

GOES-R CI Proxy for Aviation: Trial Period 2015

Introduction

NASA-SPoRT conducted a trial evaluation of the operational utility of the GOES-R Convective Initiation proxy product (GOES-R CI) at specific NWS weather forecast offices (WFOs) and Center Weather Service Units (CWSUs) during June and July of 2015. The GOES-R CI product was developed at the University of Alabama in Huntsville (UAH) by Dr. John Mecikalski, and it was transitioned to NWS WFOs through collaborations with NASA-SPoRT. The GOES-R CI product can be used as a proxy to the future capabilities from GOES-R which will have improved spatial and temporal resolution that are anticipated to benefit the GOES-R CI performance. The product provides a 0-2 hr nowcast of a discrete cloud object's probability to initiate convection that will result in a radar reflectivity of 35 dBZ or greater. In this evaluation, the NWS WFOs and CWSUs evaluated the impact of the GOES-R CI proxy product to provide situational awareness for aviation support during the summer season of difficult-to-predict "pop up" convection near airports and along flight paths.

The GOES-R CI proxy uses inputs from the current GOES imager, including trends in single channel and channel difference brightness temperatures to indicate cloud growth and glaciation, as well as inputs from the Rapid Refresh (RAP) numerical model to help define environmental stability. The forecasters received training materials in the form of a short (~13 minute) primer module and a NASA-SPoRT Quick Guide explaining the basics and operational applications of GOES-R CI (<http://weather.msfc.nasa.gov/sport/training/>).

Because this product has been evaluated and updated previously, the 2015 version of the training module included some modifications to reflect changes such as improved detection under thin cirrus cover. Forecasters were encouraged to pay attention to these changes, particularly if they had experience with earlier versions of the product.

Forecasters at FFC (Atlanta/Peachtree City) and BOU (Boulder) WFOs and the KZHU CWSU (Houston) office provided actionable feedback during the assessment. Forecasters were given the option to provide feedback to NASA-SPoRT via an online form comprising three product questions and a comment box. Forecasters also

provided feedback directly to SPoRT via email, sharing information about specific weather events and asking questions as they arose.

User Feedback

Forecasters self-reported the specific use or attempted use of GOES-R CI in their offices for each event. In the WFOs, GOES-R CI was used for nowcasts/forecasts and for severe weather decision support. In the CWSU, GOES-R CI was used in issuing Center Weather Advisories. Note that at the CWSU level, the size of the area of responsibility is much greater, and any convective activity is monitored, meaning that the two user groups, although ostensibly focusing on aviation concerns during this assessment, would be using GOES-R CI in slightly different ways with different needs and goals in mind. For example, a Center Weather Advisory, which is a 2hr nowcast product issued by CWSUs, addresses weather concerns including convection occurring over large regions or 30+ minute duration (i.e., conditions approaching convective SIGMET criteria). The view is broader, the valid time is shorter, and the threshold of concern is lower than for a Terminal Aerodrome Forecast issued by a WFO for a specific airport.

GOES-R CI was considered "very useful" in issuing Center Weather Advisories, provided there was no cirrus contamination. For WFOs, the utility of the product also depended on the absence of cirrus clouds, and the cases with the most positive feedback showed no cirrus clouds and had lengthy lead times on convection. While WFO forecasters were not strongly critical of GOES-R CI, they were generally less effusive in their praise of GOES-R CI than CWSU forecasters.

Product Impacts and Limitations

In the cases in which GOES-R CI was called "useful" and "very useful", forecasters at both the WFO and CWSU level cited long lead times on convective activity and appropriately high CI probabilities (for example, 45 minutes on convective cells at 70% and 90 minutes on convective cells at 60%). For aviation support, it is beneficial to forecasters to have an idea of the time and location of convection to provide that information to the appropriate entities, such as airports or the FAA. Figure 1 below shows an evaluated event in which the CI product indicated that convective initiation on a

boundary was imminent, providing in this case about 90 minutes of lead time prior to the first 35 dBZ radar echoes being observed (shown in Figure 2). In a case in which the product was considered “not very useful” in a WFO, the CI probabilities were not convincing and the lead times were short (e.g., cells at 50% became convective 10 minutes later).

