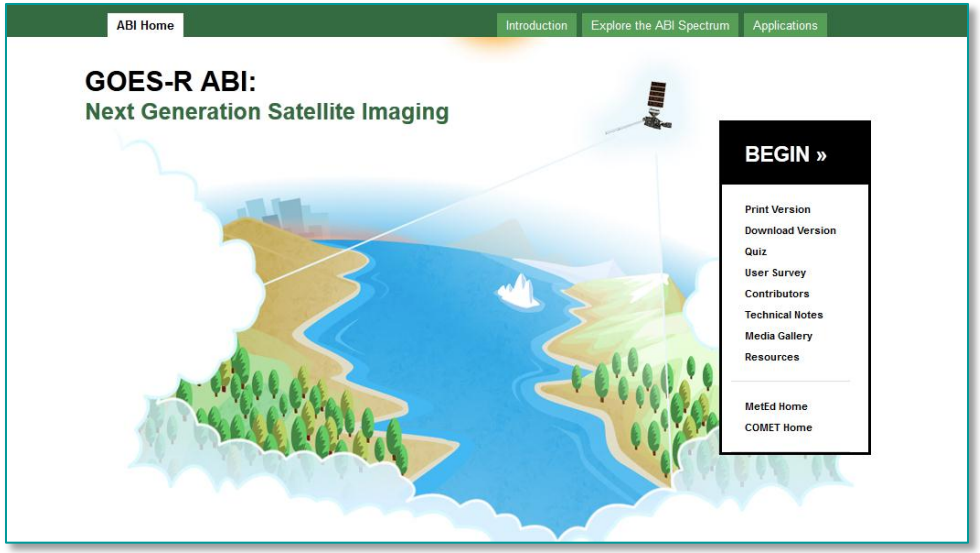
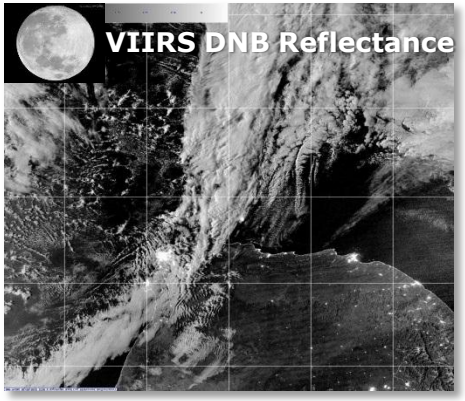
COMET Module Activities



The COMET Program
Boulder, Colorado

- **Nightime Visible Imaging With the DNB**



13 November 2012
Satellite Proving Ground Call

GOES-R ABI: Next Generation Satellite Imaging

- Module is an extension of the 2008 COMET module "**GOES-R: Benefits of Next Generation Environmental Monitoring**" and focuses on the GOES-R satellite's 16-channel imager
- Target audience - forecasters
- Covers imaging improvements including:
  - increased spectral coverage
  - higher spatial resolution
  - more frequent imaging
  - improved image pixel geolocation and radiometric performance
- Describes the improvements ABI will bring to:
  - analysis and forecasting
  - numerical weather prediction
  - climate and environmental monitoring

- **<u>Section 1</u>**: Introduces the ABI's key features and improvements over earlier GOES.
- **<u>Section 2</u>**: Lets users interactively explore the ABI's 16 channels.
- **<u>Section 3</u>**: Contains movies that show the improvements that ABI will bring to various application areas including:
  - Convection
  - Flooding
  - Wildfires
  - Land cover
  - Hurricanes
  - Climate
  - Air quality
  - Aviation
  - Coastal and marine
  - Fog and low visibility
- **<u>Section 4</u>**: Contains additional resources pertaining to the ABI, takeaways - notably the ten application movies, and an interactive spectrum

Section 1: Introduction

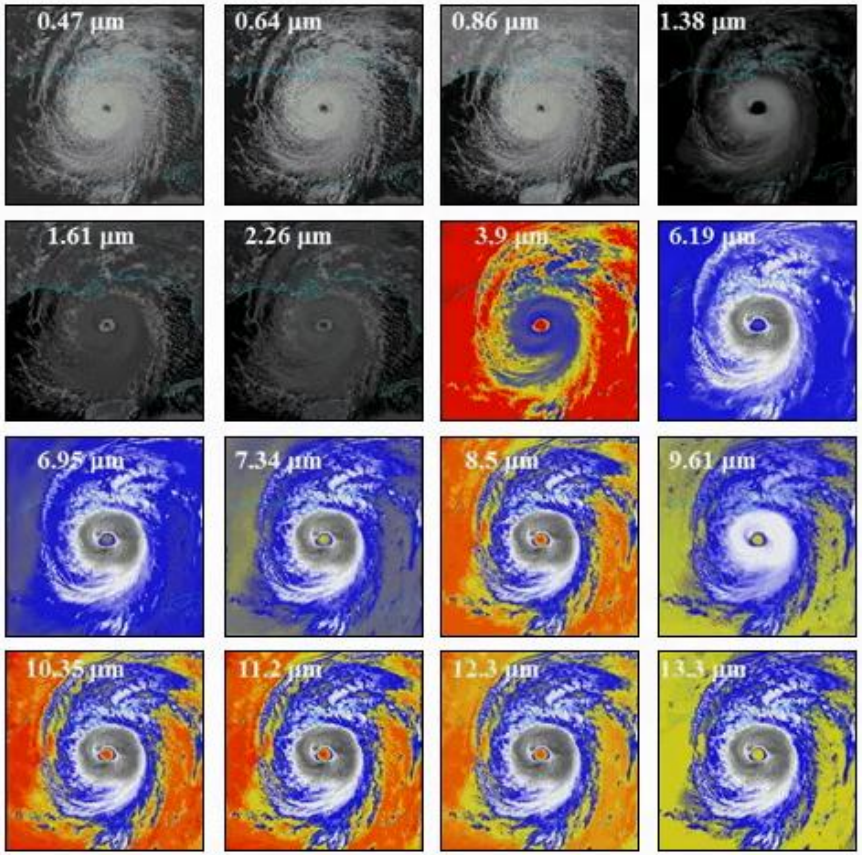
ABI Home | Introduction | Explore the ABI Spectrum | Applications

GOES-R ABI Intro

Play the video, then select the other tabs in the menu above.

- EXPLORE THE ABI SPECTRUM lets you interactively investigate the ABI channels and the phenomena that they will be able to monitor.
- APPLICATIONS discusses the improvements that the ABI will bring to forecasting, numerical modeling, and climate and environmental monitoring.
- RESOURCES provides summary and additional information about the GOES-R ABI.

