Jobsheet

WRF Simulated GOES-R IR/WV Products

Objective:

- View and compare GOES IR and WV products with WRF simulated satellite data from 1200UTC – 0000 UTC on 24-25 May 2011 data over the Texas/Oklahoma/Kansas domain.

Product Overview:

The synthetic imagery was developed for the GOES-R proving ground. The NSSL WRF-ARW model runs at a resolution that is similar to GOES-R, at least more similar than the coarser operational models. More importantly, the bands chosen for the synthetic imagery are those that will be on GOES-R. The synthetic imagery demonstrates channels that will appear on GOES-R, at least as best as possible given that this is model output, not observational data from a satellite instrument. Although the bands generated in the synthetic imagery are those for GOES-R and not the current GOES instruments, the wavelengths are similar enough for many operational uses, such as identification of jet streaks in the water vapor bands. In its current state, this product provides an integrated view of model output that can be readily compared to GOES imagery. The two products evaluated in this jobsheet are outlined below:

GOES-R 6.95µm Water Vapor Band

- The 6.95 band is a water vapor band whose central wavelength is a little larger than the current GOES-13 6.5 µm band. Its weighting function therefore peaks lower in the troposphere, resulting in slightly warmer clear sky brightness temperatures. This product has two primary purposes: 1) Synthetic imagery from cloud model output can be used to evaluate each model run. For example, one might compare a simulated water vapor band to observed GOES imagery from 12-18 UTC to see how well the model is handling the timing and location of upper level features, such as shortwaves. 2) Since the simulated bands are based on the GOES-R ABI, looking at the imagery will prepare forecasters for how the actual GOES-R imagery will look when it becomes operational. For example, certain features may be visible at these wavelengths which are not viewable in the current GOES bands.

GOES-R 10.35µm Infrared Band

- The 10.35 µm band is a window IR band, similar to the GOES 10.7 µm band, except a little "cleaner," meaning less water vapor absorption. This product has two primary purposes: 1) Synthetic imagery from cloud model output can be used to evaluate each model run. For example, one might compare a simulated IR band to observed GOES imagery from 12-18 UTC to see how well the model is handling cloud cover, which can have a big impact on convection later in the day. 2) Since the simulated bands are based on the GOES-R ABI, looking at the imagery will prepare forecasters for how the actual GOES-R imagery will look when it becomes operational. For example, certain features may be visible at these wavelengths which are not viewable in the current GOES bands.

Jobsheet Overview:

This jobsheet contains a sequential set of procedures that you will follow to view and observe the synthetic satellite output in the AWIPS environment. In addition, you will answer 7 questions along the way. Answers to these questions will be provided in the answer key document.

Instructions:

1. If AWIPS D2D is not currently open, double-click on the Launch AWIPS D2D icon to start up an AWIPS D2D session.

2. The product combinations for this jobsheet are located in an AWIPS procedure folder called **WRF_GOESR**. This can accessed from the D2D menu by selecting **File → Procedures → Open…**, selecting **WRF_GOESR** from the list, and clicking on the OK button. This will open up a new window called **Procedure – WRF_GOESR**

3. Select **18UTC WV** from the procedure window and click on the **Load** button to open the products into D2D. This will load time-matched synthetic 6.95µm water vapor and GOES US water vapor. You can toggle between the products using the decimal button on the number pad or click on the legend in the lower-right hand corner of D2D.

    a. Cycle through the data from 1200UTC to 1800UTC on 24 May and answer the questions below:

Question 1: In the 6.95 µm (water vapor) synthetic imagery, identify any upper-level jet streaks in the western CONUS between 1200-1800 UTC that may impact the forecast region. Do the brightness temperatures appear warmer or colder than GOES water vapor imagery?

Question 2: Compare the upper-level jet streak between the synthetic and the GOES water vapor imagery between 1200-1800 UTC. Are there any apparent differences in terms of location and timing of the jet-streak?

4. Select **18UTC IR** from the procedure window and click on the **Load** button to open the products into D2D. This will load time-matched synthetic 10.35μm IR and GOES IR. You can toggle between the products using the decimal button on the number pad or click on the legend in the lower-right hand corner of D2D.

    a. Cycle through the data from 12UTC to 18UTC on 24 May and answer the questions below:

Question 3: Compare the MCS in north central Kansas between the synthetic IR imagery and the GOES IR imagery. Identify any differences in location and/or timing and what the future impact might be from the associated outflow boundary.

Question 4: Compare the synthetic IR imagery with the GOES IR imagery to assess the coverage of low-level clouds across Kansas and Oklahoma. What differences exist?

5. Select **1915UTC IR/VIS** from the procedure window and click on the **Load** button to open the products into D2D. This will load a four-panel display of time-matched synthetic 10.35µm IR (Upper-Left), GOES IR (Upper-Right), and GOES VIS (Lower-Left). You can browse through these products in the 4-panel plot or rotate through them using the 1,2,3 keys at the top of the keyboard. You can return to the 4-panel layout by right-clicking on the D2D map and selecting *Four Panel Layout*.

    a. Cycle through the data from 1400UTC to 1900UTC on 24 May and answer the questions below:

Question 5: Assess the cloud coverage across Kansas by comparing the synthetic IR imagery with the GOES IR and visible imagery. What can we conclude about the model CAPE forecast in Kansas?

Question 6: Inspect the synthetic IR imagery over Oklahoma. Compare it with the GOES IR and visible imagery. What can we conclude regarding the position of the dryline? What can we conclude about the timing of convective initiation?

6. Select **2359UTC IR/VIS** from the procedure window and click on the **Load** button to open the products into D2D. This will load a four-panel display of time-matched synthetic 10.35µm IR (Upper-Left), GOES IR (Upper-Right), and GOES VIS (Lower-Left). You can browse through these products in the 4-panel plot or rotate through them using the 1,2,3 keys at the top of the keyboard. You can return to the 4-panel layout by right-clicking on the D2D map and selecting *Four Panel Layout*.

    a. Cycle through the data from 1400UTC to 2359UTC on 24 May and answer the question below:

Question 7: Comparing the products, are there any differences in the timing/spatial extent of model output versus the observed GOES products? If so, can you identify any contributing factors to this?