The GOES-R/ABI Solar Radiation Products vs. ABI capabilities

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Topics: Exploratory Science

Program: AWG

Introduction

- Many users (e.g., hydrology, land and coral-reef modelers, solar energy) require high spatial and temporal resolution Shortwave Radiation Budget (SRB) products.
- Yet, SRB products to be made available from the Advanced Baseline Imager (ABI) on GOES-R
  - Reflected SW Radiation at TOA (RSR)
  - Downward SW Radiation at surface (DSR)

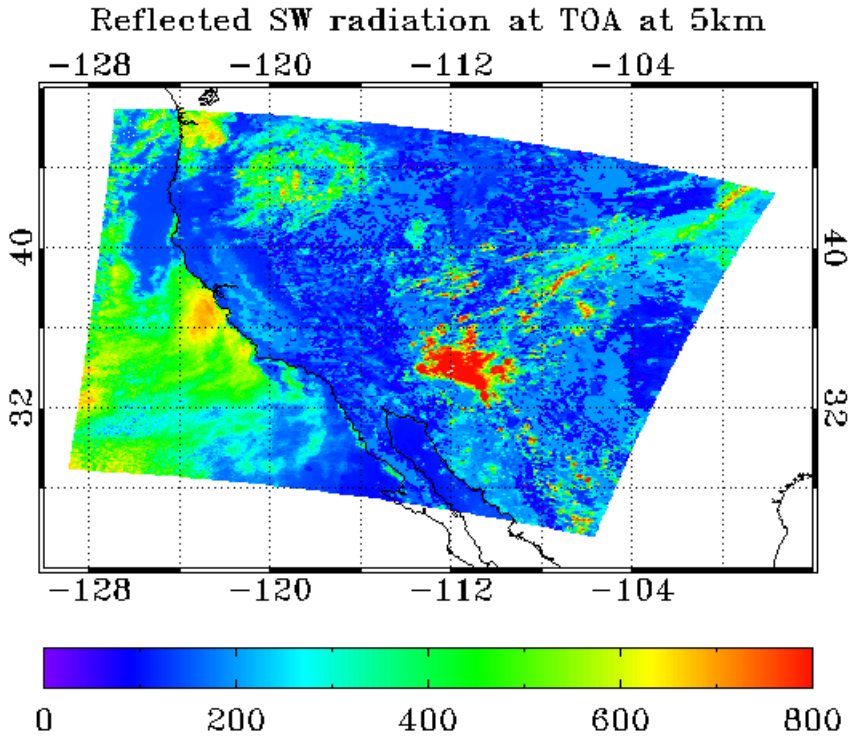
  will be made available at the relatively low spatial resolution of 25 km (CONUS), and 50 km (Full disk) and with a temporal resolution of 60 minutes. (The 5-km DSR is only for mesoscale.)
- ABI, however is capable of generating radiation budget products at least at 2-km spatial resolution and at every 15minutes for the full disk domain.

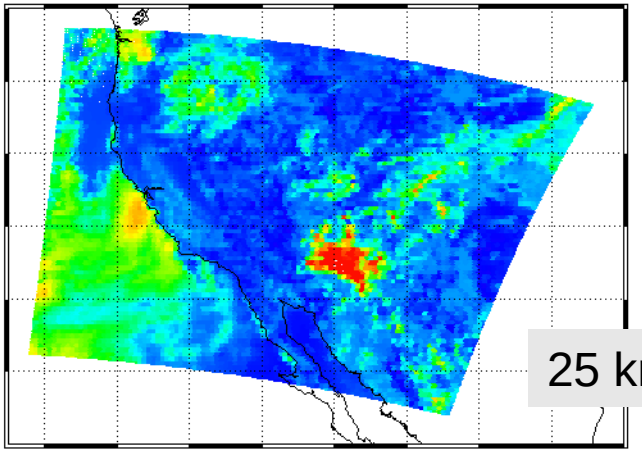
Methodology

- SRB products for full disk were generated at 5-km spatial resolution using MODIS/Terra data on 08/24/2006 as proxy for ABI.
- RSR and DSR were aggregated to coarser resolution (25km and 50km) by averaging the 5km-retrievals.
- RSR at three resolutions are shown in the Results slides using MODIS granule 2006236_1830_Terra.
- DSR at three resolutions are shown for a MODIS granule 2006236_1655_Terra.