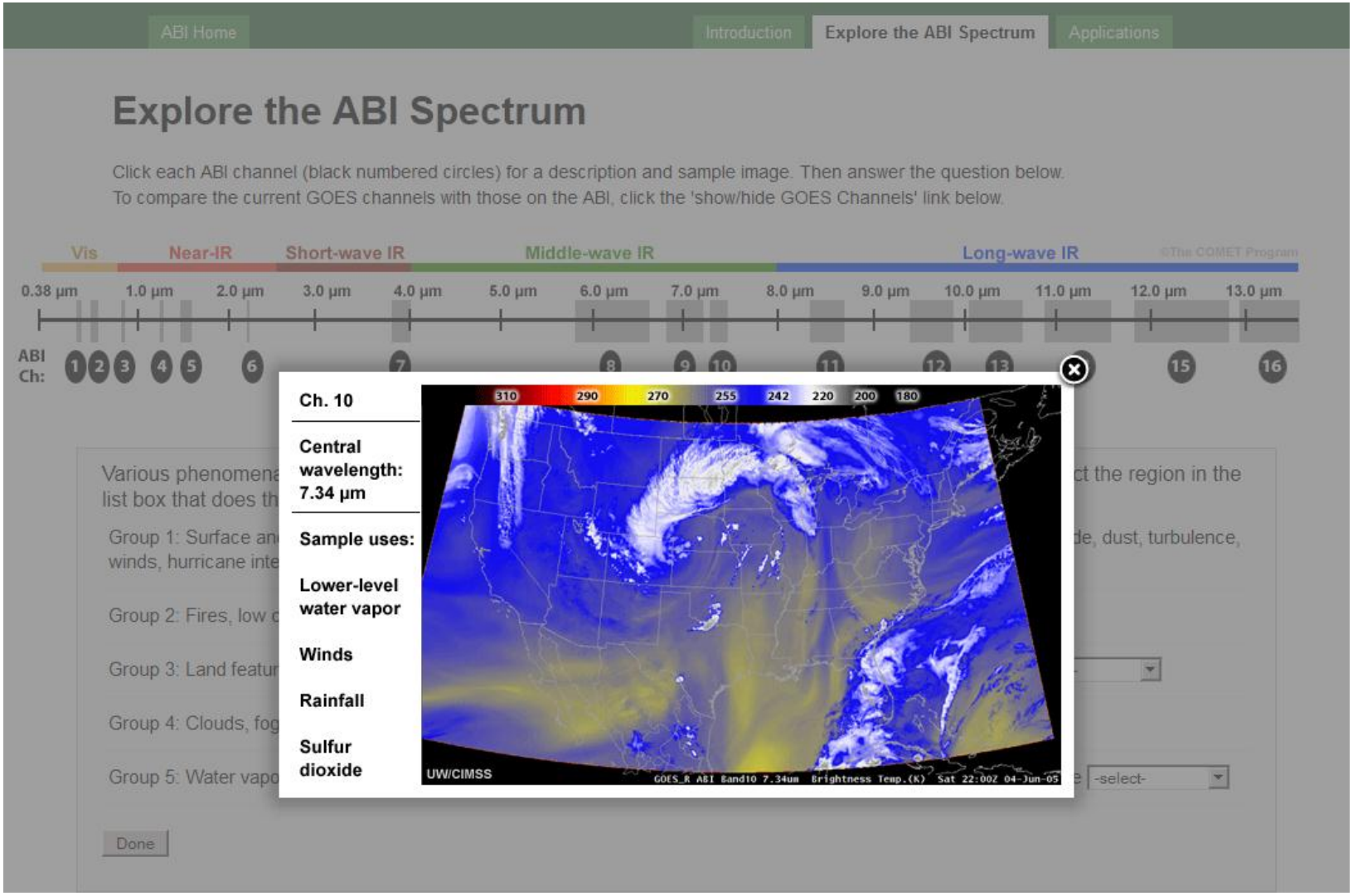
Imagery of Hurricane Katrina From the 16 Channels on GOES-R ABI



