Good example of goes imager satellite instrument research paper

Education

[Date ( )]

Abstract

The latest GOES series was launched on 23rd July 2001 but attained geostationary orbit on 12th August 2001, therefore name as GOES-12. The imager had advanced features comparing with the previous ones. The imager had a spectral band centered at 13. 3 m that eliminated 12 m, 6. 5 m modified band with a spatial resolution improved from 8 km to 4 km at the sub-satellite point. This improvements that were made on GOES-12 improved several satellite products like satellite-derived wind fields and cloud properties. These products are capable of utilizing the data that is produced by 12 m band to differentiate between volcanic ash and cloud types and also to describe low-level moisture

Introduction

The Geostationary Operational Environmental satellite (GOES) imager consists of five channels; four infrared and one visible that is designed to sense the solar and radiant reflected energy from the earth’s area.

The GOES is the backbone for clouds and surface parameters and meteorological observations at a high spatial and temporal resolution. The products observed by the GOES are solar insolation, wind fields estimations, rainfall, biomass burning, Total Precipitable Water and hurricane location and intensity.

The imager uses a servo driven and a two-axis scanning mirror together with a Cassegrain telescope and the multispectral to sweep an 8-km east-to-west through north-to-south at a rate of 20 degrees per second. Due to this features, the imager can easily cover an area of 3000 by 3000 km in 41

seconds.

During the scanning process, the imager always starts to sweep from East-to-West direction, followed by North-to-South direction then back to West-to-East direction and finally North-to-South direction. The sequence then repeats starting East-West direction.

Diag. showing GOES imager.

The GOES is maintained by the orbits that are positioned over a fixed spot on the globe. It rotates at the same rate with that of the Earth. The GOES has an improved temporal resolution but degraded spatial resolution. The Imager has a resolution providing a degree of details. The resolution is characteristics as:

Spatial Resolution: This is the amount or area covered by the sensor. The GOES observes at a lower resolution. This is done at 1 km for visible and 4 km for infrared.

Spectral Resolution: The number of wavelengths the satellite can detect. The imager uses 18 spectral bands starting from near-infrared to infrared, then one more channel is added making a total of 19.

Radiometric Resolution: Digital precise allowable by the detector. The degree of precision and subtlety increases as a radiometric resolution increase. Therefore there as it increases, the number of data bits also increases thus more data storage. The imager normally works at 10-bit.

Temporal Resolution: The number of times a point is to be sampled in any given day within a given time interval. The imager normally provides data at an interval of 15 minutes.

GOES IMAGER PRODUCTS

- Cloud product

This is generated by the use of CO2 absorption technique where various wavelengths are used to detect its presence. This is achieved by the use of 13. 3 m band (Schreiner et al, 1993). To detect the presence of the clouds, the split window (11 minus 12 m) difference is employed.

- Sea Surface Temperature (SST)

This is done by the application of shortwave windows, whereby 3. 9 m is used at night to determine the Sea Surface Temperature while during the day, 11 and 12 m masks the emitted signal to retrieve the SST.

- Dust and Volcanic ash detection

The combination of 11 minus 13. 3 m (split window difference), 11 m and 13. 3 m in the spectra bands are used to locate the presence of volcanic ash (Hillger and Clark, 2001).

- Satellite –derived wind fields

The 13. 3 m is used to provide best estimate for the height of the clouds that is used to track the motions of atmosphere (Velden et al., 1997).

- Biomass burning

For the detection of active fires, bands 11 m and 3. 9 m are employed

Conclusion

The GOES Imager that operates at 13. 3 m has a high spatial resolution. As the Imager is improved, its products are also improved. For example the improved products are satellite-derived motion vector and imager-based cloud information.

The resolution of the imager should also be improved to improve the details captured by the imager.

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Work cited

Schreiner, A. J., and T. J. Schmit, 2001: Derived cloud products from the GOES-M Imager. 11th Conference on Satellite Meteorology and Oceanography.

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