Next-Generation Weather Satellite Demonstration (NexSat)

Supporting POST

NexSat Role

- Provide satellite-derived products over operations region (off CA coast)
- Support mission planning
- Flight coordination
- Post-flight analysis

Next-Generation Weather Satellite Demo (NexSat)

Navigating the Website

Training

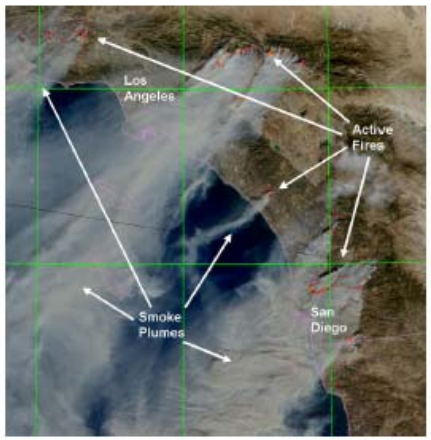
NexSat

NRL/NPOESS Next-Generation Weather Satellite Demonstration Project

Feedback?

Satellite Product Tutorials:

Detecting Fires



Above: In October 2003, wildfires fueled by years of drought and strong Santa Ana winds ravaged Southern California. The firestorm as observed by MODIS from 500 miles overhead is shown in the above image. Here, active fires highlighted in red and yellow (hottest). The military used similar products during the early stages of Operation Iraqi Freedom to monitor the oil fields of southern Iraq (during the 1991 Gulf War they were set ablaze and caused severe visibility hazards for pilots).

Why We're Interested...

Annually, fire kills nearly 3,700 people (including 100 firefights in the line of duty), injures over 20,000, and is responsible for property losses exceeding $10 billion. Deaths related to fires are higher in the United States than any other industrialized country world. Our ability to minimize the destructive impact of fires is directly related to how early we can identify and respond to them. This is particularly true for fast-spreading wild land fires that spark up in the poorly monitored back country and can race toward populated areas. We are also interested in fires from the perspective of the Earth's radiation balance, and by extension, the climate. Smoke injected into the atmosphere from global fires is thought to play an important yet poorly understood role here. For both applications, satellites provide the wide-area coverage to assist in this monitoring.

How This Product is Created...

Our eyes are sensitive to light waves from the visible part of the spectrum (roughly, waves having lengths between 0.4 and 0.7 microns). Instruments flown aboard weather satellites can be designed to "see" other wavelengths of light besides visible (which represents a very narrow part of the full spectrum of light), including those corresponding to heat emissions. The 4.0 micron channel offers exceedingly high sensitivity to heat sources (even when the heat source does not entirely fill the scene being viewed by the instrument). For this reason, 4.0 micron is well-suited for the detection of fires and hot-spots on the earth's surface.

A single satellite image is actually composed of many individual "picture elements" (or "pixels"), each representing a small area of the overall scene. The size of a single pixel is related to the area viewed by the sensor at a given point in time (called the instantaneous geometric field of view—IGFOV, or "pixel footprint"), the rate at which that IGFOV sweeps across the scene (related to the "scan rate" of the system), and the time allowed for that sensor to collect the information (called the integration time). Consideration for all this parameters allows us to in specify the "spatial resolution" characterizing a given sensor. For example, an area 100 miles on a side that is viewed by a satellite having 1-mile spatial resolution will be represented by a 100 by 100 pixel image.

d image.

