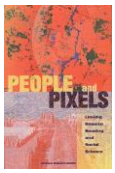
Global Studies

- Encompasses both true global and regional
  - ✓ beyond national or even natural boundaries
- Objectives
  - ✓ inventory
    - ➢ what is out there
      : identification and development of classification scheme
    - ➢ how much of it is there
      : totals and subtotals
    - ➢ where is it
      : patterns of spatial distribution
    - ➢ Note that these are all different and important questions
      : what is the significance of each?
  - ✓ change over time
    - ➢ current
    - ➢ historical
  - ✓ role of land cover in global cycles
    - ➢ link remotely sensed data to in-situ readings
    - ➢ carbon cycle

Global Studies

- Interdisciplinary approach
  - ✓physical: biology, ecology, geography, geology, atmospheric science
  - ✓social: geography, sociology, anthropology, economics -> Why?
    - ➢"socializing the pixel"
      : examination of human cause and effect in relationship to mapped phenomena
      : mining the pixel for hidden meaning



Sensors for Global Monitoring

- large array of (mostly) wide-field sensors
  - ✓ atmosphere, ocean, and land surface
  - ✓ why wide-field? - global coverage daily
- higher resolution sensors (spatial or spectral) often fill calibrating roles
- wide-field sensors (terrestrial vegetation)
  - ✓ AVHRR, SPOT Vegetation, WiFS, MERIS (on ENVISAT), MODIS
- additional sensor types
  - ✓ passive microwave, thermal, hyperspectral (esp. IR)
- EOS Program (Earth Observing System)
  - ✓multi-platform, multi-sensor
    : EOS-AM and EOS-PM, Landsat-7, MODIS a key sensor
  - ✓EOSDIS

Sensors for Global Monitoring

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  - ✓EOSDIS (Earth Observing System Data and Information System)
- Other satellite constellations and sensor suites
  - ✓NASA A-Train
    - ➢ several Earth-observing satellites that closely follow one after another along the same orbital track
    - ➢ crossing the equator northbound at about 1:30 p.m. local time, within seconds to minutes of each other
  - ✓RapidEye (1996; BlackBridge, 2013)
    - ➢ German constellation of 5 satellites to monitor agriculture
    - ➢ 5-meter resolution with 77 km swath
  - ✓Sentinel – European radar satellite constellation

Case Studies

- ***Rift Valley Fever***
  - ✓ Rift Valley in East Africa
  - ✓ mosquito-borne viral disease that can be fatal to cattle and humans
  - ✓ outbreaks every 7-10 years, then disappears
  - ✓ Question: Can we predict outbreaks?
    - link to rainfall discovered
    - heavier than normal rainfall linked to El Nino and to temp rise in the western equatorial Indian Ocean
    - heavier rainfall results in greener than normal vegetation and higher mosquito populations → outbreak of Rift Valley Fever
  - ✓ Note how vegetation condition becomes a surrogate measure several steps removed for outbreaks of Rift Valley Fever

Case Studies

- ***Toxic Algal Blooms in Gulf of Mexico***
  - ✓ Chain of events beginning with iron-rich dust from the Sahara
    - Dust (rich in iron) blown from Sahara to Gulf of Mexico
    - Trichodesmium bacteria use the iron to fix nitrogen into a form usable by plant life, including algae
    - Nitrogen feeds the algae, leading to large algal blooms → toxic "red tides"