CIMSS AWG Proxy Team / SSEC / UW-Madison

3:26 | 9:14

Section 2: Explore the Spectrum

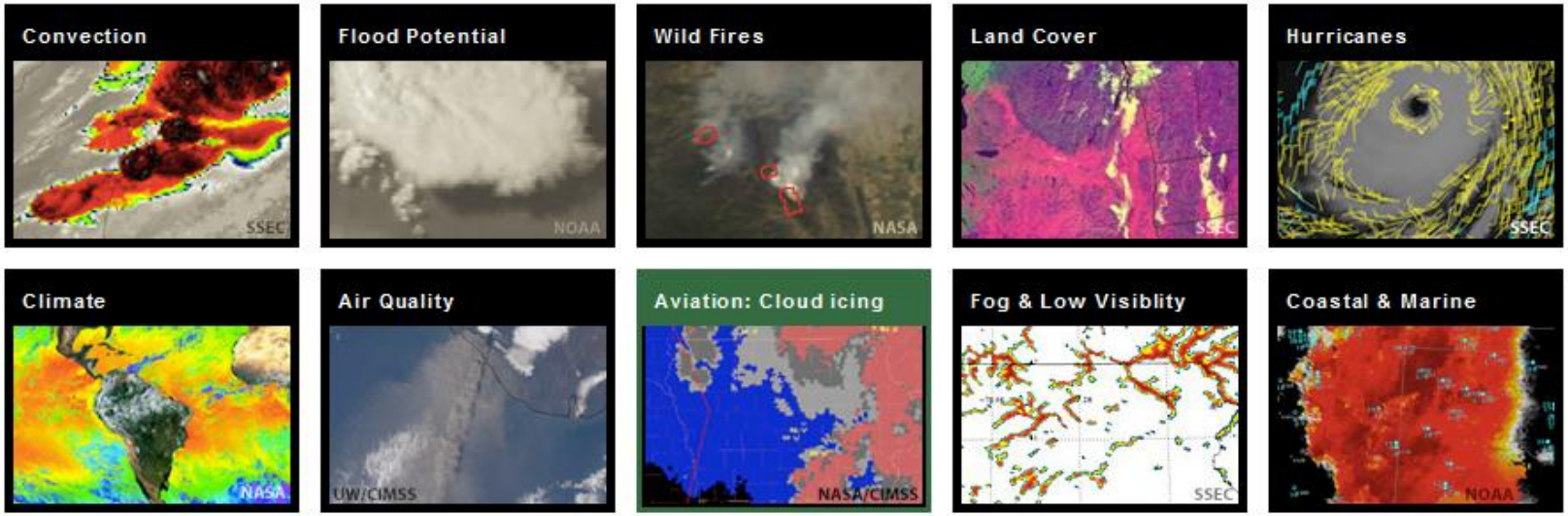


Section 3: Applications

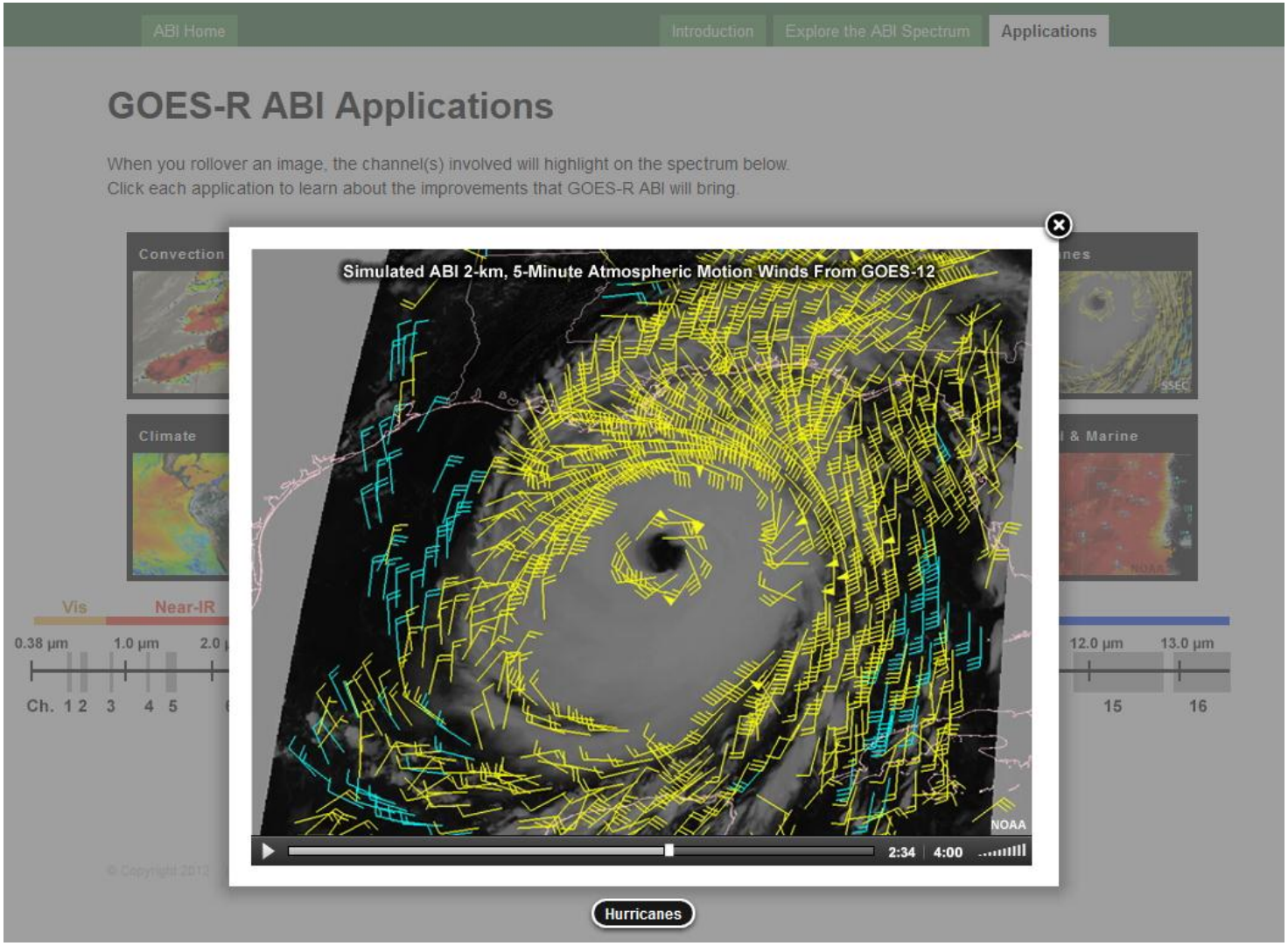
ABI Home | Introduction | Explore the ABI Spectrum | **Applications**

GOES-R ABI Applications

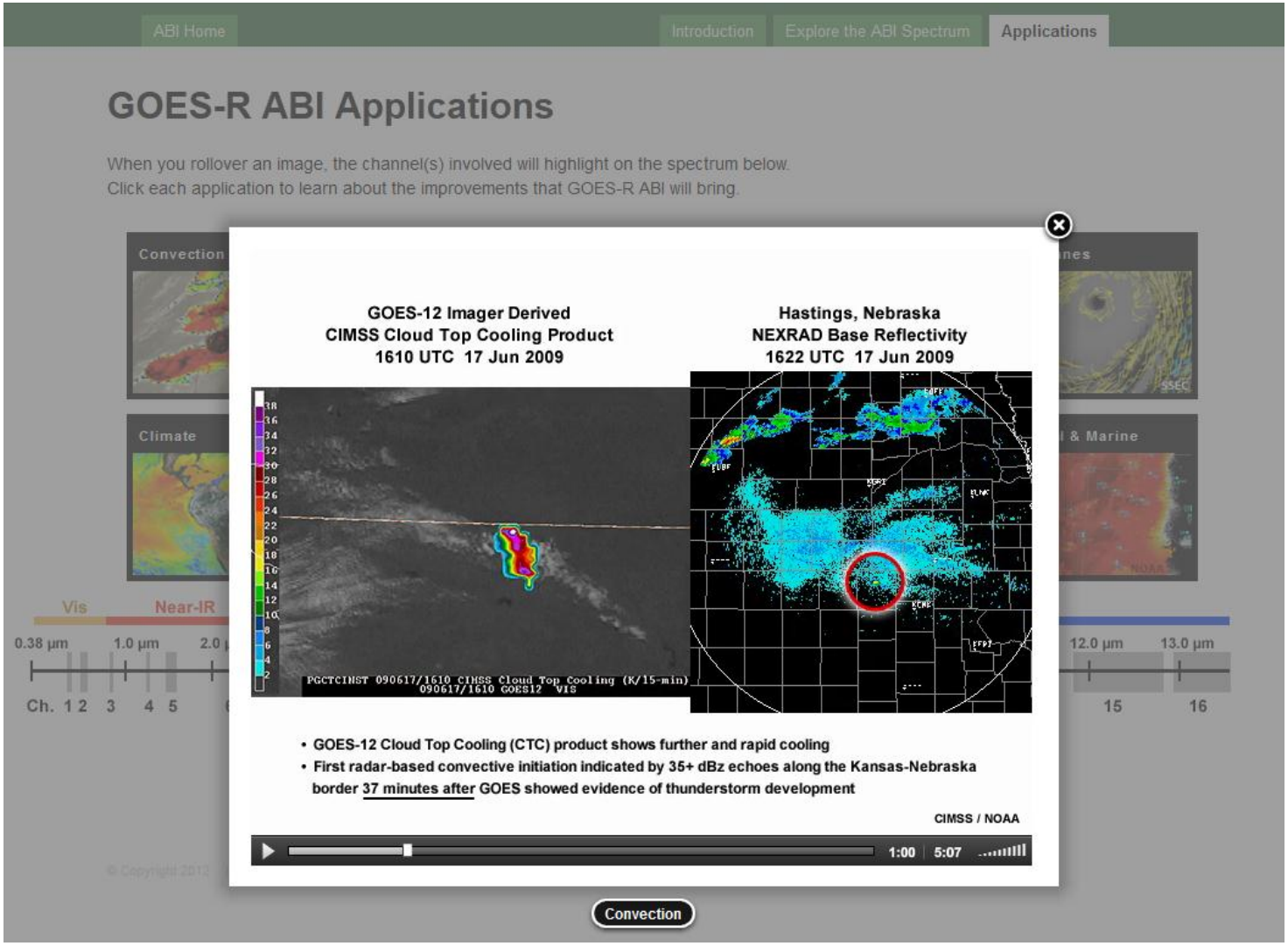
When you rollover an image, the channel(s) involved will highlight on the spectrum below.
Click each application to learn about the improvements that GOES-R ABI will bring.



