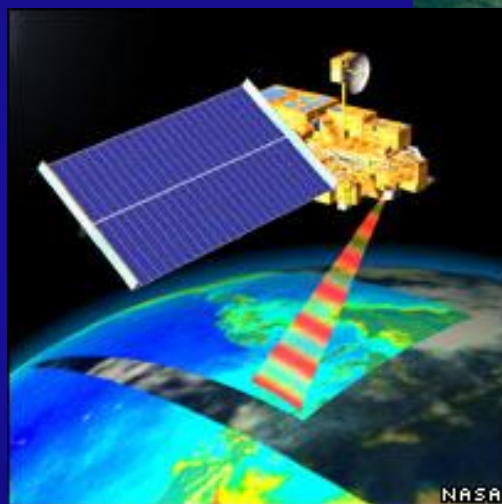


# Using MODIS in Support of CBVM Mapping



**Dave Selkowitz, US Geological Survey, Alaska Science Center**

# Presentation Overview

- Why MODIS
- MODIS Overview
- MODIS Processing Chain
- Canadian Center for Remote Sensing (CCRS)  
MODIS Products
- Additional considerations



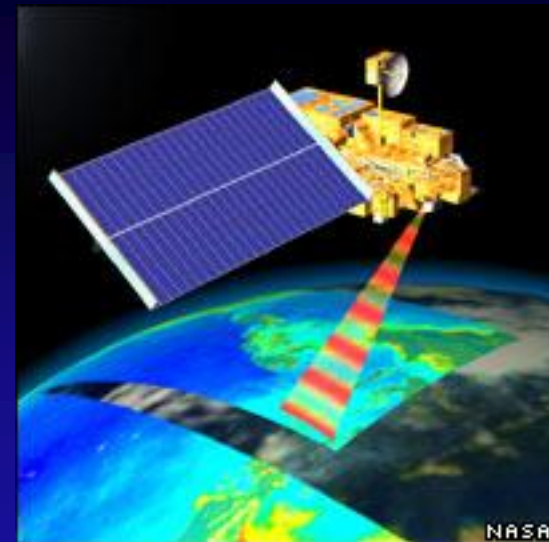
# Why MODIS?

- MODIS provides the best combination of coverage (daily), spatial resolution (250-500 m), spectral bands (7 bands useful for land mapping), and access (free and available to everyone)
- MODIS is similar to but superior to AVHRR, which was used successfully for the Circum-Arctic Vegetation Mapping Project