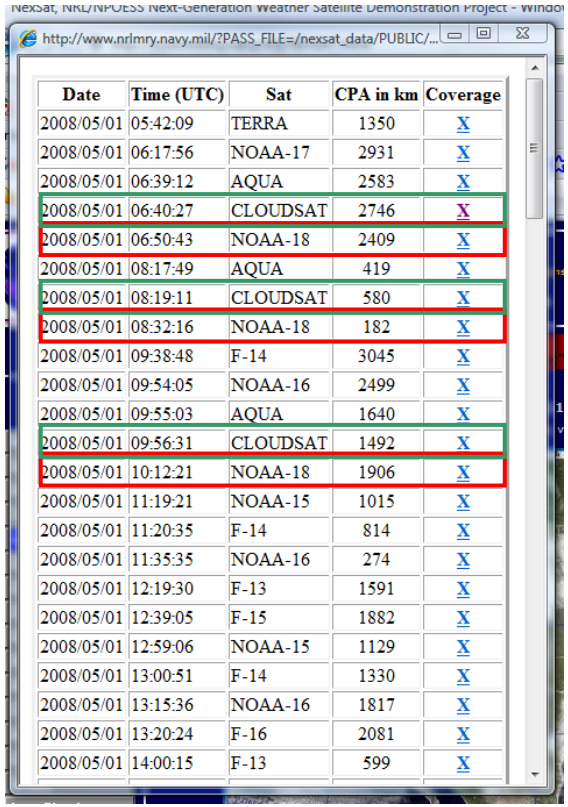
32 UTC

NRL_Home|Sat_Home|NPOESS|COMET|Search

NexSat: 2.7.6 (06/11/08)
Page Generated: Thu Jun 12 13:25 2008 GMT
Approved for public release by: Superintendent NRL Monterey
Technical POC: ***NexSat Lead***
Webmaster: ***contact***

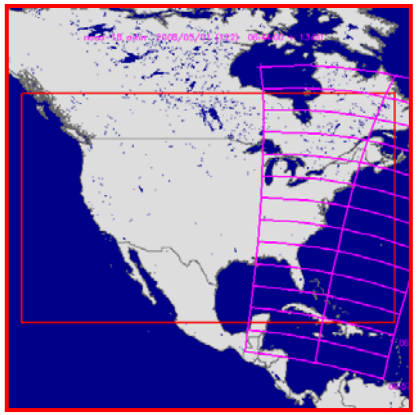
NexSat Pass Predictor

2008/05/01

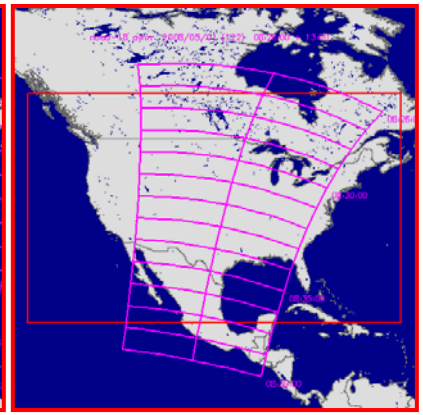


Date	Time (UTC)	Sat	CPA in km	Coverage
2008/05/01	05:42:09	TERRA	1350	X
2008/05/01	06:17:56	NOAA-17	2931	X
2008/05/01	06:39:12	AQUA	2583	X
2008/05/01	06:40:27	CLOUDSAT	2746	X
2008/05/01	06:50:43	NOAA-18	2409	X
2008/05/01	08:17:49	AQUA	419	X
2008/05/01	08:19:11	CLOUDSAT	580	X
2008/05/01	08:32:16	NOAA-18	182	X
2008/05/01	09:38:48	F-14	3045	X
2008/05/01	09:54:05	NOAA-16	2499	X
2008/05/01	09:55:03	AQUA	1640	X
2008/05/01	09:56:31	CLOUDSAT	1492	X
2008/05/01	10:12:21	NOAA-18	1906	X
2008/05/01	11:19:21	NOAA-15	1015	X
2008/05/01	11:20:35	F-14	814	X
2008/05/01	11:35:35	NOAA-16	274	X
2008/05/01	12:19:30	F-13	1591	X
2008/05/01	12:39:05	F-15	1882	X
2008/05/01	12:59:06	NOAA-15	1129	X
2008/05/01	13:00:51	F-14	1330	X
2008/05/01	13:15:36	NOAA-16	1817	X
2008/05/01	13:20:24	F-16	2081	X
2008/05/01	14:00:15	F-13	599	X

