

Poster Presentations

2019 CSPP in Chengdu, China

P1. Bearson, Nick (SSEC): *CSPP CLAVR-x*

Nick Bearson, Andrew Heidinger, Denis Botambekov, Kathy Strabala, Liam Gumley

The Clouds from AVHRR Extended System (CLAVR-x) is a processing system developed at NOAA/NESDIS and UW/CIMSS for generating quantitative cloud products in real-time from AVHRR, MODIS, VIIRS, and other sensors. CLAVR-x was first packaged and released for the direct broadcast community as part of the CSPP suite in May 2014 and receives ongoing support. We report on the capabilities of CSPP CLAVR-x and improvements users can find in the latest version, including NOAA-20 and MetOp-C support, improved output configuration, and algorithm updates.

P2. Botambekov, Denis (SSEC/University of Wisconsin-Madison): *Cloud Properties from FY-4 in CLAVR-x Processing System.*

Denis Botambekov, Andrew Heidinger, Steve Wanzong, Yue Li, Andi Walther, William Straka

The first version of the CSPP CLAVR-x (The Clouds from AVHRR Extended) was released in 2013. The CLAVR-x processing system with CSPP wrapper provides users official NOAA Enterprise cloud algorithms, some surface and other products for polar-orbiting AVHRR, MODIS, VIIRS, and Geostationary Imagers ABI, AHI, SEVIRI, COMS. Since then many users all over the world are using the CSPP CLAVR-x.

The new FY-4a - second-generation geostationary satellite, positioned at the 105E longitude, is added to the CLAVR-x. The results of performance of cloud detection and cloud properties algorithms will be presented with comparisons to Himawari-8/AHI and collocated CALIPSO/CALIOP data.

P3. Costa, Ozeas (The Ohio State University): *Using satellite based AOD to estimate particulate matter in Qatar*

We used a combination of daily aerosol optical depth (AOD) data from the Moderate Resolution Imaging Spectro-radiometer (MODIS) and ground measurements using a Dylos air quality monitor (a laser particle counter) to estimate particle matter air quality over a number of locations throughout the country of Qatar, in the Middle East. An empirical relationship between AOD and PM air quality was obtained from these datasets (linear correlation coefficient of 0.78) and was used to evaluate annual and seasonal trends in air pollution in Qatar since 2012.

P4. Cureton, Geoff (CIMSS, UW-Madison): *Himawari Support In The CSPP-GEO Direct Broadcast Package*

We used a combination of daily aerosol optical depth (AOD) data from the Moderate Resolution Imaging Spectro-radiometer (MODIS) and ground measurements using a Dylos air quality monitor (a laser particle counter) to estimate particle matter air quality over a number of locations throughout the country of Qatar, in the Middle East. An empirical relationship between AOD and PM air quality -8 provides several challenges for the CSPP-GEO-Geocat package, which generally revolve around the greatly increased data rate associated with the subsatellite point footprint approaching 1km. CSPP-GEO-Geocat takes advantage of python

shared-memory multiprocessor support to divide Himawari data into manageable pieces, which are then farmed out to individual cores for processing by the underlying geocat code. The resulting product segments are then stitched together to make the final product NetCDF4 files. CSPP-GEO-Geocat will support high-data-rate HRIT input, as well as the reduced resolution HimwariCast direct broadcast data stream. Products supported by CSPP-GEO-Geocat include the level-1 reflective and emissive bands, as well as level-2 products like cloud mask, cloud type, optical depth and particle size, cloud top temperature and pressure.

P5. Haibo, Xu (National University of Defense Technology): *New Method for Determining Cloud-Top Height from Stereoscopic Observation based on FY-4A and Himawari-8 satellites*

Xu Haibo, Du Huadong

High temporal and spatial resolution of new generation geostationary satellite such as FY-4A and Himawari-8 contributes to the improvement of geometric method for determining cloud top height(CTH). A new method based on Convolutional Neural Network(CNN) has been used to accurately match images from FY-4A and Himawari-8 respectively, and CTHs are determined through spherical and plane triangular relationships of satellites, earth core, projected-cloud and true-cloud. The new method has been applied to retrieve CTHs in South China Sea between August to September 2018. A comparison between the results and CloudSat data is conducted for validation.

