Lab Session: Friday 8 am Name: Aaron Marks

GEOG 362 Introduction to Remote Sensing

Homework 5, Fall 2011

USE INTERNET SOURCES TO PERFORM THE FOLLOWING TASKS:

http://modis.gsfc.nasa.gov/about/specifications.php

http://landsat.gsfc.nasa.gov/about/tm.html

http://asterweb.jpl.nasa.gov/characteristics.asp

http://www.class.ngdc.noaa.gov/data_available/goes/index.htm (GOES imager)

http://www.spot.com/? countryCode=US&languageCode=en

http://www.satimagingcorp.com/characterization-of-satellite-remote-sensing-systems.html

Multiple satellite specifications at the last website

1. Create a *table* of performance characteristics (spatial, spectral, radiometric, swath width, orbit, and temporal) for **ALL** of the following satellite systems:

	Spatial	Spectral	Radiometric	Swath	Orbit	Temporal
MODIS	250m – 1000m	0.1-0.5 um 36 bands	12bit	2330x10 km	705km Sun-Sync	1-2 days
LANDSAT-5	30m-120m	0.06-2.0 um 7 bands	8 bit	185km	705km Sun-Sync	16 days
ASTER	15m 30m 90m	0.08-0.7 um 14 bands	8 / 12 bit	60km	705km Sun-Sync	16 days
GOES	1km vis 4km thermal	0.2 -1.0 um 5 channel	10 bit	40km (8x5km)	35,790km Geo-stat.	8 days
SPOT-5	10m-20m	0.7 – 2.0um 3 channel	8 bits	60x60km 60x80km	822km Sun-Sync	2-3 days

2. Rank the systems above in terms of visible band scene contrast from highest to lowest

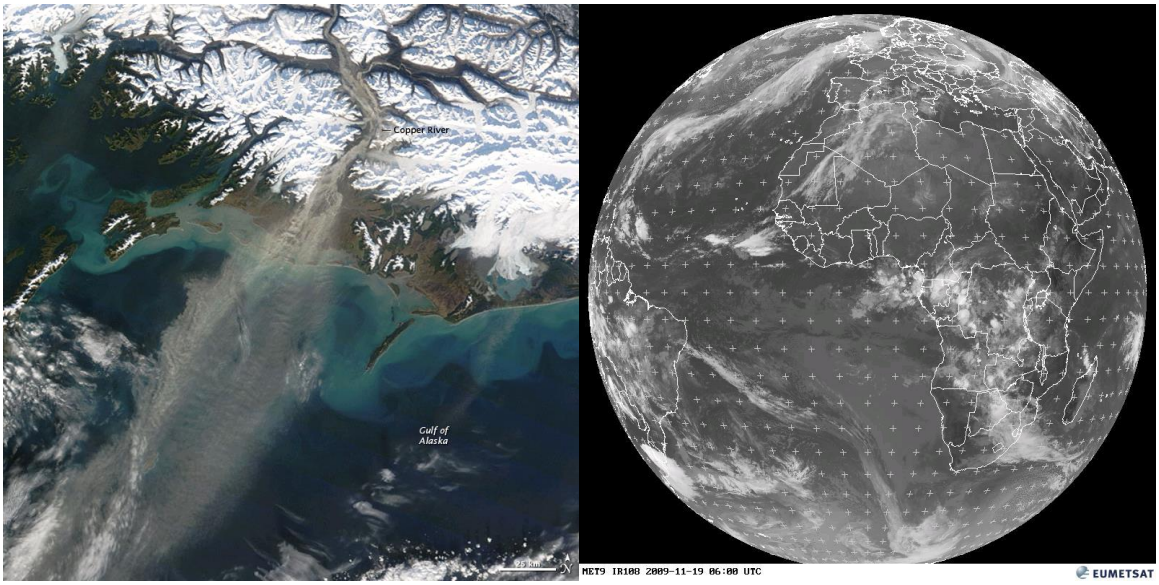
High visible band scene contrast would have a high radiometric resolution, or a high number of bits: MODIS/ASTER > GOES > LANDSAT/SPOT-5

3. What would you do to increase signal strength for a band in the thermal part of the EM spectrum? EXPLAIN WHY IN TERMS OF THE SYSTEMS PERFORMANCE CHARACTERSITCS

To increase signal strength you can change a few things, but at the cost of something else. Increasing the IFOV would increase the amount of energy but would lower the spatial

resolution. You could also lower the altitude which would increase spatial resolution but reduce swath width and temporal resolution.

4. What is the likely type of orbit of the satellite system that produced the two images below (EXPLAIN WHY):
   The image on the left was produced by a sun-synchronous orbit while the second image was produced from a geostationary orbit. The sun-synchronous orbit generates high special resolution image due to its lower altitude. A geostationary orbit is far from the earth and is able to often see an entire hemisphere and doesn't require sunlight (dark image).



5. What is the relationship between swath width and altitude of a satellite system? Explain how this relationship affects spatial and temporal resolutions of a given system.
The lower the altitude a satellite orbits the thinner the swath width becomes; Given the IFOV stays the same, the GIFOV becomes smaller. This would increase special resolution due to the decreased GIFOV as well as temporal resolution due to the thinner swath width, requiring more passes to cover the same amount of land. The opposite occurs if you increase altitude – wider and faster swaths, larger GIFOV with lower spatial resolution.

6. If the spatial resolution for a satellite system is 100 meters and the spectral resolution is fixed at 10 nm in the NIR portion of the EM spectrum, then what can be done to increase the signal strength for the fixed performance characteristic values given?
In order to increase signal strength with fixed spatial and spectral resolution , and therefor

temporal, it is necessary to change the radiometric resolution. Increasing the radiometric resolution would increase signal strength.

7. You're a soil scientist and require greater scene contrast by improving the radiometric resolution from 8 to 10 bit, how might you increase the signal strength required to accomplish this given satellite data with a fixed spatial resolution of 10m and a fixed spectral bandwidth (spectral resolution) of 10nm?

Similar to the last question, ratiometric resolution has been increased. To further increase signal strength, the satellite's altitude could be lowered with an altered IFOV to keep the spatial resolution the same.