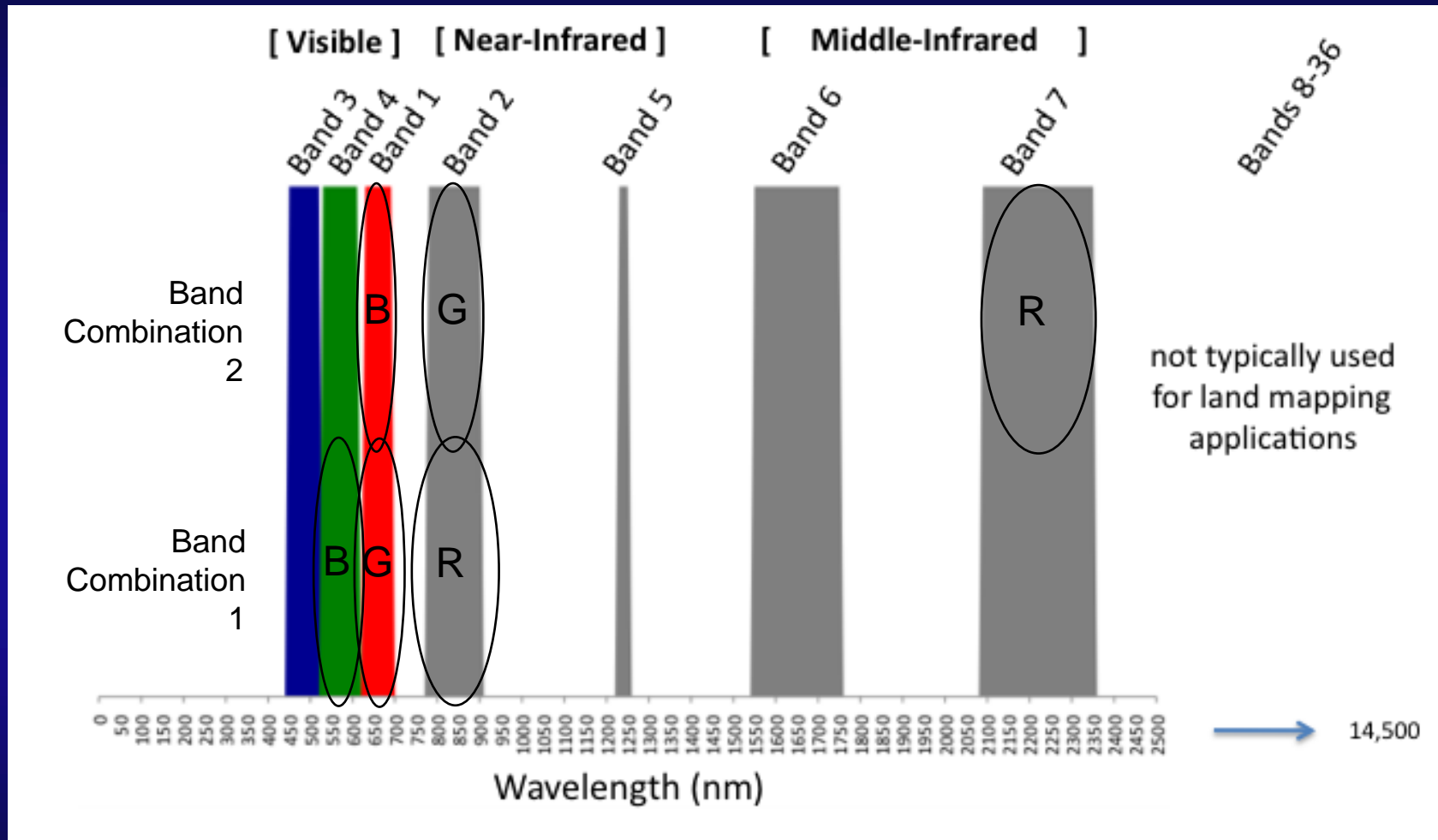


# MODIS Overview

- **MODIS**: the **M**oderate Resolution **I**maging **S**pectroradiometer
- Part of NASA's Earth Observing System
- Onboard both the Terra and Aqua spacecraft
  - Terra launched December 18, 1999
  - Aqua launched May 4, 2002