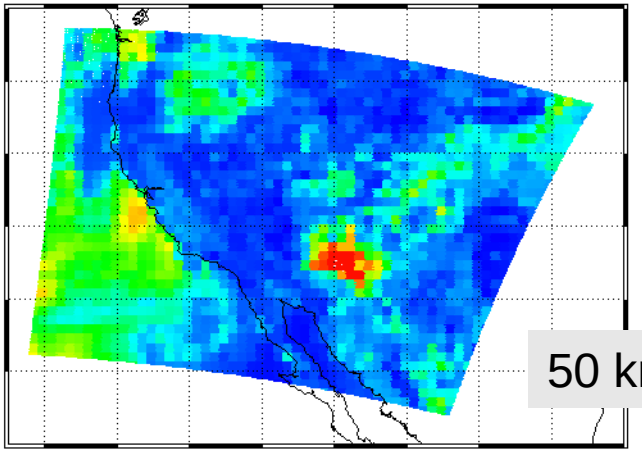
Results(1) : 5-, 25- and 50-km RSR

- Reflected Shortwave Radiation at TOA (Wm^{-2})



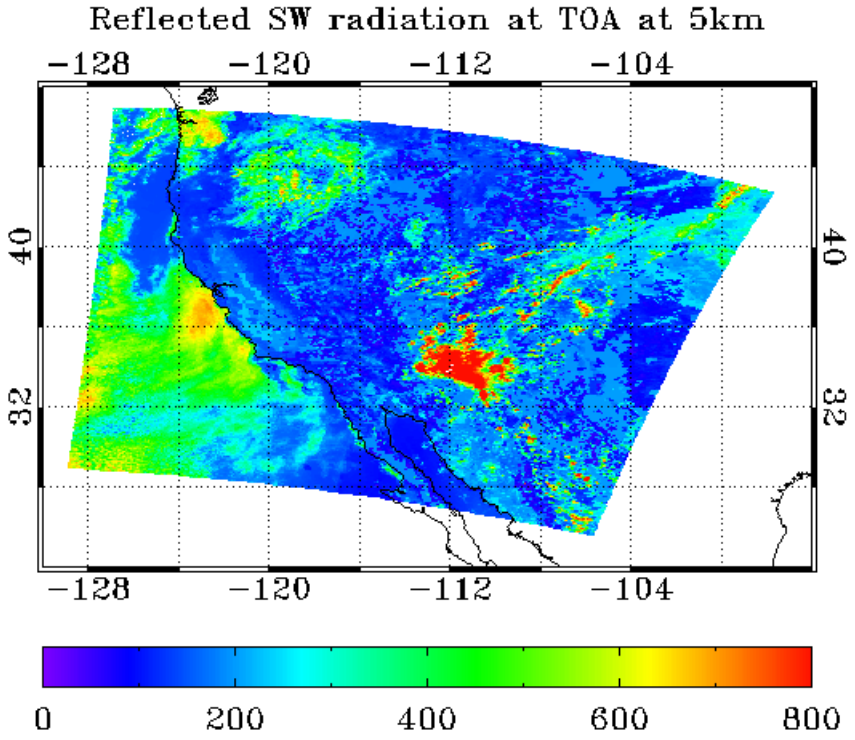


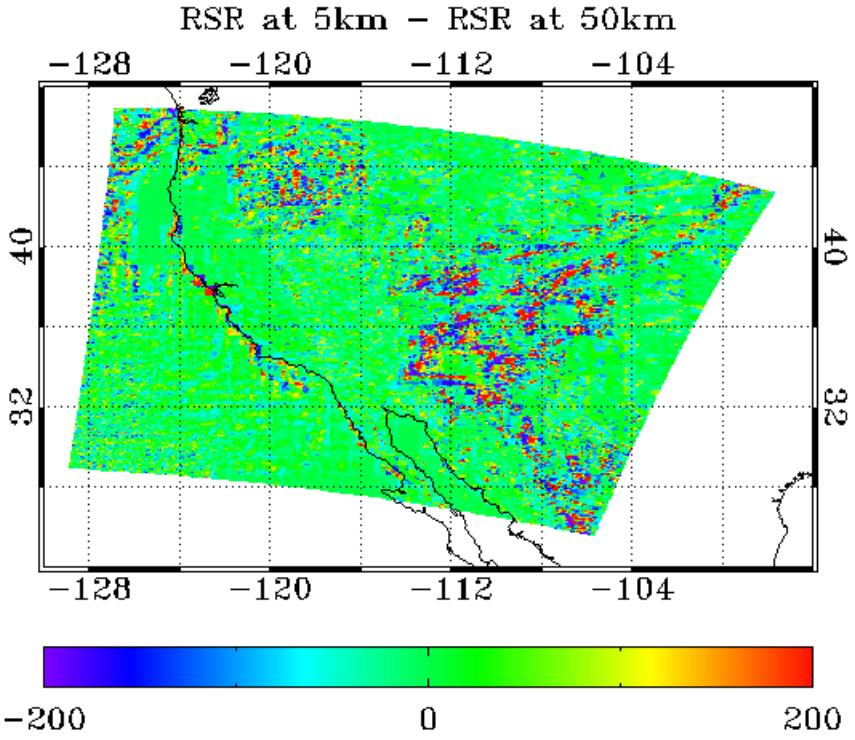
25 km