Section 3: Applications



Section 3: Applications



Section 4: Resources

GOES-R ABI: Next Generation Satellite Imaging

Produced by The COMET® Program

Resources

Internet Resources:

- Official GOES-R Program Site, http://www.goes-r.gov/
- GOES-R Training Overview, http://www.goes-r.gov/users/training.html
- GOES-R ABI Instrument Page, http://www.goes-r.gov/spacesegment/abi.html
- GOES-R ABI Product List, http://www.goes-r.gov/products/list.html
- GOES-R: Benefits of Next-Generation Environmental Monitoring (a COMET module)
- GOES-R Proving Ground Page, http://www.goes-r.gov/users/proving-ground.html
- CIRA RAMMB GOES-R Proving Ground Activities, http://rammb.cira.colostate.edu/research/goes-r/proving_ground/
- CIRA RAMMB GOES-R Proving Ground Product List, Information and Training, http://rammb.cira.colostate.edu/research/goes-r/proving_ground/cira_product_list/
- UW CIMSS GOES-R Activities and Resources, http://cimss.ssec.wisc.edu/goes_r/
- UW CIMSS Satellite blog and GOES-R, http://cimss.ssec.wisc.edu/goes/blog/archives/category/goes-r
- UW CIMSS GOES-R Proving Ground Product List, Information and Training, http://cimss.ssec.wisc.edu/goes_r/proving-ground/SPC/SPC.html
- GOES and POES Conferences and Meetings, http://www.goes-r.gov/users/conf-mtgs.html
- GOES-R ABI Interactive Weighting Functions, http://cimss.ssec.wisc.edu/goes/wf/ABI/
- NASA SPoRT GEOS-R Proving Ground Activities, http://weather.msfc.nasa.gov/sport/goesrpg/
- SSEC/CIMSS GOES-R Bibliography, http://library.ssec.wisc.edu/resources/goesr/goesr.php
- VISIT: SHyMet for Forecasters: GOES-R 101 Training Session, http://rammb.cira.colostate.edu/training/shymet/forecaster_goesr101.asp

	Current GOES Imager	Future GOES-R Imager (ABI)	Comments
Spectral Coverage	5 bands • 1 visible • 0 near IR • 4 IR	16 bands • 2 visible • 4 near IR • 10 IR	ABI has 3.2x greater spectral coverage • Daytime clouds and aerosol, cloud motion winds, snow and ice cover, vegetation, burn scars, other surface features during daytime • Daytime cirrus clouds, cloud phase and particle size, low clouds and fog, aerosols, vegetation, snow and ice cover, other land properties • Surface and clouds, fog at night, winds, rainfall, fire, dust, ash, water vapor, cloud heights and amounts, ozone, SO_2, SST
Spatial Resolution • 0.64 µm visible • Other visible/near-IR • IR (>3 µm)	~ 1 km Not available ~ 4 to 8 km	0.5 km 1.0 km 2 km	ABI has 4x better spatial resolution Resolution at the sub-satellite point above the equator
Areal Coverage • Full Earth disk • CONUS (48 contiguous U.S.) • Mesoscale (~1000 x 1000 km)	Every 3 hours ~ 15 minutes Not available	Every 15 minutes Every 5 minutes Every 30 seconds	ABI scans about 5 times faster Simultaneous coverage of the different scan modes

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Summary of Wavelengths, Resolutions, Sample Uses, and Heritage Instruments of the GOES-R ABI Bands/Channels

Future GOES imager (ABI) band	Wavelength range (µm)	Central wavelength (µm)	Nominal subsatellite IGFOV (km)	Sample use	Heritage instrument(s)
1	0.45–0.49	0.47	1	Daytime aerosol over land, coastal water mapping	MODIS
2	0.59–0.69	0.64	0.5	Daytime clouds fog, insolation, winds	Current GOES imager/sounder
3	0.846–0.885	0.865	1	Daytime vegetation/burn scar and aerosol over water, winds	VIIRS, spectrally modified AVHRR
4	1.371–1.386	1.378	2	Daytime cirrus cloud	VIIRS, MODIS
5	1.58–1.64	1.61	1	Daytime cloud-top phase and particle size, snow	VIIRS, spectrally modified AVHRR
6	2.225–2.275	2.25	2	Daytime land/cloud properties, particle size, vegetation, snow	VIIRS, similar to MODIS
7	3.80–4.00	3.90	2	Surface and cloud, fog at night, fire, winds	Current GOES imager
8	5.77–6.6	6.19	2	High-level atmospheric water vapor, winds, rainfall	Current GOES imager
9	6.75–7.15	6.95	2	Midlevel atmospheric water vapor, winds, rainfall	Current GOES sounder
10	7.24–7.44	7.34	2	Lower-level water vapor, winds, and SO_2	Spectrally modified current GOES sounder
11	8.3–8.7	8.5	2	Total water for stability, cloud phase, dust, SO_2, rainfall	MAS
12	9.42–9.8	9.61	2	Total ozone, turbulence, and winds	Spectrally modified current sounder
13	10.1–10.6	10.35	2	Surface and cloud	MAS
14	10.8–11.6	11.2	2	Imagery, SST, clouds, rainfall	Current GOES sounder
15	11.8–12.8	12.3	2	Total water, ash, and SST	Current GOES sounder
16	13.0–13.6	13.3	2	Air temperature, cloud heights and amounts	Current GOES sounder/GOES-12+ imager