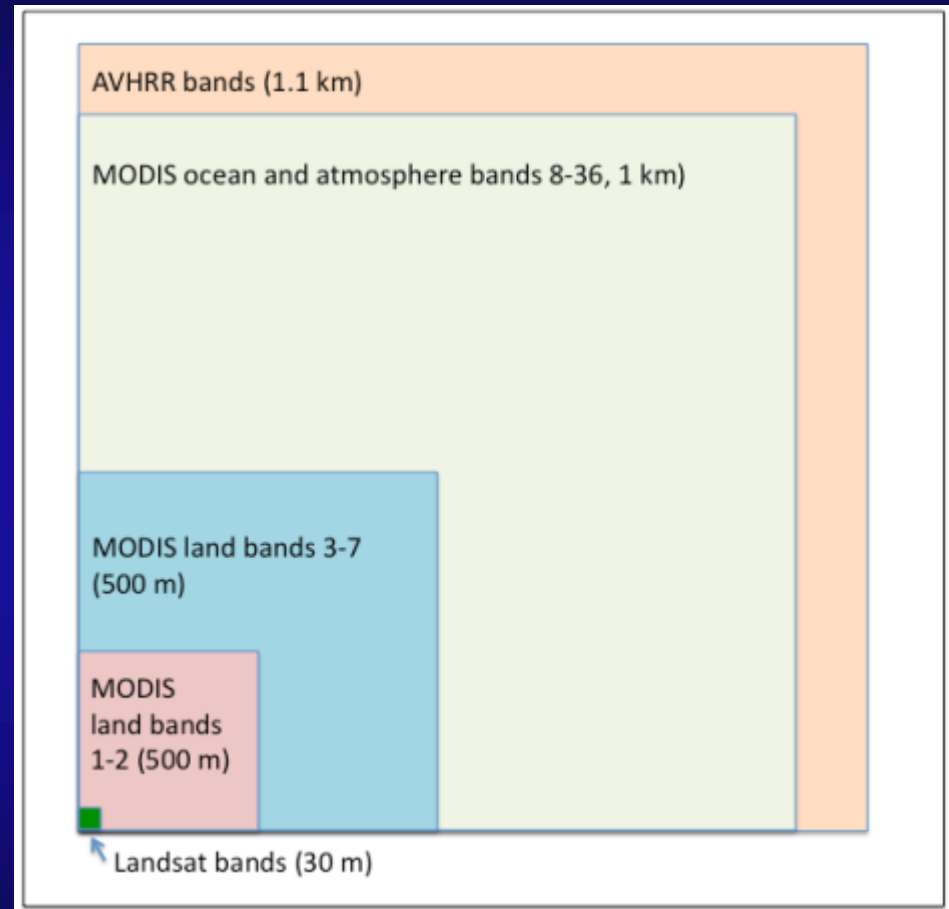


# MODIS Overview: Spectral Bands

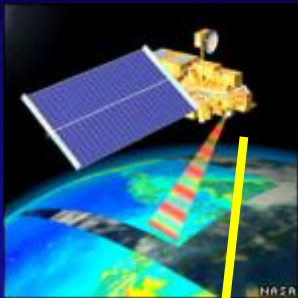


# MODIS Overview: Spatial Resolution

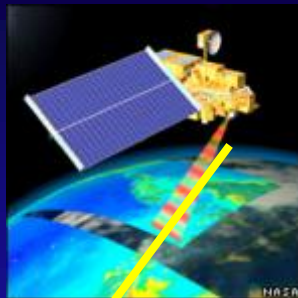
- Bands 1 (red) and 2 (NIR) at 250 m
- Bands 3-7 at 500 m
- CCRS MODIS product resamples all bands to 250 m spatial resolution



# MODIS Imaging and Processing Chain



MODIS  
(Terra)



MODIS  
(Aqua)

- Terra and Aqua continuously imaging
- Data transmission to White Sands Ground Terminal
- Transmission to Goddard Space Flight Center, home of MODAPs



