6.2 Future Remote Sensing with NexSat

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AMS 2011 Meetings, 23 – 27 January, Seattle
NexSat Website Interface
Microwave Imagers:  
DMSP       SSM/I (2), SSMIS (3)  
NASA        TMI, AMSR  
NRL           WindSat  

Micro Sounders: NOAA/MetOp    AMSU-B (3), MHS (2)  

Microwave Radar: NASA        TRMM PR, CloudSat,  
EUMETSAT     ASCAT, ERS-2  

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

Imagers (Vis/IR): NOAA - AVHRR (5)  
METOP - AVHRR (1)  
DMSP - OLS (5)  
NASA - MODIS (2)  
Comm - SeaWiFS  

Microwave Imagers: DMSP       SSM/I (2), SSMIS (3)  
NASA       TMI, AMSR-E  
NRL           WindSat  

Micro Sounders: NOAA/MetOp    AMSU-B (3), MHS (2)  

Microwave Radar: NASA        TRMM PR, CloudSat,  
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Data latency:   GEO < 1 hour  
                 LEO 0.5 - 3 hours  

Data volume: 250 – 300 GB/day
Global Coverage

Primary domains using global GEO data

North America

South America

Europe

Africa

Australia

West Pacific

Indonesia
NexSat Product Examples

CloudSat
Global Clouds

new dimension of environmental depiction

Global Clouds
Snow-Cloud
IR, winds and rain

1-D field
value-added
multi-dimensional

courtesy: Joe Turk
NexSat city coverage

- 81 cities globally
- MODIS 0.25 km resolution
- true color & bio mass products
- Google Earth viewing option
Chicago: Summer Green
Chicago fall Colors
Chicago after the leaves fall
Chicago late autumn snow
NexSat volcano coverage

- Currently, 21 active sites
- MODIS 0.25 km resolution, OLS 1 km resolution
- vis, IR, true color, biomass, fire, dust, night visible, volcanic ash products
- Google Earth viewing option
Volcano Monitoring
Eyjafjallajökull

MODIS True Color

NRL “Dust” Product

April 19, 2010
NexSat Support
Volcano monitoring

2010/05/06  1155 UTC Terra MODIS
NexSat Support
Volcano monitoring

2010/05/07  1240 UTC Terra MODIS
NexSat Support
Volcano monitoring

2010/05/08  1325 UTC Terra MODIS
NexSat Support
Volcano monitoring

2010/05/09  1230 UTC Terra MODIS
Animating the eruption
May 8

Meteosat-9 EUMETSAT Volcanic Ash & SO2 algorithm

S02 range  volcanic ash range

May 8 sfc chart

source

source

volcanic ash range

S02 range
NexSat applications
Day and night dust monitoring

EUMETSAT-MSG and NRL-MODIS RGB dust algorithms

20100318 - 13:30 GMT
Northern Africa

MODIS 1 km
~4 times daily

MSG 3 km
(hourly)
NexSat applications
NRL MODIS dust detection algorithm

April 15, 2003  Chihuahuan Desert

discrete sources
Nighttime: IR Only

Daytime: MODIS VIS + IR

3 March 2004, 1110 GMT

Nighttime: OLS VIS + IR

3 March 2004, 2017 GMT

Moonlight reflectance highlights dust plumes at night. A mid-morning (0930/2130) orbit would be particularly valuable for tracking the advance of plumes after sunset.
We can simulate the capability of VIIRS via space/time matching of OLS and sensors possessing NIR channels…
NexSat applications
Snow/cloud detection at night
Online tutorials are designed to orient new users with NexSat products using simple and straightforward illustrative examples, all the while tying into the general theme of future JPSS/VIIRS capabilities.
NOTE: IE7 users; set browser security setting to MEDIUM for controls to work. Tools > Internet Options > Security Precipitation observations provided courtesy of CoCoRaHS. What does UTC or Z mean?
Focus: mesoscale hazards, Saharan dust

NexSat collaboration
West Africa weather satellite community
Field Experiments in 2010/2011

- TCS-10/ITOP (July – October)
  - WESTPAC region
- Cape Canaveral (16-27 August)
  - West Atlantic
- Hydrometeorology Testbed (HMT) Atmospheric Rivers (Dec – Mar)
  - Eastern Pacific/CA

Disaster Relief in 2010

- Haiti earthquake
- Russian summer fires
- Iceland volcano
- Gulf of Mexico oil spill

Ongoing support

- GOES-R Proving Grounds
- West Africa severe weather
- US Navy
NexSat support

NexSat monitored oil spill for Navy operations
April - June

Deepwater Horizon Explosion- 19 April 2010

• CDR John Dumas [Joint Forces Command]
  “This support has been fantastic, thank you.”

• Roffer's Ocean Fishing Forecasting Service, Inc. [NOAA support staff]
  “Thanks. We have been using your site everyday for the oil as well as other
  applications. We like your site. Easy to manipulate and see the data.”
NexSat user statistics
2010 results

<table>
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<tr>
<th></th>
<th>Accesses</th>
<th>Visits</th>
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<tbody>
<tr>
<td>Total</td>
<td>80,748,851</td>
<td>1,174,128</td>
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<tr>
<td>Daily Average</td>
<td>231,464</td>
<td>3,478</td>
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</tbody>
</table>

- oil spill
- Iceland volcano
- Atlantic hurricanes

provided by: Wusage
Looking beyond NPOESS

Evolution of The Polar Satellite Programs

NPOESS C-2 → Early Morning Orbit → DWSS

MetOp → Mid-morning Orbit → MetOp

NPOESS C-1 → Afternoon Orbit → JPSS

• October 2011 launch on schedule
• 5 instruments
• prototype to JPSS and DWSS eras
• NexSat website demos VIIRS data
<table>
<thead>
<tr>
<th>Channels</th>
<th>Resolution</th>
<th>Distance</th>
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<tbody>
<tr>
<td>16</td>
<td>Moderate</td>
<td>.74 km</td>
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<tr>
<td>1 Day/Night</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Fine (Imager)</td>
<td>.37 km</td>
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</table>
Improved detail with VIIRS

AVHRR VISIBLE SIMULATION

VIIRS VISIBLE SIMULATION Imager Band (Visible)

Edge

Edge
- NexSat hosting products
- reformatted MODIS data
  - HDF5 data by NOAA GRAVITE
- Products:
  cloud top height, cirrus,
  contrails, cloud layers, etc.
NexSat

www.nrlmry.navy.mil/NEXSAT.html

- demonstrate near real time state of the art products
  - 38 GEO and LEO sensors, VIS, IR, microwave
- primary objective: anticipate NPP VIIRS
  - educates scientists/public on current and future sensors
- supports variety of missions
  - disaster relief, field programs, mesoscale monitoring