Schmit et al. 2005

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- **Advances in Nighttime Satellite Observation (NPP VIIRS DNB)**
  - This one-hour module begins by describing the types of atmospheric and surface features that can be observed at night, recent technical improvements in nighttime visible imaging, the lunar cycle, and lunar modeling.

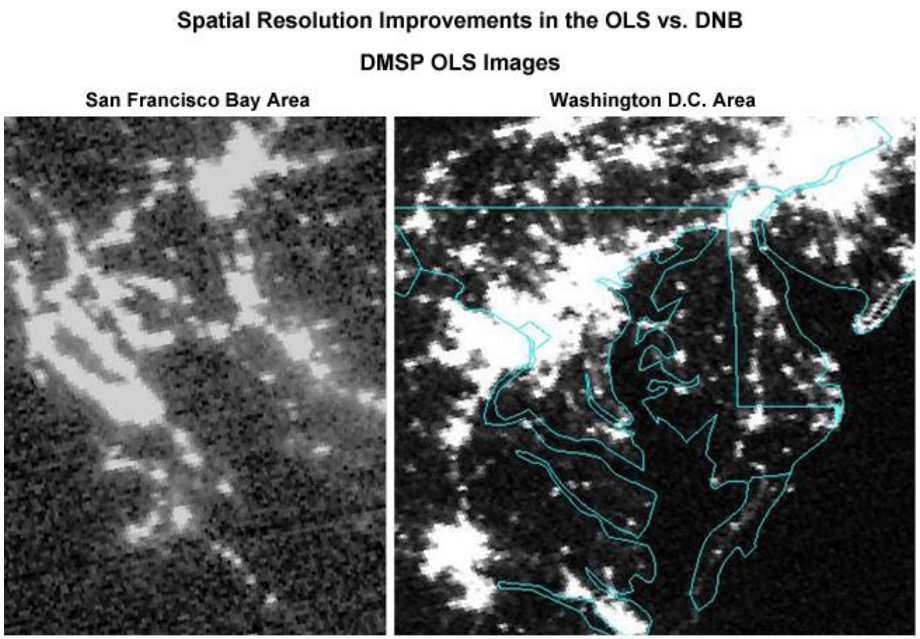
    This lays foundation for the rest of the module, which explores operational uses of nighttime visible observations.

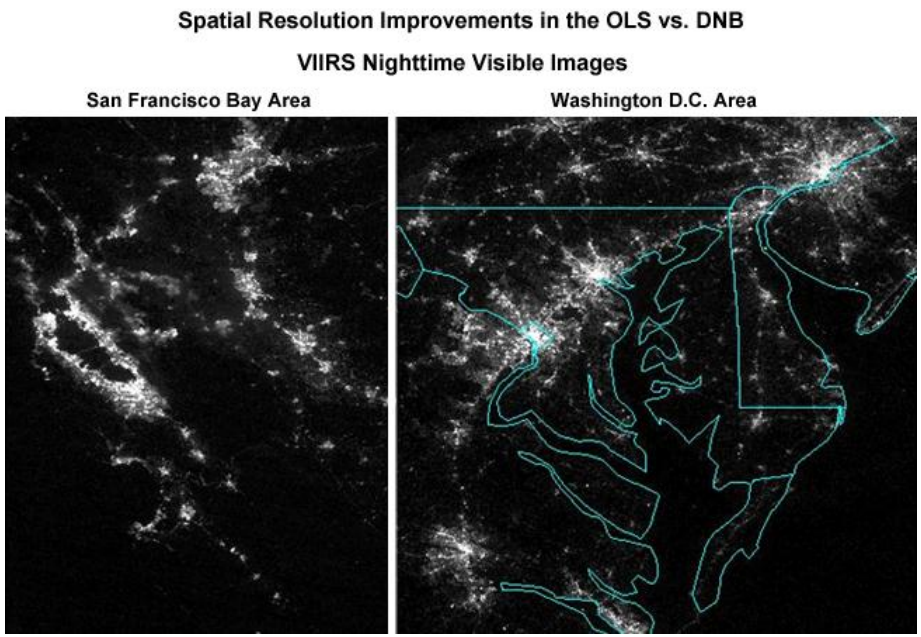
    These range from monitoring tropical cyclones, wildland fires, air pollution, and volcanoes to studying population and economic geography.

- Target users: weather forecasters and other users of nighttime visible observations - from those in the transportation industry to social scientists.
- After completing the module, users will be able to:
  - Describe the capabilities, benefits, and limitations of nighttime visible sensing.
  - Compare the two main nighttime observing methods, nighttime visible and infrared.
  - Describe meteorological and other applications that benefit from nighttime visible imagery.
  - Interpret features in nighttime visible imagery.
  - Describe potential future improvements in nighttime visible technology.

Module Outline:

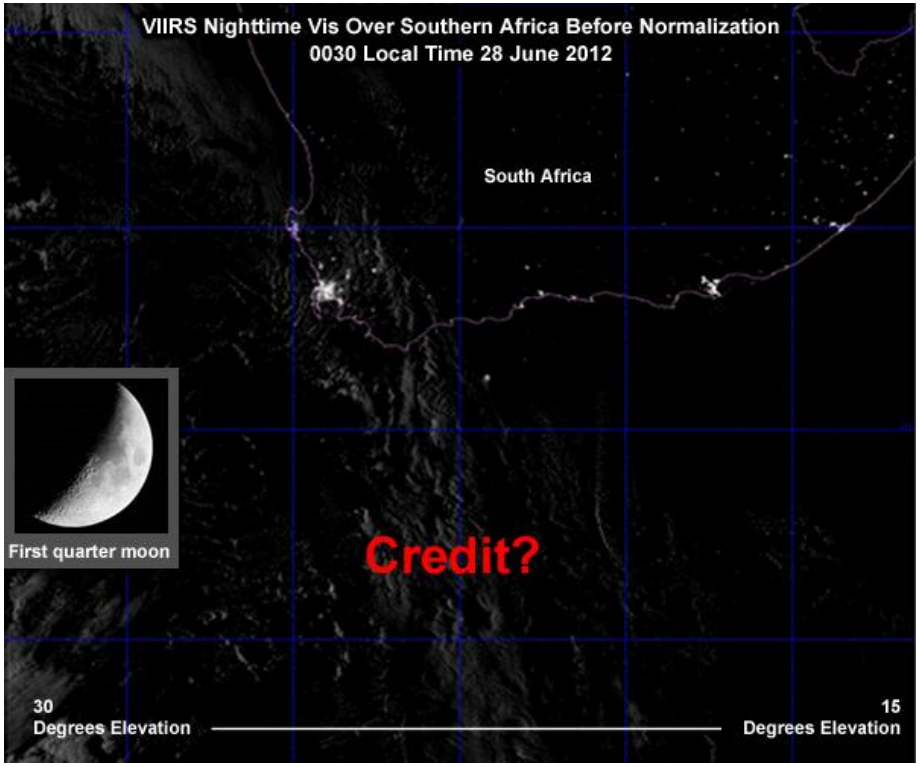
- Section 1: Introduction
  - About nighttime imaging
  - About the module
- Section 2: Nighttime Visible Imaging with the DNB
  - Nighttime illumination
  - DNB improvements

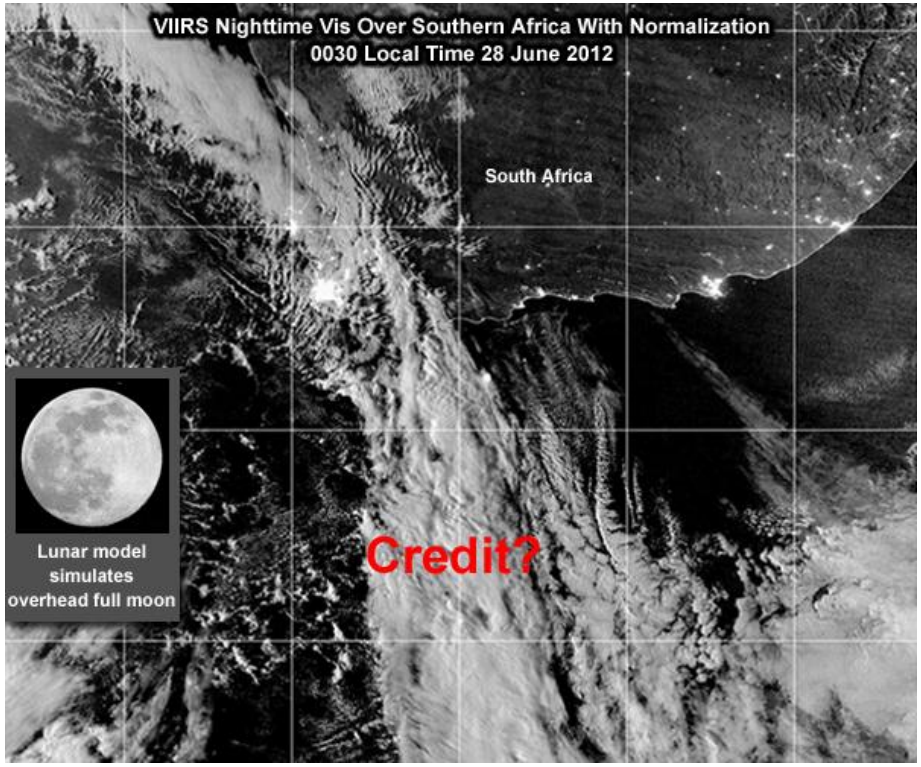




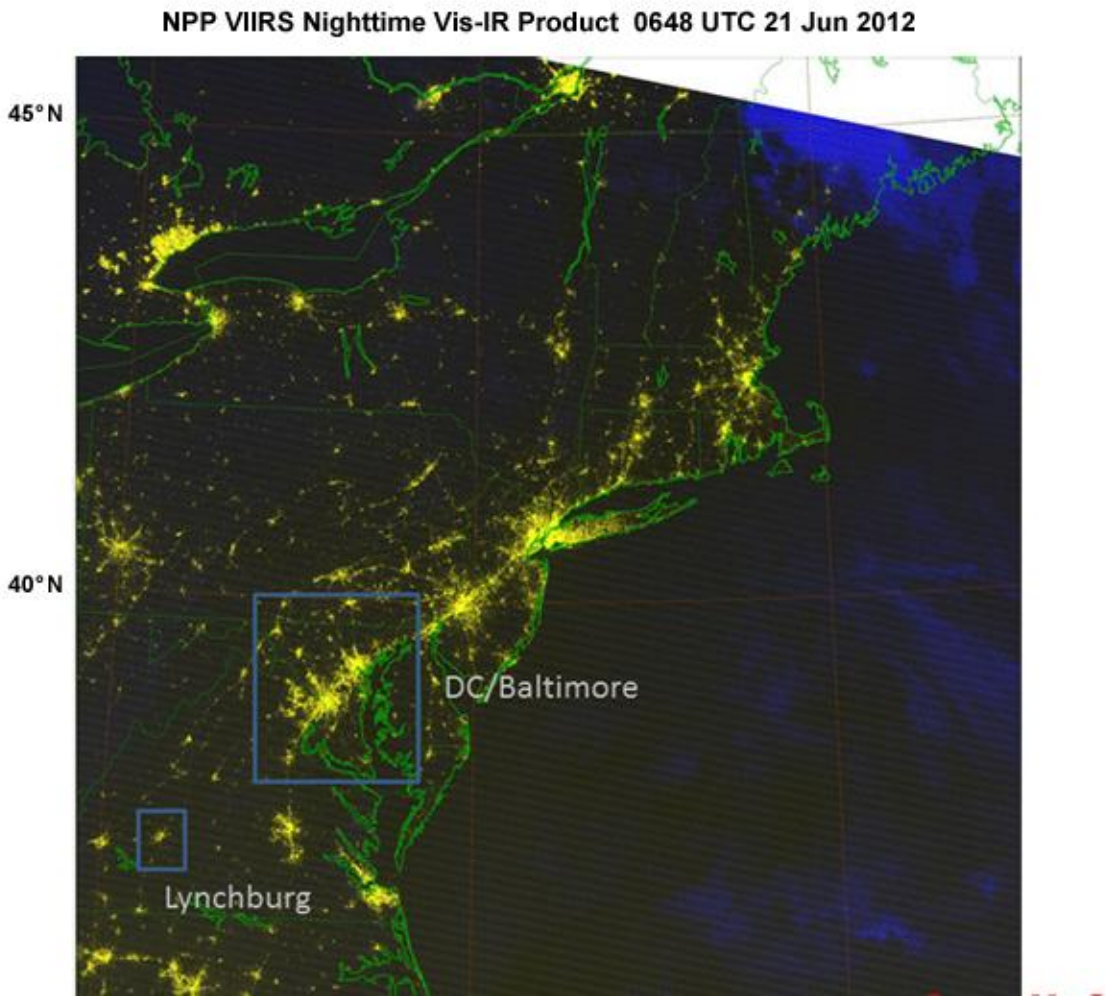
NOAA

- Section 3: Lunar Phases and Modeling
  - Lunar phases
  - Lunar model
  - Lunar availability



