Mapping Plant Functional Types with Synergistic Use of Spectrometer and Thermal Imagery

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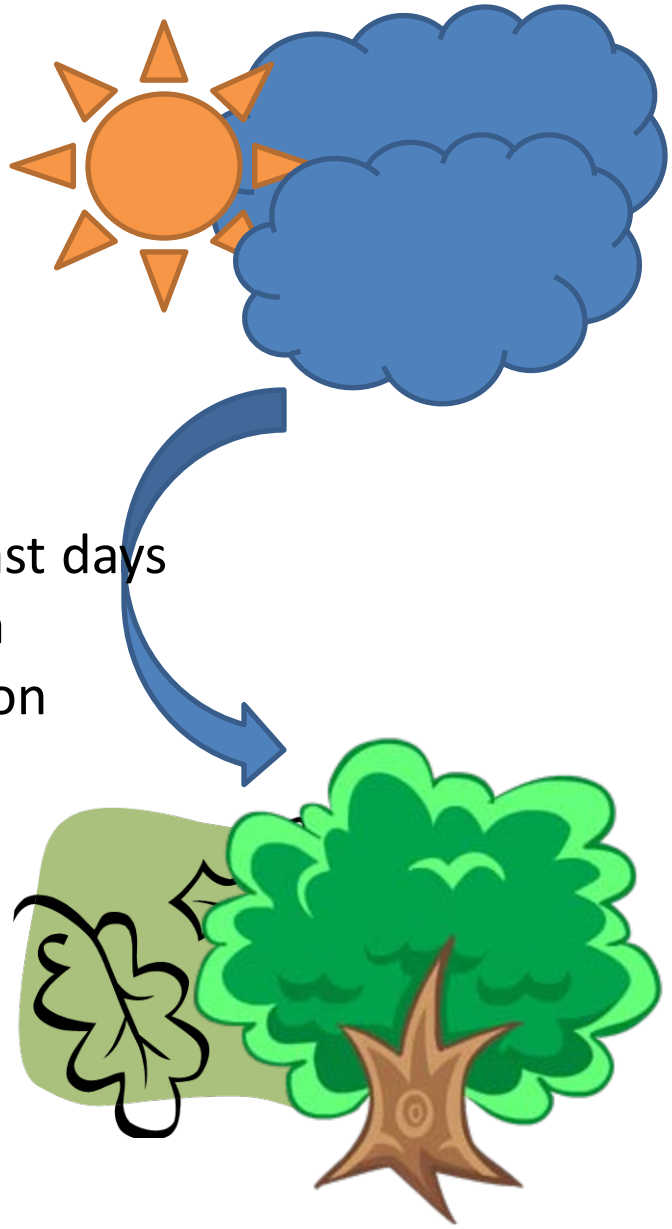
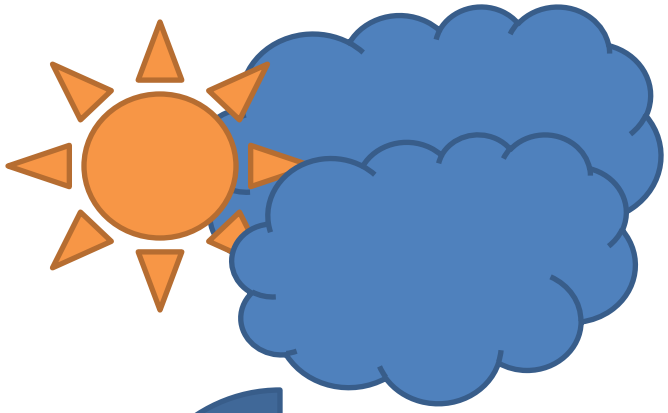


Changes in :

- Air temperature
- Precipitation
- # sunny vs. overcast days
- CO_2 concentration
- Nitrogen deposition



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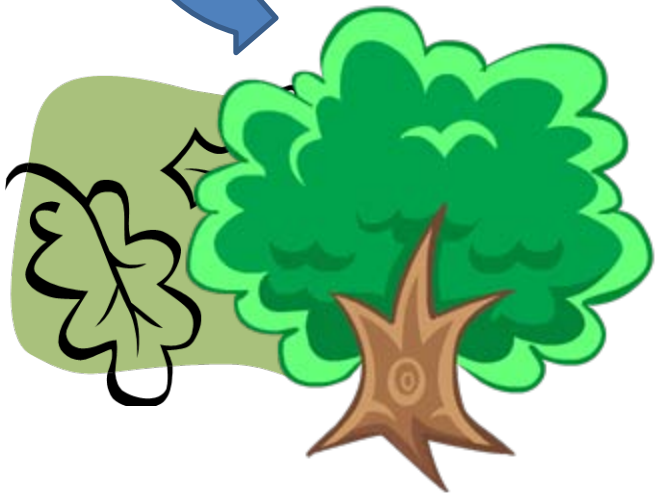

Changes in:

- Timing of greening
- Length of growing season
- Stomatal closure
- Balance among species
- PFTs, spatial & temporal

