

Remote Sensing Data receiving and research activities using NOAA-AVHRR and Terra/Aqua-MODIS at ACRoRS, AIT

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ABSTRACT: Two receiving systems were established at the Asian Center for Research on Remote Sensing (ACRoRS) to receive remote sensing data from NOAA AVHRR and Terra/Aqua MODIS sensors in October 1997 and May 2001, respectively. The data, which has been received in the research center, are very important to support and promote the remote sensing research activities for global environmental issues in Asia. Since the day of the establishment, many research and applications, which used these data, have been conducted. The data sets have been provided to researchers and users in many countries in the region to conduct research, to strengthen the research collaboration and education.

Keywords: Terra/Aqua MODIS, NOAA AVHRR, Remote Sensing Receiving System

1. Introduction

Almost every day over the entire globe, there are many sensors on board remote sensing spacecrafts monitor changes on the land surface, ocean water, and atmospheric layers. Among these sensors, AVHRR sensor and MODIS sensor on board NOAA-16 and NOAA-17, Terra and Aqua, respectively has been considered to be most appropriated Earth

NOAA AVHRR is the one of the major sensor to monitor entire surface of the earth every day with 1.1 km resolution at Nadir, which has five spectral bands,

observation instruments which would observe the global change efficiently based on the moderate resolution and high-temporal capability. In particularly, MODIS sensor on the two sibling spacecraft Terra and Aqua, has hyper spectral capability to monitor the global changes of the Earth environment.

According to the advantages of NOAA AVHRR and Terra/Aqua MODIS Earth observation systems, nowadays, which offer an unprecedented look at terrestrial, atmospheric, and ocean phenomenology to the community of researchers and users around the world, the activities research and applications of NOAA AVHRR and MODIS data for studying the global environmental change became active among many research centers and organizations worldwide, in particularly, the Geoinformatics Center at the Asian Institute of Technology has established the receiving systems to receive the AVHRR NOAA and Terra/Aqua MODIS data for promoting research, applications and education in the region.

2. NOAA AVHRR Receiving and processing activities.

ranging from Visible to Thermal Infrared. Asian Center for research on remote sensing has established NOAA AVHRR receiving system since October 1997, which is able to receive 6-8 scenes from two satellite NOAA-16 and NOAA-17 daily.

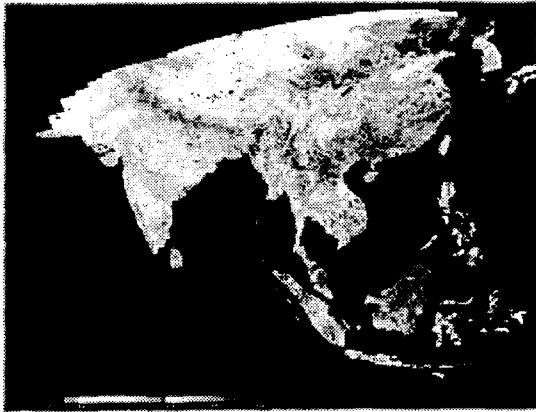


Fig. 1. 10-day composite image of NDVI

One scene has the size about 200-300 MB. The data is archived in 8 mm tape cartridges, which can be allocated about 50 scenes.

The data is daily transferred to Japan for research collaboration such as for 10-day composite of the South Asia, South-East Asia and Far East Asia regions to generate global 10-day composite images.

NOAA AVHRR data levels can be classified into following levels as below:

1. Level 0: HRPT format data, which is raw data received at ground station.
2. Level 1: NRA format data, which is radiometrically corrected
3. Level 1.5: QRA format data, which is geometrically corrected
4. Level 2.: SST data, which is atmospherically corrected
5. Level 3 is Mosaic image data by GAVICS system

To make use of the NOAA AVHRR data efficiently, GAVICS processing system was installed with the support of Iwate University, Japan at Asian Center for Research on Remote Sensing, to automatically generate 10-day composite of geometric and atmospheric corrected data, Normal Different Vegetation Index (NDVI) and Sea Surface Temperature (SST) for the Asian regions. The resulted data, generated by the GAVICS system is considered to be products that can be provided to users and researchers for remote sensing research activities on the global environmental studies.