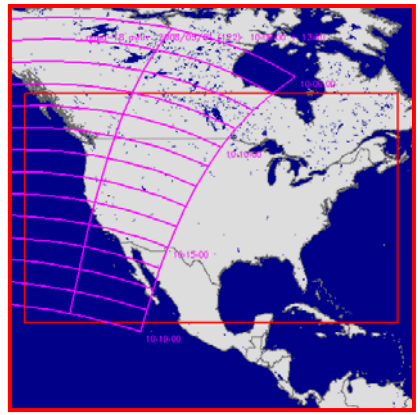
NOAA-18 passes



06:50 Z



08:32 Z



10:21 Z

CloudSat passes

06:40 Z

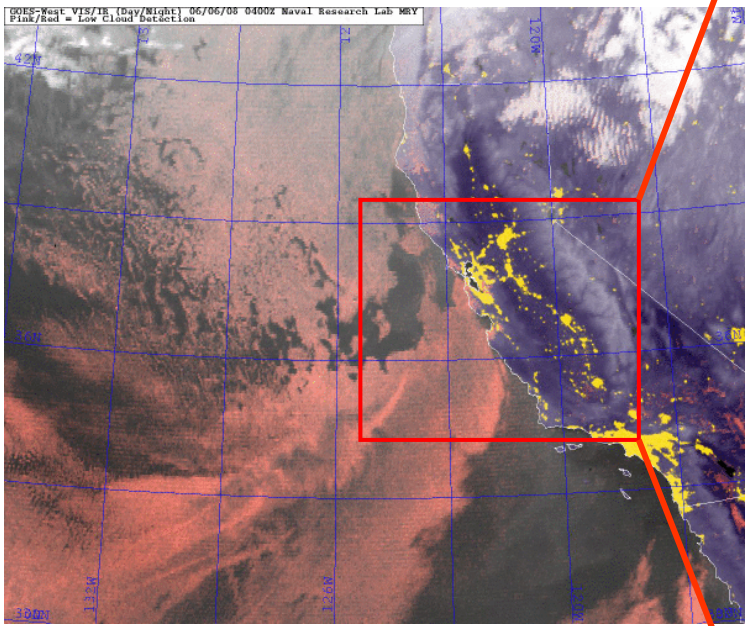
08:19 Z

09:56 Z

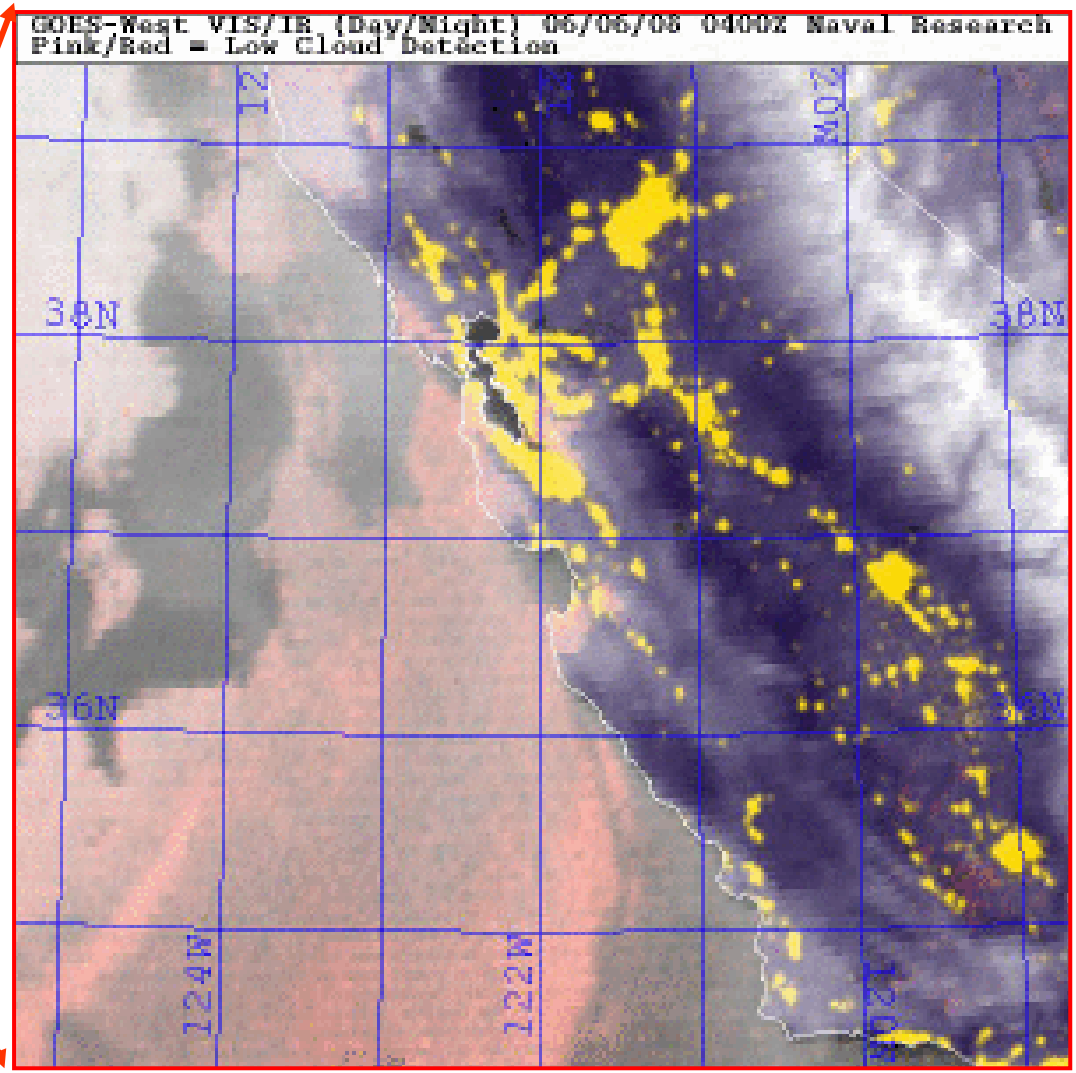
Primary Satellite Monitor Resource

June 6 GEO-color low cloud

[loop 04:00 – 20:00 GMT]



California sector



Central California sector

Catalog of NexSat Products

Standard Products

- **Visible (daytime) [1,2,3,4]**
- Visible (night time)
- **Infrared [1,2,3,4]**
- Water Vapor
- **True Color [1,2,5]**
- **GEO Color [3]**
- Rain Rates
- Rain Totals
  - 3, 6, 12, 24 hours
  - 2, 3, 4, 5, 6, 7, 10, 12, 14 days
- **Winds**
  - **Sfc measurements**
    - **WINDSAT**
    - **QUIKSCAT**
    - **ASCAT**
  - **low, mid, upper levels [3,5]**

Cloud Products

- Cloud layers (snow, low-middle, high)
- **CloudSat (cloud profile)**
- **Cirrus cloud detection [2]**
- Contrail detection
- **Low cloud (night) [1,2,3]**
- **Convective cloud top hgt [2,3]**
- **Cloud properties [3]**
  - **effective radius**
  - **optical depth**
  - **cloud top temperature**
  - **cloud top height**
  - **cloud type**

Environmental Products

- **Aerosol Opt Depth [1,2]**
  - **over water**
  - **over land**
- Biomass (vegetation type)
- Dust detection
- Fire detection (hot spots)
- Lightning detection
- Snow cover (surface)

sensor key list:

