

measurements and HSRS to denote generic high spectral resolution sounder measurements. The combined imager plus sounder algorithm for cloud top pressure determinations at imager resolution is demonstrated by using infrared window measurements from MODIS for IWI and using the full spectral coverage from AIRS for the High Spectral Resolution Infrared Sounder (HSRS). The IWI based cloud top heights are derived using an optimal estimation approach (Heidinger et al. 2009); this approach is applied to MODIS IR window measurements. The granule shown in Figure 2 is located mostly over land (southern US and Mexico). The cross section is taken from the data co-located with the CALIOP track.

In the region between latitudes 20° and 22°, IWI underestimates the actual cirrus CTHs given by CALIOP, but the IWI+HSRS results are able to approach CALIOP values of this optically thin cirrus cloud. The deep convective element at latitude 31° is very well

depicted by all three retrieval methods. The small transparent cloud around latitude 26° is captured by the HSRS and IWI+HSRS retrievals but not by the IWI retrievals. Most of the thin cirrus clouds with CTHs higher than 12 km between latitudes 29° and 39° are captured by IWI+HSRS but not as well by the IWI method alone.

New Capabilities for Fog Detection and Monitoring

VIIRS is uniquely capable of detecting and characterizing areas of fog and low cloud. Fog and low stratus clouds are a hazard to transportation. Visibility under foggy conditions can be drastically reduced, creating dangerous situations for vehicles on roadways as well as airplanes, trains, boats, and other means of transport.

From 1995 to 2005 the National Highway Traffic Safety Administration (NTSA) determined an average of 38,700 vehicular accidents that were directly related to fog. Each year, foggy conditions are responsible for 16,300

injuries and 600 deaths in the United States. In the same time period, the National Transportation Safety Board reported an annual average of 81 airplane crashes, 61 of which resulted in at least one fatality, were caused by reduced visibility due to low clouds. In addition, millions of dollars are lost each year by commercial airlines from cancellations, delays, and rerouting forced by low visibilities at airports due to fog and low stratus clouds.

Unlike surface observations, which are very localized and can be quite sparse in parts of the country, the VIIRS will provide a spatially continuous depiction of fog/low cloud with very high spatial resolution. The 375-meter resolution 3.75 and 11 mm imaging band on VIIRS will allow for unprecedented monitoring of difficult to detect small-scale valley fog events. Valley fog events are often responsible for traffic accidents. Thus, the new capabilities offered by the VIIRS can be used to improve traffic safety. In order to ensure that the VIIRS is being fully utilized for fog/low cloud applications, computer algorithms are being developed to automatically determine the probability that hazardous low cloud conditions are present. The results of this processing will allow forecasters to more accurately identify hazards caused by reduced visibility and/or low ceilings, and relay the information to the public.

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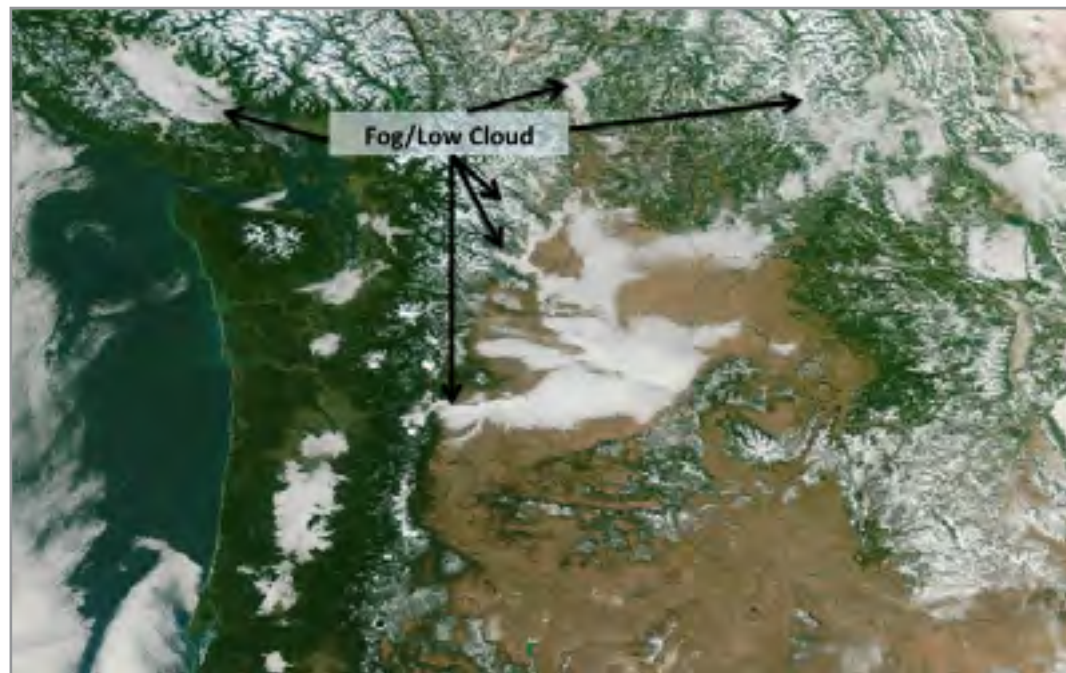


