Geography 403
Lecture 1
Introduction to Remote Sensing

Needs: Lect_403_1.ppt

Key Terms and Concepts:
Definition of Remote Sensing
Passive Sensors
Active Sensors
Contrast
"Multi" Principle
Overview of Remote Sensing History
Most Basic Terms and Measurements

A. Course Introduction
    1. Review of course syllabus
        a. Course procedure
        b. Topics to be covered
    2. 3 x 5 cards
    3. Knowledge of basic WINDOWS operations required
        a. Will want to use first third of course to familiarize yourself with the way the TerrSet-IDRISI system works on the networks
    4. Length of time required to do labs
        a. Will require work outside of class time
        b. Points have been adjusted to try and reflect amount of time that will be needed
        c. Answers to lab questions should be CONCISE (no more than 1 or at most two sentences in most cases
        d. Check the "materials needed" for labs before hand

B. Remote Sensing--collection of data by systems not in direct contact with the object or phenomena under investigation (can determine properties at a distance)
PP1 1. Media (emitted or reflected EM Rad., also sound and others)
PP2 2. Passive sensors (radiometers, cameras, and scanners)
        a. Photography--color and color IR film, stereo viewing, recorded on a film emulsion
        b. Multispectral scanners--UV, visible, near-IR, far-IR, microwave--"sensed" electronically over a specific part of the spectrum, recorded as digital computer data
        c. Specific "bands" or combinations highlight particular features of surface (e.g. near-IR increases with more vegetation)--"spectral signatures"
        d. Can be processed through a computer system to enhance features and relationships of interest
PP3 3. Active sensors (radar)-produce own "light" and then record reflections

PP4 4. Goal of analysis is to increase **CONTRAST** between objects of interest and background features

PP5-12 5. **"Multi" principle**–powerful analysis tool (multi-band, multi-scale, multi-temporal)

6. Multiple applications in weather and climate studies, land use classification, urban studies, archaeology, soil science, geology, GIS, agriculture, forestry, and many others

C. History of remote sensing

1. First air photos in 1840's, limited use in the Civil War and up till just before WWI
   a. PP13–Boston harbor from balloon, 10-13-1860, James W. Black, 365 m
   b. PP14–S.F. from 17 kite system, 4-18-1906, George R. Lawrence, 610 m
2. After WWI civilian photograph programs begun in 1930's with B&W film, especially with forest applications
3. Color film developed in 1930's
   a. PP15–Green Bay Color (from scanner)
4. "False" Color IR film developed during WWII
   a. PP16–Green Bay Color IR (from IDRISI)
   b. PP17–Milwaukee North CIR (from IDRISI)
5. Many developments in 1960's (UV and Thermal scanners, imaging radar, and satellites--hurricane detection)
   a. PP18–Moffett Field CIR (from IDRISI)
   b. PP19–Moffett Field day thermal (from IDRISI)
   c. PP20–Moffett Field night thermal (from IDRISI)
   d. PP21–Fresno, CA calibrated thermal image
   e. PP22–AVHRR, U.S. composite
   f. PP23–NDVI U.S. composite, Bi-week 13, 7-19 to 8-1/91
   g. PP24–SLAR, Panama
   h. PP25–S. Hem. Ozone and ClO amount
6. Satellites such as LANDSAT gave first large area coverage for resource assessment
   a. PP26–Ocean temperatures in February
   b. PP27–Ocean temperatures in August
7. Weather related applications
   a. PP28–Wx Map with radar, surface obs, and satellite IR image
   b. PP29–U.S. Snow cover
   c. PP30–U.S. Ground surface temperature

D. Basic things to be familiar with

PP31 1. Scientific notation

2. Metric system units and prefixes
3. ℃ and ℃K units

4. Angles
    a. Azimuth--horizontal direction (like cardinal points E=90°)
    b. Elevation--angle above ground surface
    c. Zenith--angle below direct overhead point
5. Nadir point--ground location directly below sensor (center of image if vertical)