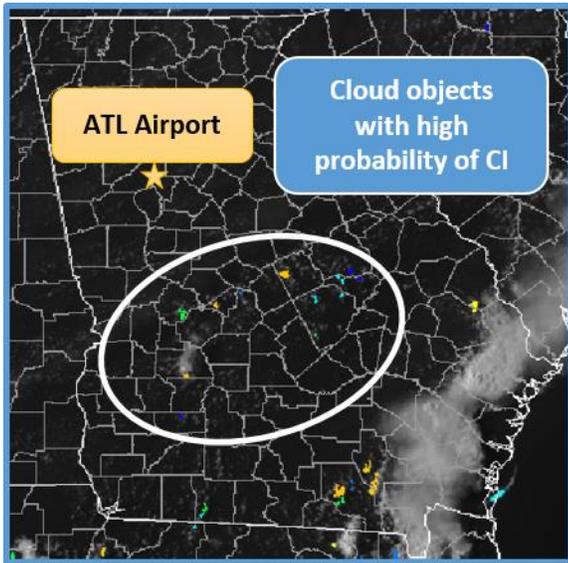


Figure 1. GOES-R CI image overlaid with visible satellite from 2130 UTC on 7 July 2015.

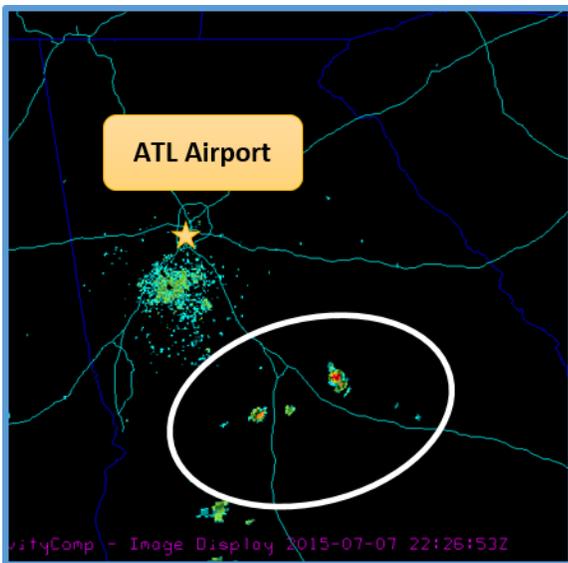


Figure 2. Radar imagery from FFC from 2227 UTC on 7 July 2015.

There were two cases in which cirrus contamination greatly limited the utility of the product. In one case, thin cirrus contamination resulted in the product unable to produce probabilities for the onset of convective initiation of several cells on the northern edge of a large system in the Boulder county warning area. It did perform well on cells on the southern and eastern edge of the system; however convective initiation was already

ongoing. The other case of cirrus contamination resulted in no convective initiation being identified in a cumulus field.

Conclusions and Recommendations

- Provide online animated loops of large regions of the GOES-R CI product to display at the forecasters’ workstations or on dedicated situational awareness monitors.
- Indicate the presence of cirrus clouds or identify cloud types to alert forecasters that the algorithm may not show nearby convective development.
- Improve lead times and algorithm confidence for “borderline” cases of convective development.

Overall, when not hindered by cirrus cloud cover, GOES-R CI provided forecasters with regional situational awareness and assisted them in issuing aviation and airport weather forecasts. CWSUs generally found greater utility in the product than WFOs, but both groups of forecasters were interested in experimentally incorporating GOES-R CI into their nowcasting processes in the near-term. Further evaluation of this product by a broader audience is justified, pending changes by the product developer. Alternatively, informal feedback could be garnered by following up with participants of this assessment during or after their next convective season.