Satellite Data and Information for the Masses: RealEarth, Mobile Apps, and Social Media Resources from CIMSS

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AMS 2017 Short Course
Experiencing JPSS Capabilities
21 January 2017
Content

- SSEC and CIMSS
- RealEarth Web Map Service
- Native apps for iOS and Android
- Weather satellite blog
- Social media activities
SSEC
Space Science and Engineering Center

- Located at University of Wisconsin-Madison
- A research and development center focusing on geophysical research and technology to enhance our understanding of the atmosphere of Earth, the other planets in our Solar System.
- Develop and demonstrate new observing systems for spacecraft, aircraft, and ground-based platforms.
- Receive, manage and distribute significant amounts of geophysical data and develop software to visualize and manipulate these data to gain insight into weather and climate.

http://www.ssec.wisc.edu
Foster collaborative research among NOAA, NASA, and the University in those aspects of atmospheric and earth system sciences that exploit the use of satellite technology;

Serve as a center at which scientists and engineers working on problems of mutual interest can focus on satellite-related research in atmospheric and earth system science;

Stimulate the training of scientists and engineers in the disciplines involved in atmospheric and earth science.

http://cimss.ssec.wisc.edu/
RealEarth Web Map Service
Motivation

• View meteorological imagery (e.g. radar, satellite data and products) in Google Maps, Google Earth, and mobile devices
• Integrate with GIS
• Animate time-series of imagery and data
• Upload products by researchers
• Scale: Install and run own VM in federated or independent network
RealEarth

http://realearth.ssec.wisc.edu
Many Ways to Visualize

- Browsers
- Embed map in website
- Use API
- Access tile cache
Begin RealEarth Demo
RealEarth Demo

NPP VIIRS true color composite
http://re.ssec.wisc.edu/s/Tmpmz
RealEarth Demo

River flood

http://re.ssec.wisc.edu/s/9mrok
RealEarth Demo

River ice concentration over VIIRS DNB image
http://re.ssec.wisc.edu/s/nmoU2
RealEarth Demo

VIIRS sea ice product over Hudson Bay with Landsat image
End RealEarth Demo
More Ways to Visualize

- Mobile Apps
  - iOS and Android
- Desktop applications
  - Add as WMS layer in qGIS or ArcMap
  - Add tile layers to ArcGIS Online
  - Add KML to Google Earth
Mobile Apps

- **WxSat**
  - Realtime satellite images
  - Global Visible, IR, WV

- **RealEarth**
  - Access to all RealEarth products
  - User-customizable displays

Available on iOS and Android
WxSat: Basic Satellite Images

- Global composites of Visible, Infrared, and Water Vapor
  - Images updated hourly
  - Full native resolution
    - ~4km IR/WV global
    - ~1km VIS global
- Products are near real-time
WxSat: Features

- Free pan/zoom
- Display current location
- Simple political map overlay that can be toggled on/off
- Time selector
- Animation
RealEarth App

• Based on and incorporating lessons learned from WxSat App
• Instead of just 3 basic satellite products (WxSat), all products in RealEarth are available
• User-configurable favorites
• RealEarth App will be basis for future specialized apps for GOES-R and JPSS imagery and products
JPSS-focused App (in development)

- **ISEE**: Innovative Satellite Enhanced Exploration
- Real-time *identification and notification* of environmental conditions:
  - Fire and smoke
  - River ice and flooding
  - Precipitation
  - Etc...
- Export to social media
RealEarth App on iOS

- iPhone (RealEarth products)
RealEarth App on iOS

• iPad
RealEarth on Apple Watch

- Twitter....
RealEarth App on Android
Get the Apps!

Visit us at SSEC booth 326!

Attend talk at 4:45pm Monday

RealEarth: Access to Real-time and Archive Satellite Data and Derived Products

RealEarth Information: http://www.ssec.wisc.edu/realearth
Social Media at CIMSS

- Weather satellite blog
- Twitter
- YouTube Channel
- Instagram
Time Lines

• **Blogging**: Started August 2006
  – http://cimss.ssec.wisc.edu/goes/blog/
  – CIMSS ‘GOES Gallery’ started January 1996

• **Twitter**: Started June 2009
  – @CIMSS_Satellite

• **YouTube Channel**: Started August 2013
  – CIMSS Satellite Blog
    • https://www.youtube.com/user/satelliteblog
  – UWSSEC

• **Instagram Account**: Started November 2014
  – @CIMSS_Satellite
Why Blog?

- A picture is worth a thousand words
- Aligns with CIMSS’ goals of outreach/education
- Explanatory text focuses the reader’s eye on the important part of the imagery, and what message for “users” to take away
- Assumption: Some readers are expert, some have zero knowledge. Blog written for relevancy to both.
White Christmas in Hawaii
December 25th, 2014

According to the National Operational Hydrologic Remote Sensing Center, only 30.5% of the Lower 48 states had snow cover on 25 December 2014. However, a deep cutoff low over the Hawaiian Islands had brought unusually cold air aloft (the 500 hPa temperature on the Lihue rawinsonde report was only -18°C) and strong winds, which prompted Blizzard Warnings to be issued for the high elevation summits of the Big Island of Hawaii on 23-24 December. As the cutoff low departed and skies began to clear, GOES-15 (GOES-West) 0.63 μm visible channel images (above; click image to play animation) revealed the bright white snow-covered summits of Mauna Kea and Mauna Loa on Christmas Day.