50 km

Results(2) : RSR at 5km and 50km

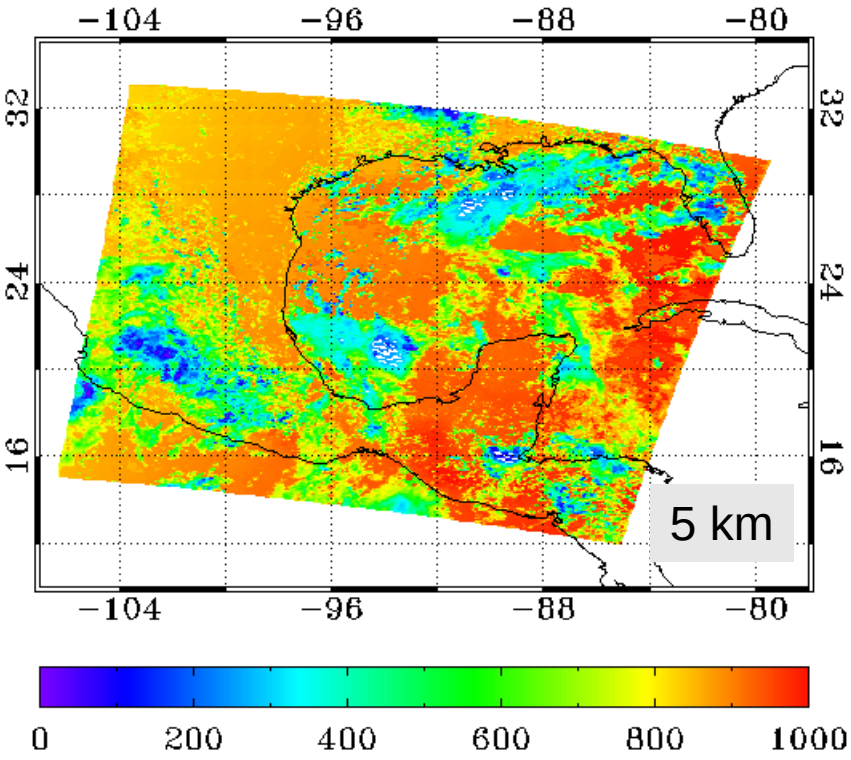


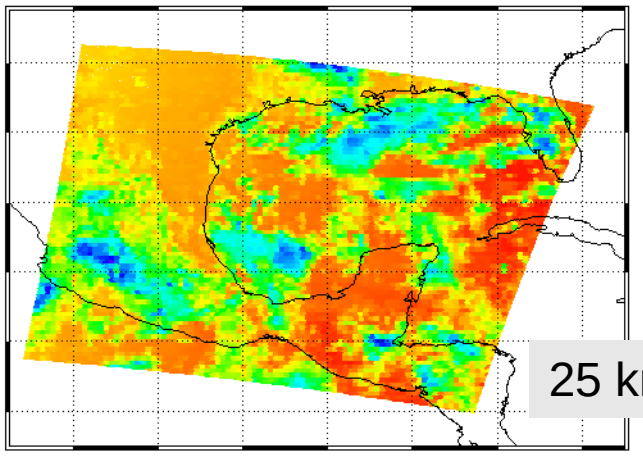


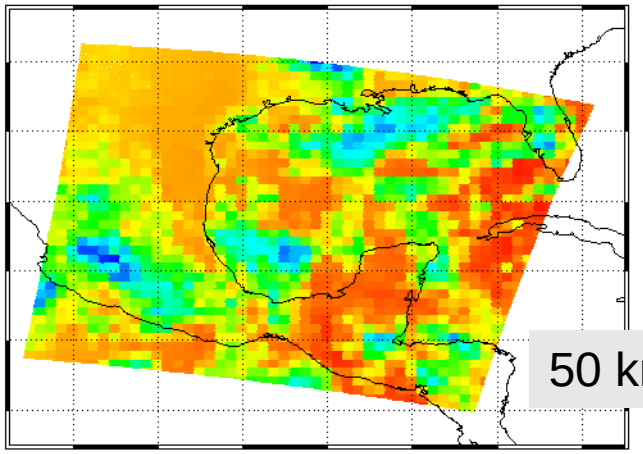
- Difference map (right) is generated by subtracting RSR at 50km from RSR at 5km