3. Terra/Aqua MODIS Receiving and processing system

TERRA is a flagship of the Earth Observing System (EOS) Project. United States and some other countries design this project. The objective of this

project is tried to observe environment of the Earth for next 15 years quantitatively. TERRA on board several sensors designed by US, Japan and Canada. Terra carries five sensors, in which MODIS is one of them that play important role for observing Earth conditions

TERRA/MODIS (the MODerate RESolution IMaging Spectroradiometer) data has been received, processed, analyzed and distributed at Asian Center for Research on Remote Sensing (ACRoRS), Asian Institute of Technology (AIT) since this 26 May 2001. This is a joint project with the Institute of Industrial Science, University of Tokyo. On 19 June 2003, the receiving system was upgraded to be able to receive MODIS data from Aqua. The propose of this project is to promote remote sensing research, applications and educations for Asian researchers in the global environmental studies. MODIS data is considered to be hyperspectral remote sensing data, which consists of 36 spectral bands, ranging from visible to thermal infrared, with three resolutions, which are 250m, 500m and 1000m that is higher than NOAA AVHRR.

After receiving the data from Terra and Aqua, MODIS raw data was converted to level 0 by the ingest system, then it was automatically generated to level1B using IMAPP system for geolocation and calibration, then it was sent to the archiving system which has the storage capacity about 8.0 Terabytes. Users can view the archived MODIS data online through the Internet using the image catalogues, which contains the quicklook of daily MODIS images. The Near-Real Time Automatic Quicklook Processing System for Terra/Aqua MODIS data was developed to generate the online catalogue. This system was developed based on IDL and C programming and SIMAP scripts. HDFLook system has been used for geometric correction of MODIS data before providing the data to users. MODIS data in level0 are archived in DLT tapes, which has capacity of 40-80 Gigabytes, while the level1b data are sending to GISTDA of Thailand for further distribution to Thai users.

For the research promotion, the data in level1b is freely distributed among Asian users and researchers as well as NOAA AVHRR data. For the purpose of research collaboration, MODIS data has been sent to National Institute of Informatics (NII), Japan for further distribution to various research institutions in Japan.

Recently, MODIS data has been applied to various research activities in Asian Center for Research on Remote Sensing. Since 2003, various research were conducted which can be listed as follow: clouds detection and masking using MODIS data using Terra

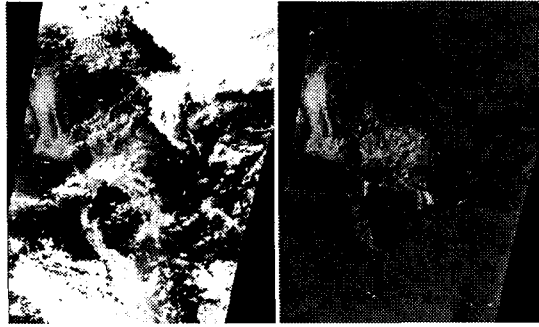


Fig. 2. Cloud detection and masking using MODIS data

MODIS, flood monitoring in Bangladesh, multi-temporal land cover change surrounding Tonle Sap lake in Cambodia, estimation of Sea Surface Temperature (SST) in South-East Asia and Indian Ocean.

4. Conclusions

Since NOAA AVHRR and Terra/Aqua MODIS have the capability to provide high-temporal environmental observation on every point on the Earth surface every 1-2 days in 5 and 36 discrete spectral bands, respectively, this will be key point to promote the environmental research study in global scale. Also, it will facilitate the applications and education in remote sensing in the Asian regions using the data distributed by the Asian Center for Research on Remote Sensing. Our research center is looking for any possibility to collaborate with other research and academic institutions, as well as various organizations for data distributions to researchers and users in many countries in the region to conduct research, to strengthen the research collaboration and education.

References

- [1] URL: MODIS Home page. Available at <http://modis.gsfc.nasa.gov/>
- [2] URL: Terra MODIS Instrument. Available at <http://eos-am.gsfc.nasa.gov/modis.html>
- [3] URL: NOAA's Comprehensive Large Array – data Stewardship System.. Available at <http://www.saanoaa.gov/nsaa/products/search>
- [4] URL: Package for ADEOS and NOAA Data Analysis. Available at <http://www.tric.u-tokai.ac.jp/rsite/r1/panda/panda.htm>