Applications

Introduction

- Earth observing satellite missions – driven by a scientific mission & practical applications
- Use remote sensing data to estimate land surface variables
- How can these derived products be used to solve practical real-world problems?

Application areas

- Ecological process models
- Agriculture
- Urban heat island effects
- Global carbon cycle
- Land-atmosphere interaction studies

Ecological process models

- 4 strategies – remote sensing data
  - Provide estimates of variables that drive ecological processing models – *forcing*
  - Test, validate or verify predictions of ecological processing models – *calibration*
  - Update or adjust ecological process models – *assimilation*
  - Use ecological process models to understand remote sensing data

Remote sensing data to drive ecological process models

- Figure 13.1
- Generate model initialization products
- Input data – forcing functions or state variables in ecological modeling
  - Surface atmospheric conditions & vegetation related information
  - Spatial & temporal scales

Remote sensing data to test predictions of ecological models

- Figure 13.2
- Direct comparison of output against estimated variable from remote sensing

RS to constrain ecological process models – data assimilation

- Figure 13.3
- Direct insertion of RS data
- Adjust initial model conditions
  - Reinitialization
  - Reparameterization

RS data to aid interpretation of ecological models

- Figure 13.4
- Ecological model used to constrain, validate or understand RS data
- Rigorous assessment of RS observations & algorithms

Agricultural applications

- Management decisions by farmers
  - Strategic
  - Tactical
  - Operational – remote sensing used

Overview of methods

- Anomaly detection
- Correlate RS to specific variables, soil properties or nitrogen deficiency
- Convert RS quantitatively into various biophysical variables (LAI, temperature) & integrate the information into physically-based crop grownthmodels

RS meet information needs of precision agriculture

- Relate surface reflectance to various soil properties (texture, organic matter, iron oxide content, soil nutrient)
- Quantify plant litter cover
- Weed & insect mapping

Decision support examples

- Irrigation management
- Potato foliar disease prediction
- Cranberry frost prediction

Drought monitoring

- Vegetation condition: monitoring with reflective imagery
- Environmental condition: monitoring with thermal remote sensing
- Soil moisture: monitoring with microwave remote sensing
- Environmental stress: monitoring with combined thermal & reflective imagery

Crop yield estimation

- Agricultural statistics
- Agrometeorological models
- AVHRR indices
- Physiological models
- Mechanical crop growth models
- USDA/FAS Program
- European MARS Program