P6. Huang, Allen (SSEC/CIMSS UW-Madison): *The Quest for the Most Effective CSPP Training*

Allen Huang and Mitch Goldberg

Over the years, the CSPP development team has offered many forms of training courses, workshops, scientific lectures, operation instructions and the use of a basic form of user's menu for package installation and software operation.

In this poster we are not only to illustrate the past forms and approaches of CSPP training and public outreach related activities and events but also to interactively inform users about our planned training formats, contents, and targeted trainees and furthermore, to solicit inputs and ideas about how users envisage the optimal training courses that they like to receive.

This first dynamic and interactive 2019 CSPP training subject poster will have ample opportunity for viewers to voice their desire of which areas of training and reeducation that they wish to have along with subject details such as fundamental remote sensing theory, algorithm theoretical based principle, products performance uncertainties, limitations, and others related to processing technique, and timeliness and available tools for projection, mapping, visualization, and information integration are also included for deliberation.

P7. Jin, Sha (HUAYUN ShineTek, Beijing China): *3.5m Vehicle-mounted Antenna System for Satellite Telemetry and Data Receiving*

Jia Shubo, Liang Yonglou, Sha Jin

With the opening of the satellite telemetry market, China's domestic satellite telemetry systems are springing up all over the world. However, for the mobile and portable needs of some sites, many systems are still unable to meet. In addition, on the basis of satellite telemetry, there are few multi-functional systems that can verify the load data broadcast by satellites. So few, the key technical point is the mobile and portable transformation of antenna system.

Based on the investigation of various types of mobile and portable antennas, the design scheme of 3.5m vehicle antenna system for satellite telemetry and data reception is given. In the second chapter, the system requirements are elaborated in detail, and functional analysis is carried out. In the third chapter, the overall design scheme of the 3.5m vehicle antenna system is given. Chapter IV and Chapter V will respectively elaborate the electrical design and structural design of the antenna system. In Chapter 6, the tracking mode of the antenna system is explained, and the corresponding indicators are given. Chapter 7 describes the servo control part of the antenna system and its specific interface.

Finally, this paper realizes the design of 3.5 meters vehicle antenna system, and provides technical basis for its subsequent production and processing.

P8. Liu, Xingpin (NOAA/STAR IMSG): *Applications of JPSS/NOAA-20 Limb Corrected ATMS Observations for Severe Weather Monitoring*

Xingpin Liu, Lihang Zhou, Quanhua Liu, and Mitch Goldberg

The Suomi National Polar-orbiting Partnership (S-NPP) satellite, launched in October 2011, initiated a series of the next generation weather satellites for the National Oceanic and Atmospheric Administration (NOAA) Joint Polar Satellite System (JPSS) program. The Advanced Technology Microwave Sounders (ATMS), carried onboard the S-NPP and the recently launched JPSS-1 (renamed as NOAA-20) satellites, is a follow-on instrument to the Advanced Microwave Sounding Unit (AMSU). A feature of a cross-track sounder is that the measurements vary with scan angle because of changes in the optical pathlength through the Earth's atmosphere between the Earth and the satellite. This feature is called the limb effect. By performing the limb correction we transform the data into the values they would have been observed in a nadir view and remove the scan angle effects. The limb corrected ATMS are generated as ATMS imagery products and have been made available on the JPSS STAR web server. It is also going to be integrated as part of the Microwave Integrated Retrieval System (MiRS) system and will be made available to the direct broadcast users.

A preliminary set of NOAA-20 ATMS limb correction coefficient was calculated using the December 1-29, 2017 training data set. With the ATMS algorithm reached the validated maturity on July 5th, 2018, it is necessary to update the limb correction coefficients with more matured training data set. This paper will present the detail of the updated NOAA-20 ATMS limb correction coefficient set and the corresponding results. Comparisons with the NOAA-20 limb corrected ATMS from previous coefficient set, and with the SNPP limb corrected ATMS, will also be briefed. This paper will also present some applications of limb corrected ATMS towards monitoring the severe weather events, such as Hurricanes.