1 = AVHRR

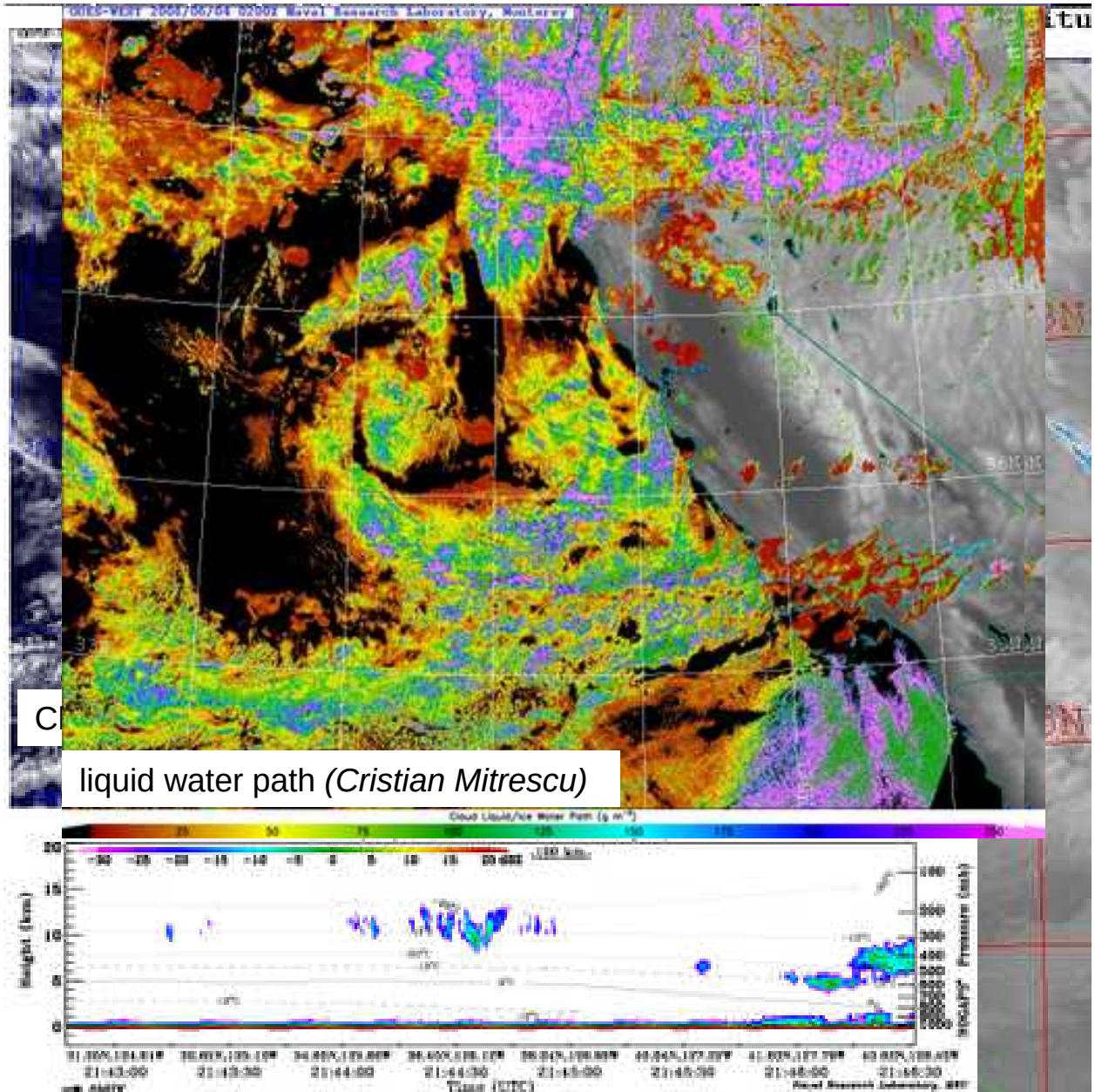
2 = MODIS

3 = GOES

4 = OLS

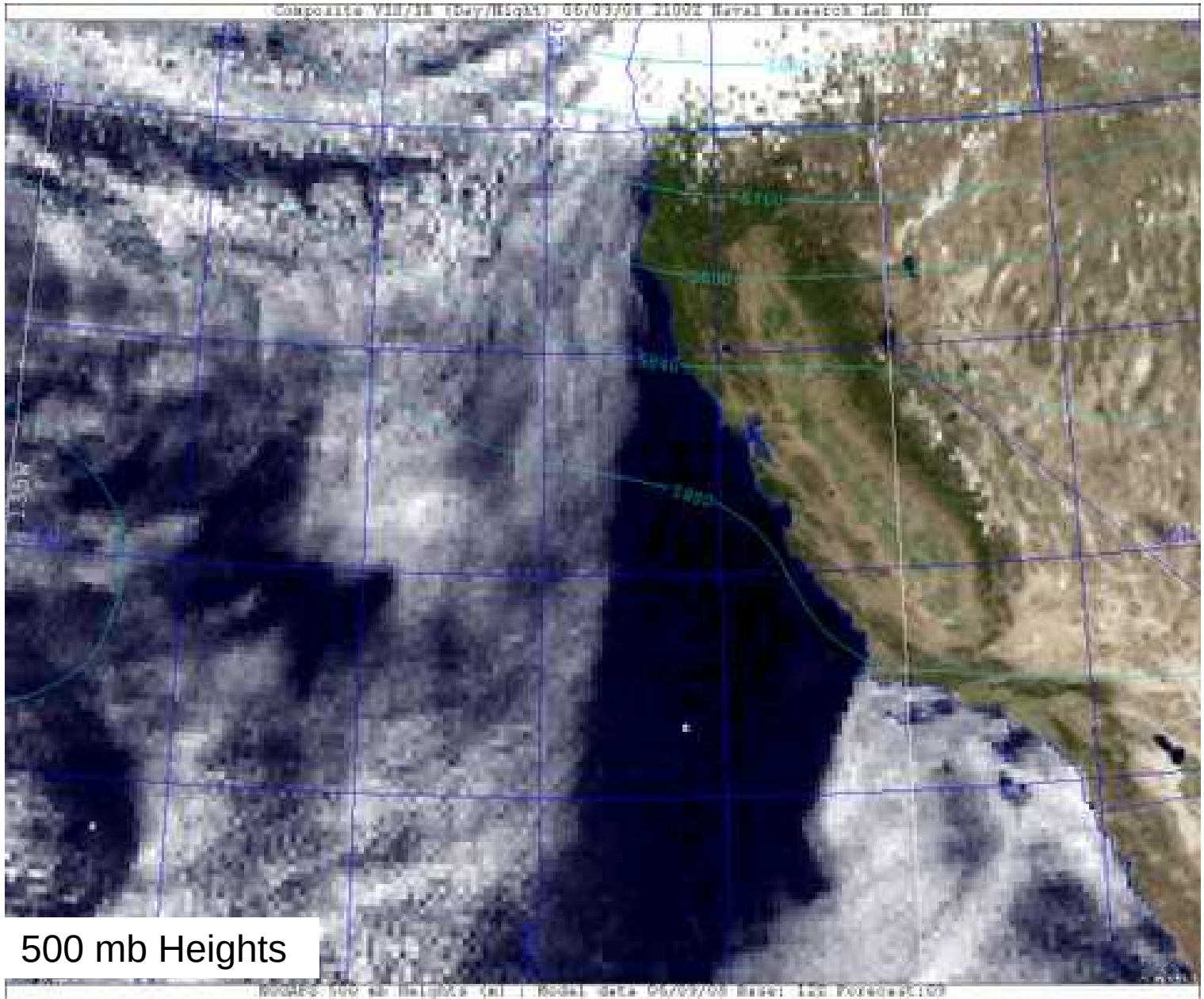
5 = NOGAPS overlay

NexSat Satellite-derived Products



liquid water path *(Cristian Mitrescu)*