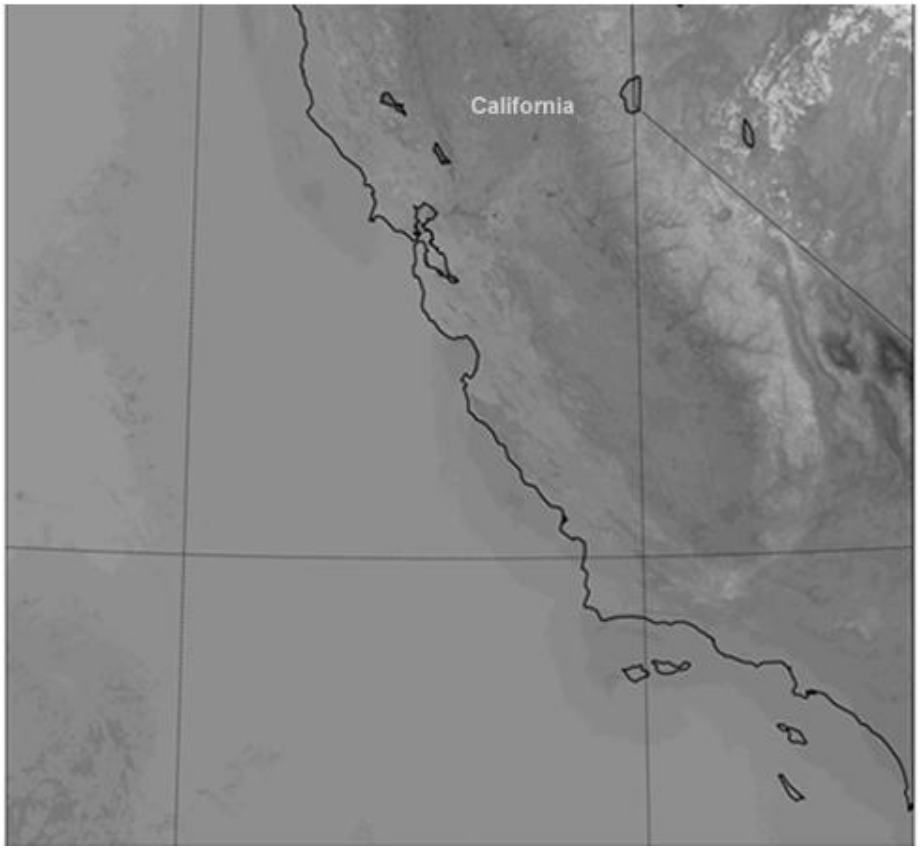


- Section 4: Applications of Nighttime Visible Imaging
  - City lights

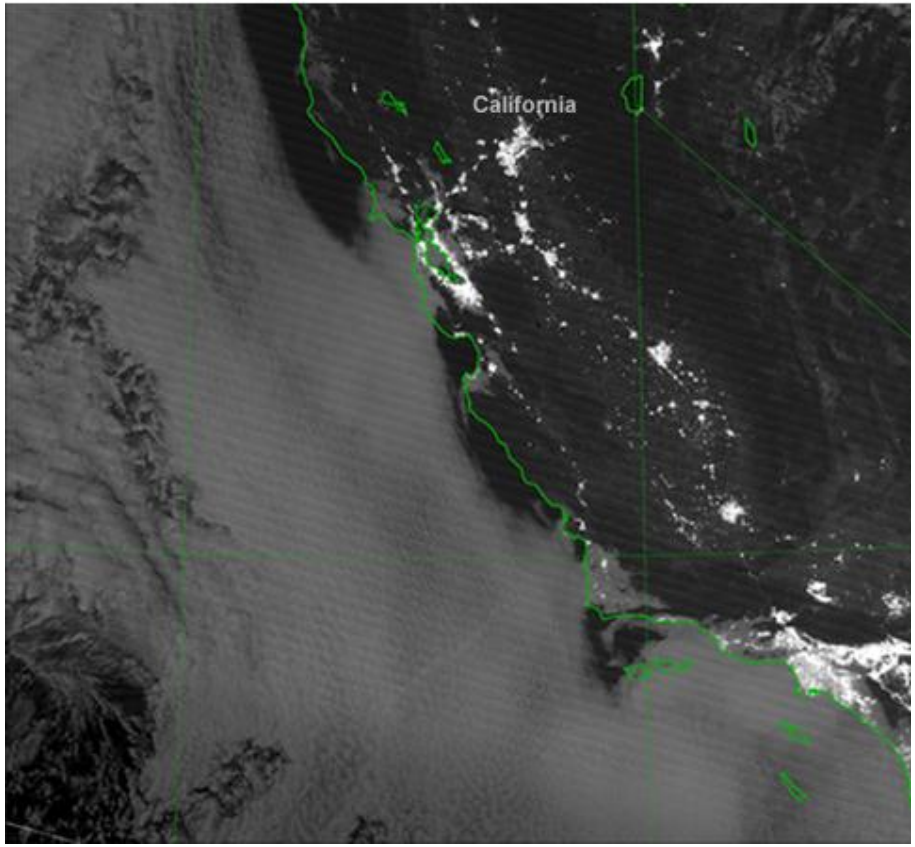


- Section 4: Applications of Nighttime Visible Imaging
  - Tropical Cyclones
  - Fog and Low Stratus

