Generating Synthetic Infrared GOES-R ABI Images with AVHRR and GOES 12 images

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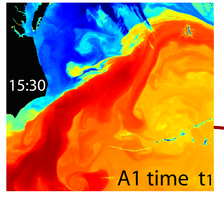
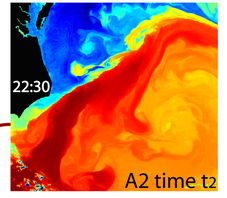
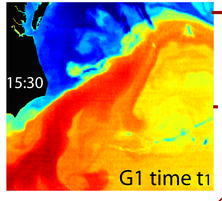
AVHRR channel 4

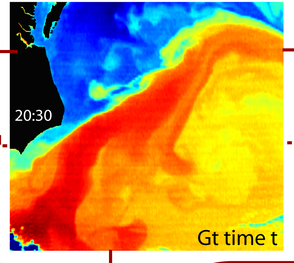




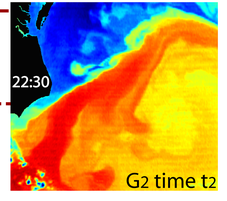
GOES 12 Imager channel 4



16:00 16:30 17:30 18:30 19:30 — half-hourly GOES data



half-hourly GOES data — 21:30

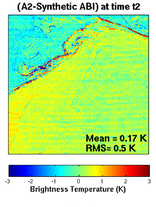


3. TEST

Compare a true AVHRR image A2 with a synthetic ABI image at time t2

computed using 2 AVHRR images surrounding A2 in time: A1 and A3 and the corresponding Goes: G1, G2 and G3

4. Test I: DIFFERENCE



A difference image contains georegistration errors and errors from the use of different sensors with specific spatial and radiometric resolutions as well as various noise sources. It shows the influence of the GOES line scan noise

1. METHODOLOGY

Select 2 consecutive AVHRR images covering the region of interest (scan angle less than 35 degrees)

Collect half-hourly GOES 12 data between the 2 AVHRR images

Calibrate the 11-micron infrared window channel for both instruments to compute brightness temperature

Filter the GOES data to reduce the fundamental frequency of the predominant East-West stripes

Regrid the 4km GOES resolution data to a 1km AVHRR conic projection using cubic interpolation

Correct any georegistration inaccuracies

2. SYNTHETIC ABI image computation at time t

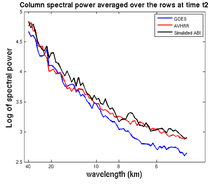
(see images above)

Extract the relatively high wavenumber information from AVHRR by taking the difference: A1-G1 at time t_1 and A2-G2 at time t_2. (GOES containing the low wavenumbers)

Interpolate the high wavenumber information to time t and **add** it to Gt in the following way:

$$\textbf{Synthetic ABI}(t) = Gt+\{(t_2-t)(A1-G1)+(t-t_1)(A2-G2)\}/(t_2-t_1)$$

5. Test II: SPECTRUM



Synthetic ABI retains the characteristics of the GOES low wavenumbers and the high wavenumbers of the interpolated AVHRR data. It relates well to A2 even though there is some added noise.

6. ERRORS

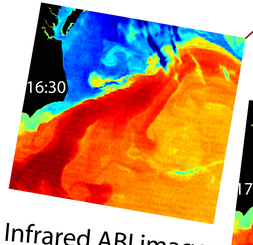
The maximum error for the high wavenumbers happens at the mid-time $(t_2-t_1)/2$. The quality of the low wavenumbers relates to the unpredictable level of the GOES scan line noise.

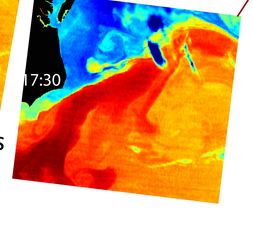
APPLICATION

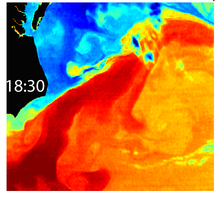
Shows improved spatial resolution compared to GOES

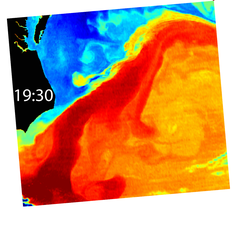
Provides a good test bed for future ABI image analysis

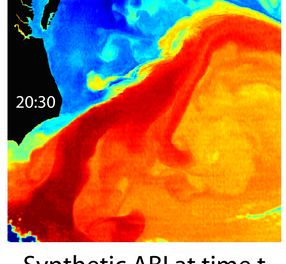
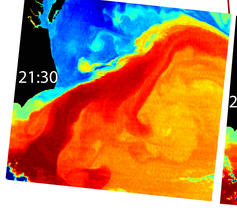
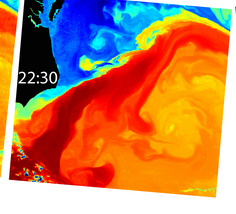
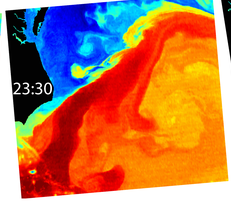
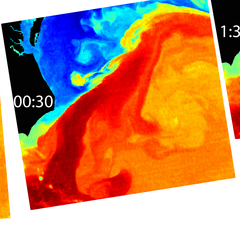
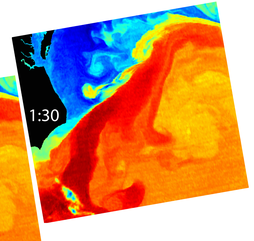
Hourly Synthetic Infrared ABI images of the Gulf stream on a 1km grid











Synthetic ABI at time t