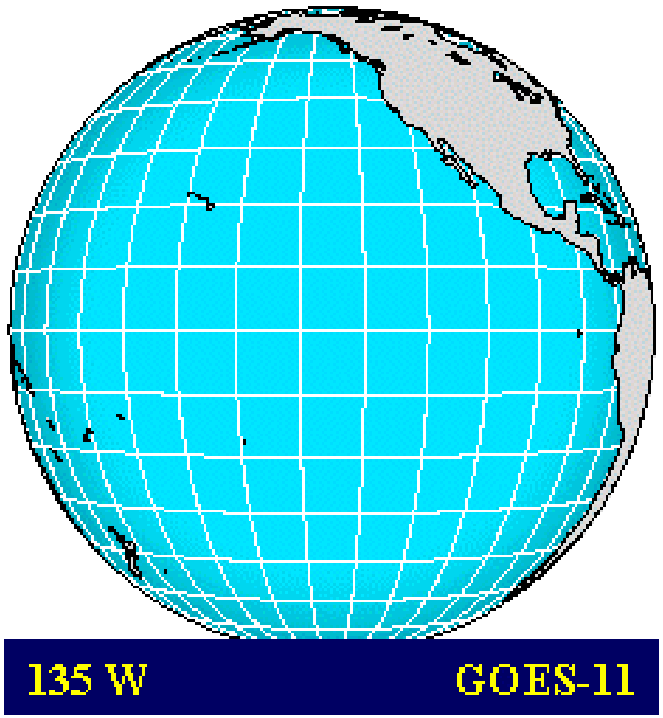
NexSat NOGAPS-derived Products



500 mb Heights

NexSat Satellite Data

GEO



Polar Orbiting Satellites

Imagers (Vis/IR): **NOAA - AVHRR (5)**

METOP - AVHRR

DMSP - OLS (5)