P9. Mindock, Scott (SSEC /CIMSS): *CSPP SDR and CSPP VIIRS ASCI, Level 1 and 2 Products at your fingertips*

Scott Mindock, Ray Garcia, Graeme Martin, Kathy Strabala, Nick Bearson, Liam Gumley, Allen Huang

The CSPP (Community Science Processing Package) Team at SSEC/CIMSS has created the CSPP VIIRS ASCI 1.0 software to support SNPP and JPSS-1 Level 2 product creation. The CSPP VIIRS ASCI package creates Enterprise Level, Cloud, Ice, Snow, Ash and Aerosol products using NOAA/NESDIS Enterprise Level algorithms. The CSPP SDR package creates Level 1 (SDRs) from SNPP and J01 RDRs acquired from Direct Broadcast. CSPP VIIRS ASCI allows the user control over the creation of Cloud, Ice, Snow, Volcanic Ash and Aerosol products. CSPP SDR and CSPP VIIRS ASCI work beautifully

together. SDRs created with CSPP SDR are used as input to CSPP VIIRS ASCII providing a complete set of Cloud products from your antenna. The packages also provide quick-look capabilities for a wide variety of products.

P10. Mindock, Scott (SSEC /CIMSS): *CSPP User Group 2019 Deploying CSPP applications with virtualization*

Scott Mindock, Ray Garcia, Graeme Martin, Kathy Strabala, Nick Bearson, Liam Gumley, Allen Huang

CSPP software packages are developed and tested on the Centos 6 platform. CSPP Users may choose or be required to run on other platforms, in addition CSPP Users may not have control the versions of the CSPP packages they are using. This can create problems for users desiring to use the latest CSPP packages. The CSPP team has been exploring package deployment using virtualization technology. Virtualized deployment will be examined. Different deployment scenarios will be defined and examined, Comparisons of virtual machines, to containers and other technologies will be made. Potential downfalls and solutions will be explored and shared, so that recommendations and guidelines can be established for CSPP users.

P11. Shao, Min (Hampton University): *Impact of Atmospheric Retrievals on Hurricane Florence/Michael Forecasts in a Regional NWP Model*

Min Shao, William L. Smith

Adding atmospheric information to the initial conditions of a numerical forecast model is critical for improving regional nowcasting and forecasting severe weather events such as convection storms and hurricanes. The hyperspectral instruments onboard the polar orbiting satellites provide high temporal and spatial resolution atmospheric temperature and water vapor information. Atmospheric temperature and water vapor profiles with acceptable qualities under clear condition and above clouds are derived using the Dual-Regression (DR) algorithm based on the Principle Component based Radiative Transfer Model (PCRTM). The application of the derived atmospheric retrievals with high temporal and spatial resolutions in a regional weather model is studied for two hurricane cases by assimilating the retrievals in an hourly update cycle. Improvements on hurricane forecast are obtained by assimilating satellite retrievals as compared to both conventional operational data and radiance assimilation. Position of the predicted hurricane center which is especially critical for landfall position is corrected with a maximum improvement of 45 km compared to conventional assimilation. Predictions of heavy precipitation produced by hurricanes are improved with smaller bias and Standard Deviation (STD). Precipitation scores used for the validation of predictions also show great improvements in heavy precipitation forecast against conventional data and radiance assimilation. Potential applications of such approaches can be applied to assimilating the retrieved information from the geostationary satellite instruments by adding higher temporal and horizontal resolutions to the polar satellite hyperspectral sounding data.

P12. Wang, Mingshi (Space Star Technology Co.,Ltd.): *FY-3D satellite product generation system design and implementation*

Product generation system is the core mainline operation system of fy-3d satellite ground application system. The main objective is to generate a variety of geophysical parameter products that can reflect the characteristics of atmosphere, cloud, land surface, sea surface and space

environment from the data of multiple spectral data through the comprehensive use of multiple information quantitative extraction methods based on L1 data observed by satellite instruments and auxiliary data. The overall design principle of the system is stability, extensibility and maintainability, standardization and normalization. Meanwhile, the efficiency, usability and robustness are improved to meet the requirements of the operation system.

P13. Wang, Yanting (HUAYUN ShineTek): *Cloud Shadow Detection and Elimination Technology Based on FY-3D MERSI-II Vegetation underlying surface data*

FY-3D was launched in November 2017. The Medium Resolution Spectral Imager-2 (MERSI-II) onboard Fengyun-3D, which data play an important role in many fields, such as ocean, land and so on. But, the data of almost four months in summer, there are many clouds and cloud shadows, covered on different underlying surfaces. And due to the difference of their radiation characteristics from other surfaces, it limits the application of MERSI-II global data, especially for product inversion and application. At present, cloud detection technology is basically mature, but cloud shadow, especially the shadows of fragmented clouds, which is dense and extremely difficult to detect and remove. Therefore, after studying the characteristics of a large number of MERSI-II data in different seasons and different underlying surfaces, this paper innovatively proposes to use the correlation of multi-day data to identify cloud shadow for vegetation underlying surface, and using technology of synthesizing multi-day data to eliminate cloud shadow based on the principle of Gemma. And it has achieved good results. At present, some images have been included in the production of Fengyun 3 Atlas of the NSMC, and the subsequent economic product application has been considered.