- RSR difference ranges from -584 Wm^{-2} to 655Wm^{-2}

Results(3) : 5-, 25- and 50-km DSR

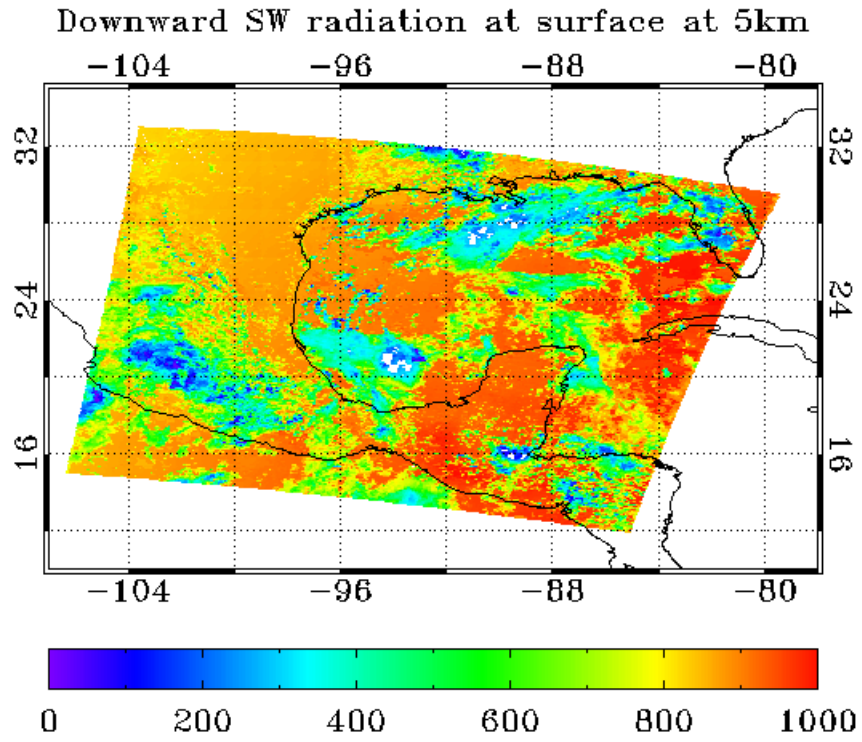
- Downward Shortwave Radiation at surface (Wm^{-2})