White Sands Ground  
Terminal, New Mexico

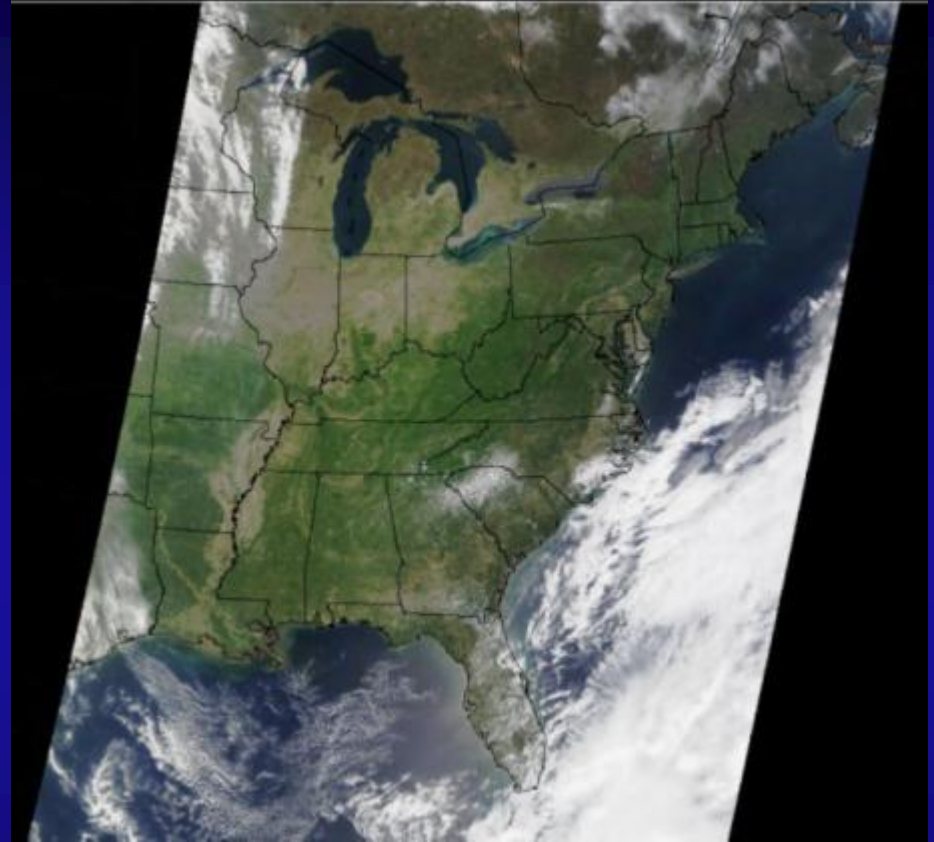


Goddard Space Flight Center  
Maryland



# Overview of MODIS Swath Data

- Calibrated radiance data available in swath format (level 1B)
- No atmospheric correction, cloud masking, compositing, or additional processing
- Original image geometry preserved
- best representation of “what the sensor sees” for a given overpass
- Forms the input for almost all other MODIS products (NASA or other)





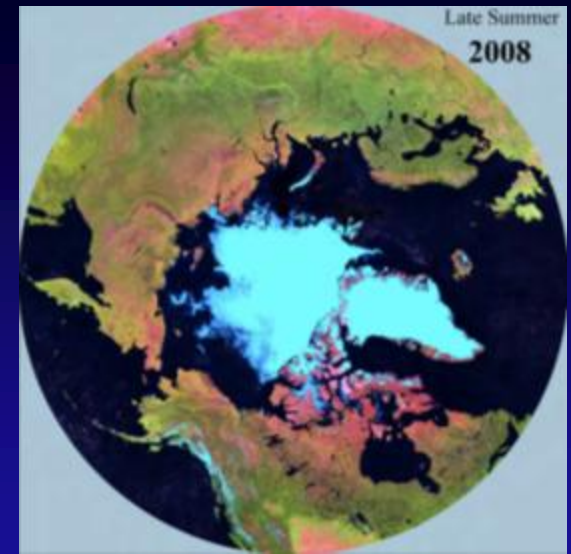
# MODIS Overview: Gridding Process

- Comprehensive, cloud-free MODIS coverage requires additional processing steps
- Swath data are the input to these processes
- NASA's standard higher level MODIS products, including daily surface reflectance, are mapped to the Sinusoidal grid
- NASA MODIS gridding process introduces image geometric distortion
- Geometric distortion appears to be more significant at higher latitudes

