution geostationary measurements. These include, but not limited to: imagery, convective initiation, cloud-top cooling, cloud micro-physical properties, atmospheric motion vectors, etc.

Caveats: Understood that the stray light data collection (and any other operationally needed test) takes priority, although this will be during the night. Understood this is experimental, best-effort, data and will not interfere with the operational data.

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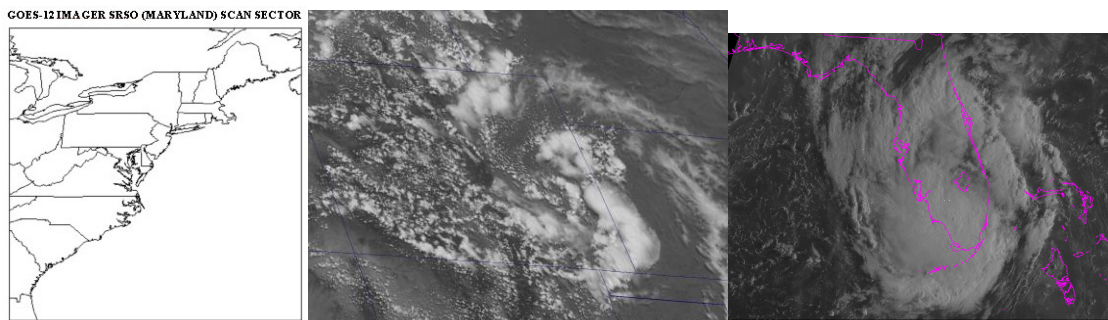
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NWS: SPC, NHC, OPC, AWC

Coverage: Sample 1-min sized images. Details will change based on center point, view angle, etc. (courtesy of T, Schmit)



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