Keywords: cloud shadow, radiation characteristics, Gemma, Fengyun 3 Atlas

P14. Wang, Yanting (HUAYUN ShineTek): *Inter-Orbital Data Fusion Technology of FY-3D MERSI-II Instrument*

Junjie YAN, Yanting WANG

The Medium Resolution Spectral Imager-2 (MERSI-II) onboard Fengyun-3D (FY-3D) satellite, which was launched in November 2017. MERSI-II joins all the spectral bands with Visible and Infrared Radiometer and has the capability to observe virtually the entire Earth every day via a set of 25 spectral bands at nadir geometric instantaneous fields of view (FOVs) of 250 and 1000 m. The FY3D orbits around Earth for a period of 102 minutes. Due to the time delay of two adjacent orbits, the difference of solar zenith angle, solar azimuth angle and calibration between adjacent orbits near the mosaic area in the global image. Therefore, there are usually obvious gaps or color difference in the global mosaic. These gaps limit the application of MERSI-II global data, especially for vegetation monitoring and urban heat island monitoring. Based on a certain optimization algorithm which use satellite zenith angle to correct the orbit differential, this paper proposes a progressive data fusion technology for polar satellite and develops corresponding engineering modules to eliminate the data difference between orbits. The application of this technology in the FY-3D satellite service system has achieved significant results and improved the performance of series remote sensing retrieval products of MERSI-II. Key words: FOVs, satellite zenith angle, Solar azimuth angle, data fusion.

P15. Zhang, Fangfang (HUAYUN ShineTek): *An improved fire detection algorithm for Himawari-8 /AHI*

QU Jianhua, ZHANG Fangfang, WANG Ding

Abstract: This paper describes an improved fire detection algorithm based the continuous phase change on the two channels of Himawari-8 3.9 μm and 11.2 μm . Continuous phase change studies were performed on two channels of Himawari-8 3.9 μm and 11.2 μm . According to the results on the brightness temperature change of different latitude under clear sky conditions in one day, it is concluded that the brightness temperature change is stable and obvious. When the fire happens, the brightness temperature of 3.9 μm channel changes rapider than 11.2 μm channel between two continuous ten minutes. An improved fire detection algorithm is proposed based on this change studies, and considers the visible spectra effect on the 3.9 μm channel during the day time. Experiments with this algorithm have been carried out in several places, such as the serious explosive fire near a chemical plant in Qiaodong District, Zhangjiakou City, Hebei Province, at 16:40 (UTC) on November 27, 2018, a fire incident near the northeast border of China and Australia, and the improved fire detection algorithm was used to quickly and effectively extract the fire points. The results show that the algorithm can perform fire detection well, and can solve the fire detection on snow , during twilight ,and so on.

Keywords : Himawari-8 ; AHI ; fire detection ; high-frequency observation; phase change; brightness temperature;

P16. Zhonghui, Tan (National University of Defense Technology): *Estimation of Cloud Base Height for FY-4A Satellite based on Random Forest Algorithm*

Tan Zhonghui, Yan Wei, Yu Zhuofu, Hu Xiong, Gao Ding

Knowledge of cloud-base height (CBH) is of practical relevance to the aviation and military. Whereas cloud-top height (CTH) and cloud water path (CWP) has been traditionally provided as an operational product, retrieval of CBH for satellite remote sensing with passive radiometers heavily depends on the assumptions on cloud water content (CWC; g m^{-3}) in terms of priori cloud type. This paper presents a new methodology based on Random Forest for retrieving CBH of the uppermost cloud layer, introducing more factors such as geography position and solar declination into the input and eliminating assumptions on CWC. Upstream products of FY-4A and A-Train satellites data (August to November 2017) are used to train the RF model, and then CBH can be estimated utilizing upstream products of FY-4A and trained RF model. Compared with cloud profile of CloudSat, CBH estimations from FY-4A have good coherence with bias less than 2km. Best results are expected for single-layer liquid-phase clouds while optically thin cirrus and deep convection generally perform worse.