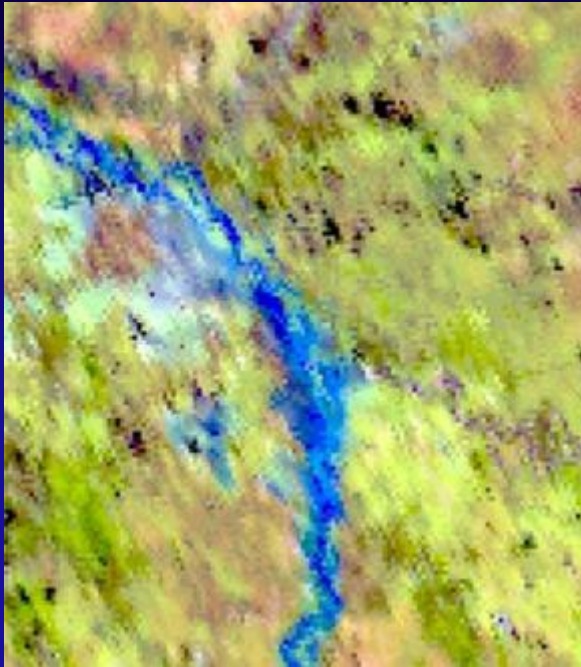


# CCRS MODIS Product

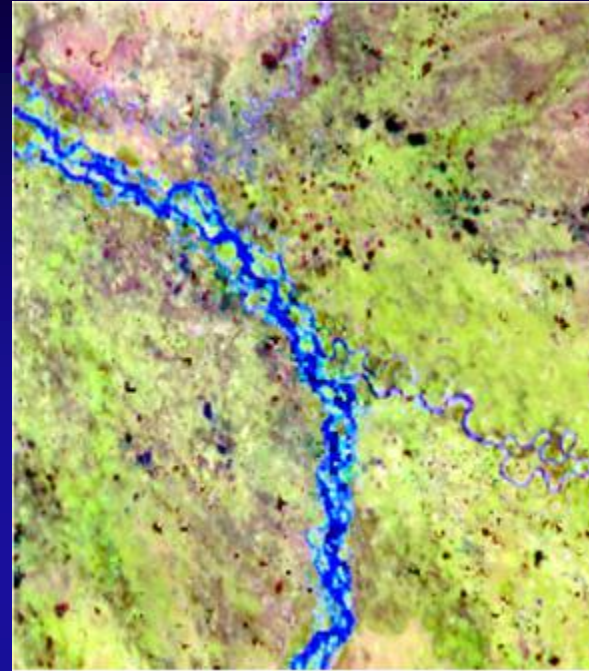
- Developed by Alex Trishchenko, Canadian Centre for Remote Sensing
- Available for (almost) the entire circumboreal region
- 10 day composite period for entire MODIS period of record
- Cloud free mosaics available for late summer 2000-2008
- Uses adaptive regression and normalization image fusion technique to make all bands available at 250 m resolution



# Advantage of CCRS MODIS Product



Standard MODIS (NASA)



CCRS MODIS

- Minimal geometric distortion
- Improved handling of clouds
- Higher spatial resolution (for bands 3-7)



# Additional Considerations

- **Band compositing**
  - Base maps produced to date use a standard NIR-red-green (2-1-4 for MODIS) band composite
  - Base maps could also be made available using an IR-NIR-red (7-2-1) band composite, depending on the preferences of the group or individual
- **Missing areas**
  - A small area within southeast Russia's boreal zone is not included in CCRS arctic mosaic
  - Can extend the mosaic to include this area using MODIS swath data



# Acknowledgements

- **Alex Trishchenko, Candian Center for Remote Sensing, for providing the MODIS circumpolar arctic mosaics**
- **James Brandt, Natural Resources Canada, for providing boreal forest extent boundary for North America**
- **Nicolai Ermakov, Russian Academy of Sciences, for providing boreal forest extent boundary for Eurasia**
- **Nancy Norvell, USGS Alaska Science Center, for assistance with large format map production**



# Resources for More Information

- MODIS web site:
  - <http://modis.gsfc.nasa.gov/>
- MODIS Land Team:
  - <http://modis-land.gsfc.nasa.gov/>
- CCRS MODIS Product:
  - [http://ccrs.nrcan.gc.ca/geospatial/mosaic\\_e.php](http://ccrs.nrcan.gc.ca/geospatial/mosaic_e.php)