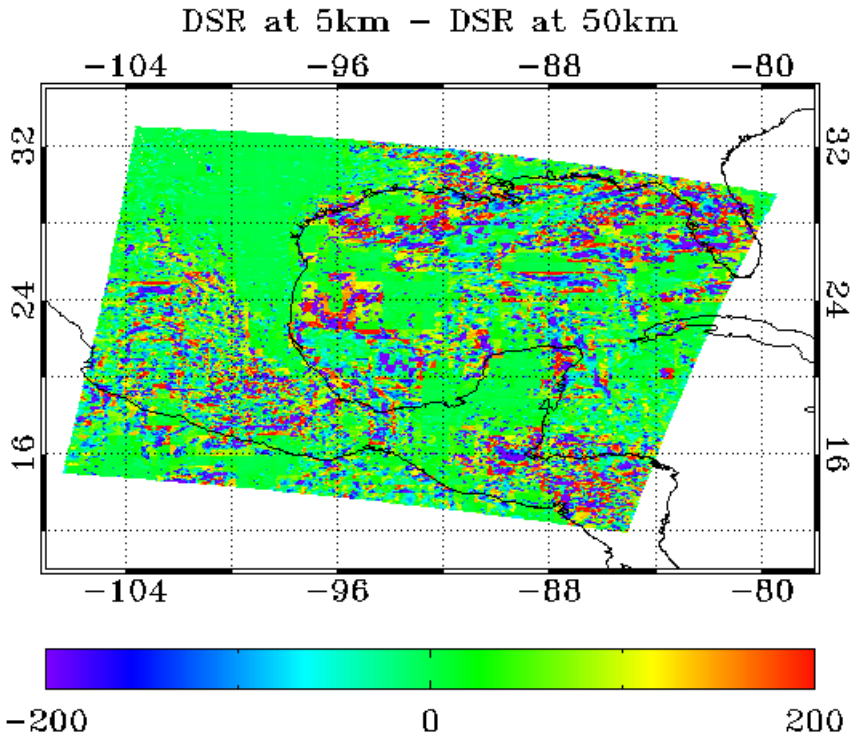






Results(4) : DSR at 5km and 50km





- Difference map (right) is generated by subtracting DSR at 50km from DSR at 5km
- DSR difference ranges from -843 Wm^{-2} to 816Wm^{-2}

Summary and Recommendations

- The GOES-R requirements call for generating SRB data at spatial resolutions of 5 km (mesoscale), 25 km (CONUS) and 50 km (full disk) every 60 minutes.
- The GORS-R SRB products represent a “step back” as solar radiation budget products from the GOES Surface and Insolation Product (GSIP) system are already made available at 14 and 4 km spatial scales.
- The capabilities of ABI allow for SRB products to be generated at 2 km (or a least 5 km) spatial scale every 15 minutes for the entire full disk.
- The 2/5-km 15-minute SRB data better captures both spatial and temporal variability of radiation and thus would better suite users with need of such resolution. NOAA/NESDIS should generate these products in additions to the official GOES-R SRB products.