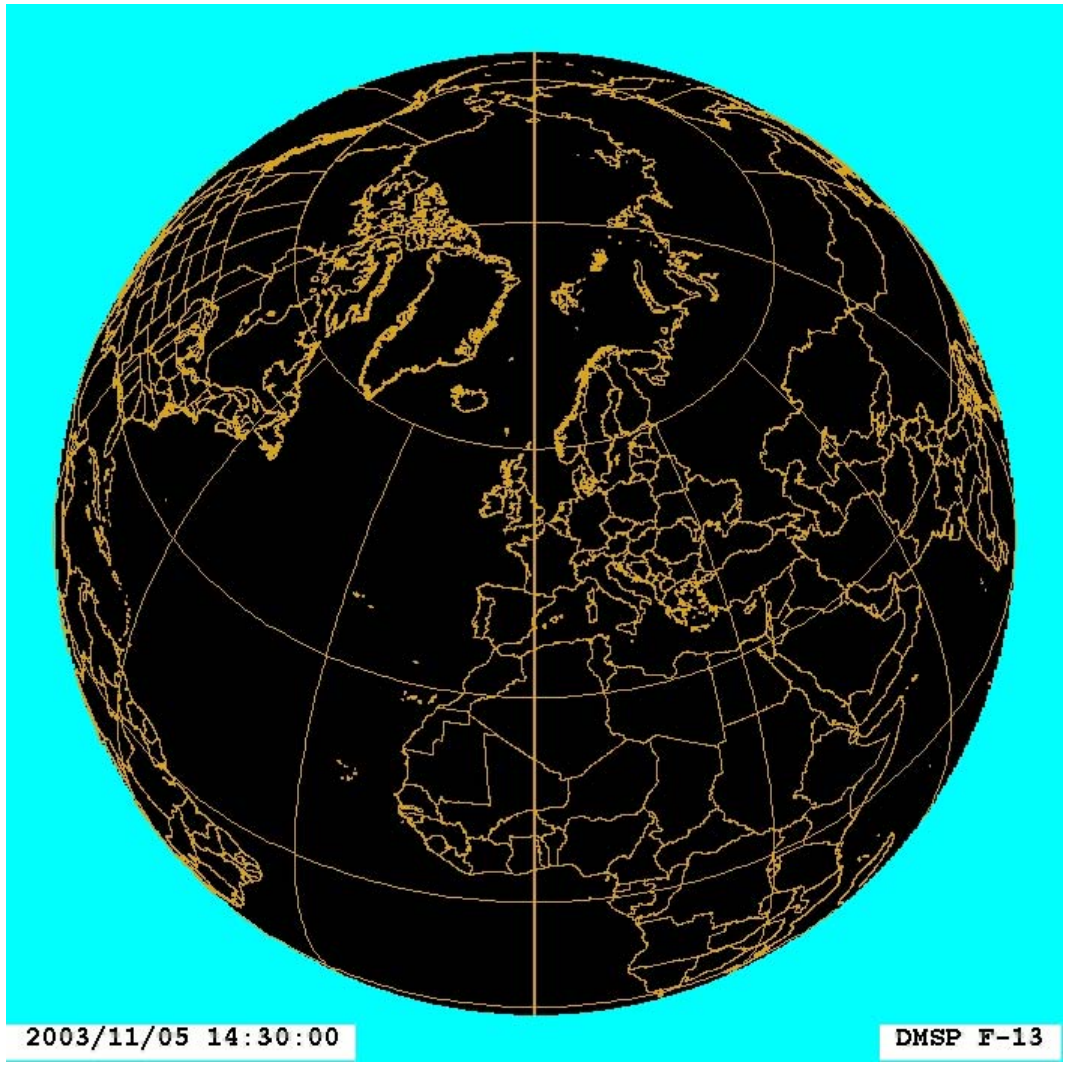
NASA - MODIS (2)

Microwave Imagers: **NRL - WindSat**

Microwave Radar: **NASA - QuikSCAT, CloudSat, ASCAT**

Collaborations: FNMOC, AFWA, NASA, NOAA, NAVO, CIRA

Exploiting Polar Orbiting Satellites



As the constellation grows and diversifies, revisit times decrease.

Average Data Latencies for Various Sensors

GOES-11:	55 min.
NOAA/MetOp-AVHRR:	2.0 hrs
NASA-MODIS:	1.5 – 9 hrs, mode ~ 5 hrs
CloudSat:	4.5 – 6 hrs
OLS:	4.5 hrs

Issues

- Sectors:
  - ✓ Central CA box: 34.5N – 39.5N/119W – 125W
- Products

Zoom & broad scope:

- ✓ vis
- ✓ IR
- ✓ cloud tops
- ✓ cirrus
- ✓ winds (non model)
- ✓ low cloud

Broad scope only:

- ✓ CloudSat
- ✓ Winds (NOGAPS)
- ✓ AOD
- ✓ Cloud properties

www.nrlmry.navy.mil/NEXSAT.html