Figure 3. On 9 December 2011, VIIRS depicts an area of freezing fog over the Pacific Northwest of the United States.

Highlights of Recent Publications

MODIS cloud-top property refinements for Collection.

Journal of Applied Meteorology and Climatology, v.51, no.6, 2012.

Baum, Bryan A.; Menzel, W. Paul; Frey, Richard A.; Tobin, David C.; Holz, Robert E.; Ackerman, Steve A.; Heidinger, Andrew K., and Yang, Ping.

The Collection-6 refinements in the Moderate Resolution Imaging Spectroradiometer (MODIS) operational cloud-top properties algorithm are summarized. The focus is on calibration improvements and on cloud macrophysical properties including cloud-top pressure–temperature–height and cloud thermodynamic phase.

Detection and tracking of subtle cloud features on Uranus.

Astronomical Journal, v.143, no.6, 2012.

Fry, P. M.; Sromovsky, L. A.; De Pater, I.; Hammel, H. C., and Rages, K. A.

Recently updated Uranus zonal wind profiles sample latitudes from 71° S to 73° N. But many latitudes (outside 20°–45° S and 20°–50° N) remain grossly undersampled due to a lack of trackable cloud features. Offering some hope of filling these gaps is our recent discovery of low-contrast cloud that can be revealed by imaging at much higher signal-to-noise ratios than previously obtained.

On-orbit absolute blackbody emissivity determination using the heated halo method.

Metrologia, v.49, no.2, 2012.

Gero, P. Jonathan; Taylor, Joseph K.; Best, Fred A.; Garcia, Raymond K., and Revercomb, Henry E.

A novel method to measure the absolute spectral emissivity of a blackbody cavity in situ using the heated halo, a broadband thermal source is presented. Laboratory demonstrations have yielded spectral emissivity measurements of a 0.999 emissivity blackbody that are in agreement with results based on Monte Carlo ray trace modeling.

Applications of full spatial resolution space-based advanced infrared soundings in the preconvective environment.

Weather and Forecasting, v.27, no.2, 2012.

Li, Jun; Liu, Chian-Yi; Zhang, Peng, and Schmit, Timothy J.

Advanced infrared sounders such as the Atmospheric Infrared Sounder and Infrared Atmospheric Sounding Interferometer provide atmospheric temperature and moisture profiles with high vertical resolution and high accuracy in preconvective environments.

Predicting hurricane intensity and structure changes associated with eyewall replacement cycles.

Weather and Forecasting, v.27, no.2, 2012.

Kossin, James P. and Sitkowski, Matthew.

New statistical models based on a recently documented climatology of intensity and structure changes associated with eyewall replacement cycles in Atlantic Ocean hurricanes are introduced. The model input comprises environmental features and satellite-derived features that contain information on storm cloud structure.

Comparison between GOES-12 overshooting-top detections, WSR-88D radar reflectivity, and severe storm reports.

Weather and Forecasting, v.27, no.3, 2012.

Dworak, Richard; Bedka, Kristopher; Brunner, Jason, and Feltz, Wayne.

Convective storms with overshooting-top (OT) signatures in weather satellite imagery are often associated with hazardous weather. An objective satellite-based OT detection product has been developed using 11- μ m infrared window channel brightness temperatures for the upcoming R series of the (GOES-R) Advanced Baseline Imager.

Honors and Awards

Professor Verner Suomi

Satellite Renamed The National Polar-orbiting Operational Environmental Satellite System Preparatory Project (NPP) satellite renamed Suomi NPP -- the Suomi National Polar-orbiting Partnership.

Christopher Velden

Received the UW Chancellor's Award for Excellence in Research.

Steven Ackerman

Named UW-Madison Associate Dean for the Physical Sciences.

Mathew Gunshor, Anthony J. Schreiner, James P. Nelson III, A. Scott Bachmeier, Dave Stettner, Steve Wanzong, Christopher C. Schmidt, Wayne Feltz, Justin Sieglaff, William Straka, Christopher Velden and the SSEC Data Center

Received NOAA-CIMSS Collaborations Awards.