A toggle between a Suomi NPP VIIRS 0.64 μm visible channel and a false-color Red/Green/Blue (RGB) "snow vs cloud discrimination" image at 23:22 UTC (below) confirmed that the bright white features seen in the GOES-15 visible images was indeed snow cover — snow (and glaciated ice clouds) appear as darker shades of red on the RGB image.
Examples of High-Impact Blog Posts

• Mali Air Crash
  – http://cimss.ssec.wisc.edu/goes/blog/archives/16262

• Haiyan Landfall
  – http://cimss.ssec.wisc.edu/goes/blog/archives/14311
  – YouTube Video: 2100 Views
  – YouTube Video (vis): 6800 views

• Air Asia Flight 8501
  – http://cimss.ssec.wisc.edu/goes/blog/archives/17443

• Bakken Shale
  – http://cimss.ssec.wisc.edu/goes/blog/archives/12572

• Hurricane Sandy
  – http://cimss.ssec.wisc.edu/goes/blog/archives/11686
  – YouTube Video: 17000+ views

• Typhoon Nuri
  – http://cimss.ssec.wisc.edu/goes/blog/archives/17131
  – YouTube video: 8900+ plays!

• Satellite view of Chelyabinsk Meteor
  – http://cimss.ssec.wisc.edu/goes/blog/archives/12356
  – YouTube Video: 300 plays!

Each of these is a great Teaching opportunity!
Plane Crash over Mali, July 2014: Was Weather Involved?

Added: Day Night Band imagery shows flare at Crash site
Haiyan Landfall, late 2013
Biggest traffic of the year for a Blog post.
COMS-1 data
Day Night Band
Links to YouTube Videos

Super Typhoon Haiyan (31W) formed as a tropical depression at low latitudes in the West Pacific Ocean on 03 November 2013 — and by 18 UTC on 07 November was estimated to have peaked at an intensity of sustained 170 knot winds with gusts to 205 knots (Storm track map | ADT plot | JTWC warning text). McIDAS images of 15-minute interval 10.8 µm IR channel data from the Korean COMS-1 satellite (above; click image to play animation; a YouTube video or also available) showed the intense tropical cyclone as it moved westward and made landfall in the Philippines on 07 November. There was a large, nearly symmetric ring of very cold cloud-top IR brightness temperatures in the -80 to -90°C range (violet colors) — and at times there were a few isolated pixels colder than -90°C (yellow enhancement). For comparison, a YouTube video of MTSAT-1 10.8 µm IR imagery is also available.

As the eye was still east of the Philippines, a McIDAS-V image comparison of 375-m resolution Suomi NPP VIIRS 0.7 µm DayNight Band (DNB) and 11.45 µm IR channel data at 16:15 UTC on 07 November (below; courtesy of William Straka, CIMSS) revealed intricate banding structures within the eyewall region on the IR image, as well as bright streaks on the DNB image due to cloud illumination by intense lightning activity.
Use Suomi NPP Day Night Band to show areal extent of gas extraction from Bakken Formation in North Dakota. (Also shows thermal signatures)

How can satellite data monitor the Planet?
Many posts on Hurricane Sandy – many links back to CIMSS websites to explain how the storm formed, weakened, re-strengthened, moved, etc. etc.

Very high-impact, and great SRSO-R imagery to boot!
Blog Post on interesting transition from typhoon to strong extratropical storm in Being Sea.

MTSAT-2 data, MIMIC TPW and Day Night Band Imagery as well as GOES-West.

Demonstrates products that are useful as well as the breadth of data available from data center

Teaches reader how tropical cyclones in the Pacific can affect weather in the USA
Meteor strike near Chelyabinsk

Opportunity to show all the different satellite data available at CIMSS, and discuss why the satellite signatures appear and what they mean.
Air Asia flight that went down in Java Sea while flying through tropical convection.

Image at left uses SSEC’s RealEarth Display – toggling between Google Maps and overlain IR imagery.
The corresponding COMS-1 0.675 μm visible channel images (below; click to play animation; also available as an MP4 movie file) showed evidence that there were some overshooting tops associated with these thunderstorms.

Given that there was a long gap in available COMS-1 images (between 23:00 and 23:45 UTC), a closer view is shown using the 23:32 UTC MTSAT-2 10.8 μm IR channel (above) and 0.675 μm visible channel images (below). A circle is again drawn near the center of the MTSAT-2 IR channel image (click to enlarge).

COMS-1 Visible Data and MTSAT-2 IR data document the strong convection that the airline flew through.
Why Tweet?

• As a way to direct people (or organizations) to a blog post

• As a way to monitor what others are seeing: CIMSS scientists cannot watch everything

• As a way to communicate with a NWS Office that has alerted us to an interesting event
@CIMSS_Satellite

4200+ Followers

Links to blog posts at CIMSS Blog or to animations
Tweet from NWS in Gray ME about an offshore vortex forced by topography of Gaspe Peninsula
Tweet to NWS in Gray ME about an offshore vortex forced by topography of Gaspe Peninsula ...

…with a link to the GOES-13 visible animation!
Why YouTube?

• Useful format
• Video creator can track number of views!
• SRSO-R especially results in very long loops that can be multi-hundreds of megabytes in an animated gif.
  – Animated gifs have no start/stop feature
  – https://www.youtube.com/watch?v=3KkwQ1Sek44
Why Instagram?

• Satellite imagery are just so pretty!

• Send out images that are beautiful
  — Difficulty: Can’t do much with a desktop – need a smart phone or a tablet.
Thanks to …

• RealEarth: http://realearth.ssec.wisc.edu
• CIMSS Blog: https://cimss.ssec.wisc.edu/goes/blog
• Twitter: @CIMSS_Satellite
  Also: @UWSSEC, @UWCIMSS
• Instagram: CIMSS_Satellite
• YouTube: CIMSS Satellite Blog, UWSSEC