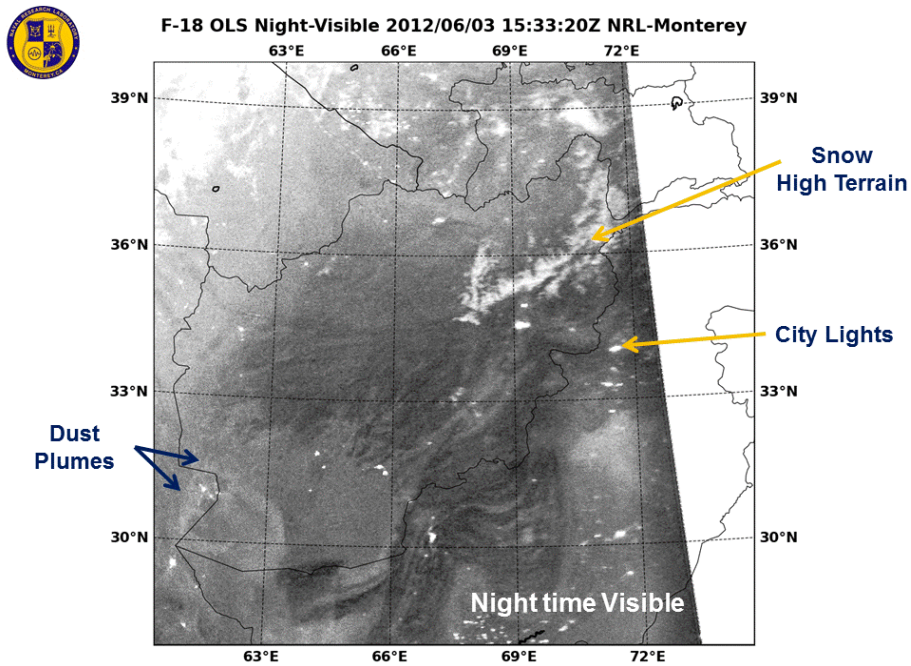
NPP VIIRS Infrared 0330 Local Time 06 July 2012

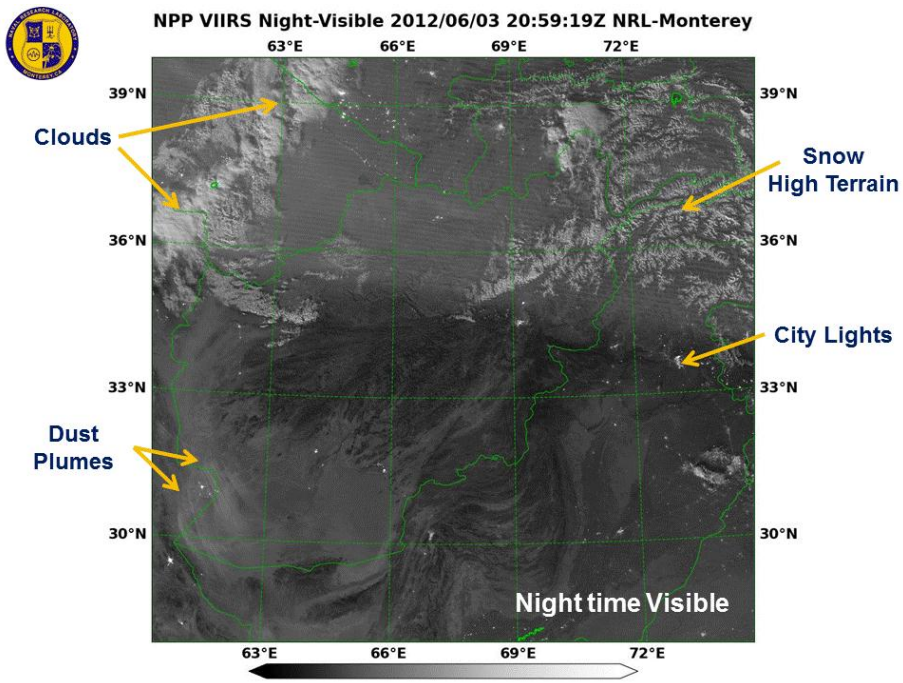


NPP VIIRS Nighttime Visible 0330 Local Time 06 Jul 2012

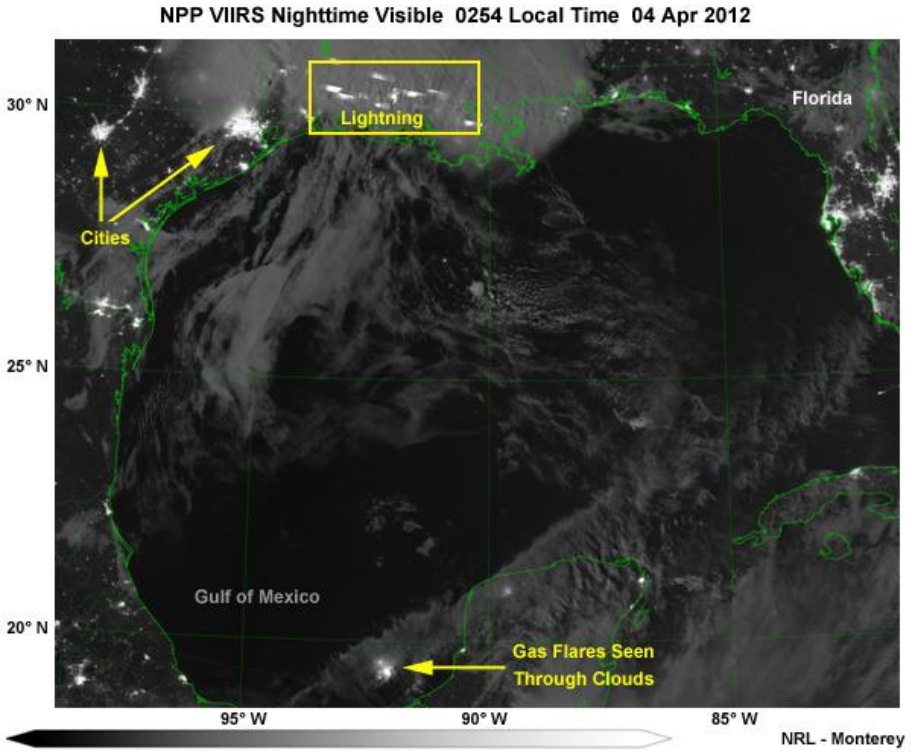


- Section 4: Applications of Nighttime Visible Imaging
  - Arctic and Antarctic nights
  - Wildland fires





- Section 4: Applications of Nighttime Visible Imaging
  - Volcanoes
  - Dust storms
  - Air pollution
  - Ocean surface
  - Auroras
  - Lightning
  - Gas flares
  - Ships and boats
  - Population & economic geography



- Section 5: Future of Nighttime Visible Observation
- Section 6: Exercises