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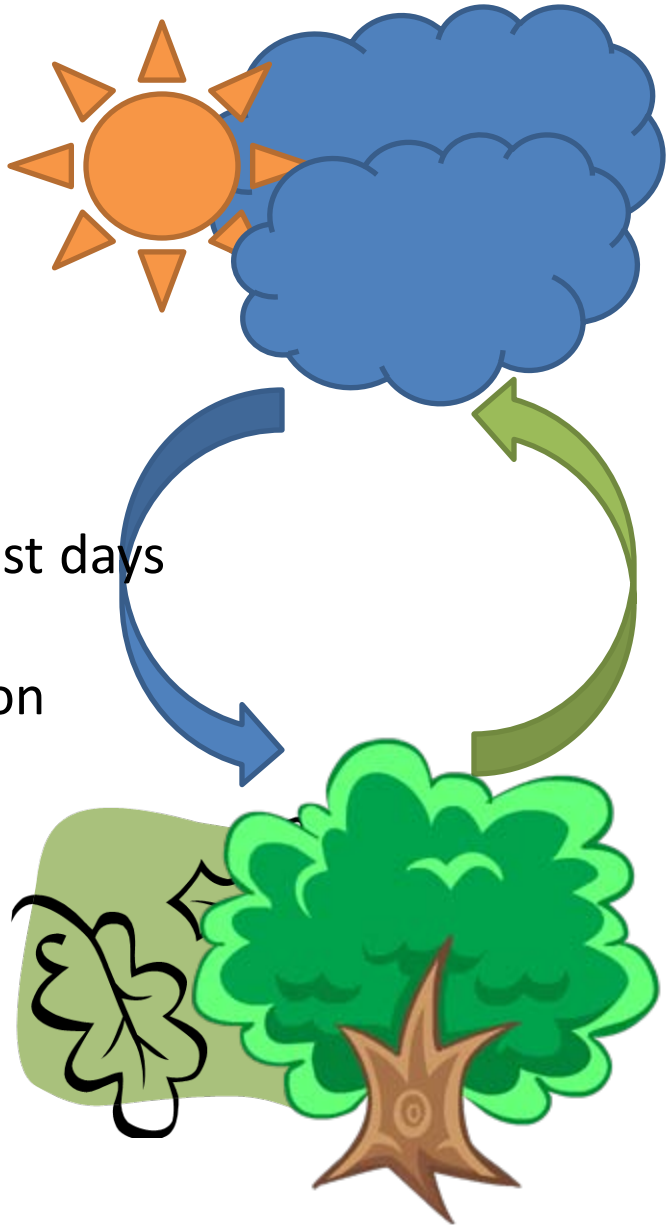

Changes in:

- Albedo
- Evapotranspiration
- Soil moisture
- Surface temperature

Changes in:

- Timing of greening
- Length of growing season
- Stomatal closure
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- PFTs, spatial & temporal

Changes in :

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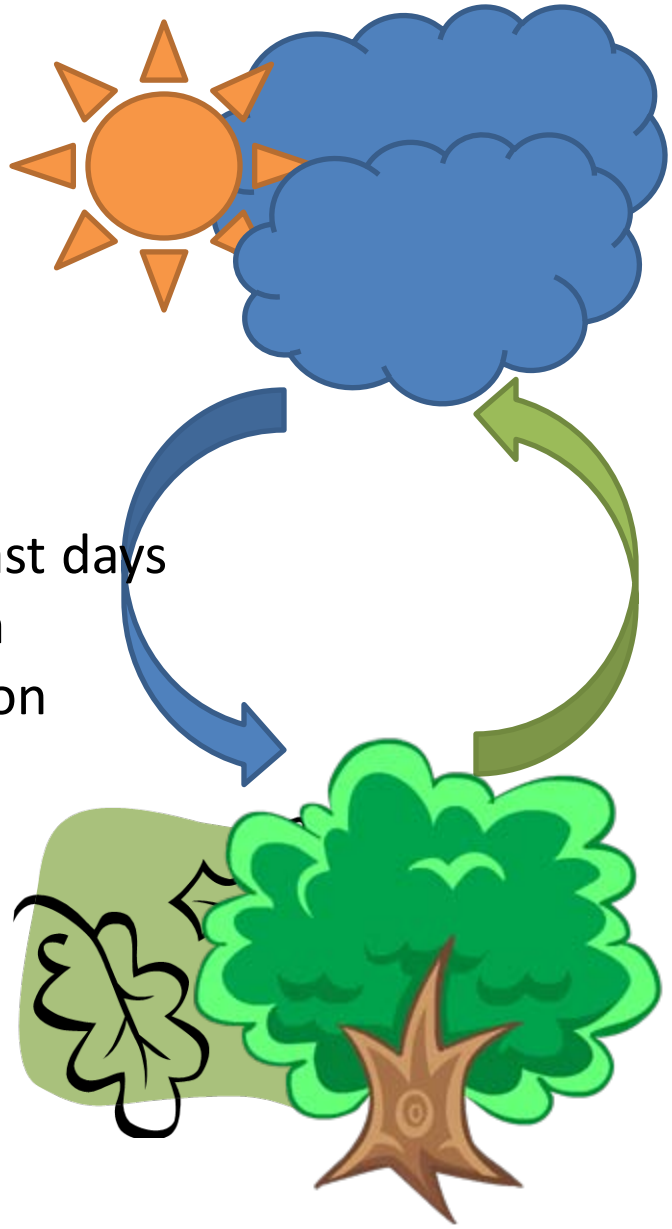


It's not only ***that*** the climate is changing.

It's also ***what*** the climate is changing.

Why do we study PFTs ??

- Plant functional types (**PFTs**) bridge the gap between plant physiology and community and ecosystem processes, thus providing a powerful tool in climate change research.
- **PFTs** are a necessary device for reducing the complex and often uncharted characteristics of species diversity for function and structure attributes, when attempting to model and/or predict ecosystems in future environmental and climate scenarios.
- **PFTs** serves as the bridge that connects climate and ecosystem models. Accurate assessment of PFTs coverage has become more important since modeling effort, land surface modeling.

Woodard & Wolfgang, 1996; Díaz & Marcelo, 1997; Bonan et al., 2002

PFTs link to:

- VQ1. Pattern and spatial distribution and ecosystems and their components [DS 195]
- VQ2. Ecosystem Function, Physiology and Seasonal Activity [DS 191,195,203]
- VQ3. Biogeochemical Cycles
- CQ4. Ecosystem Function and Diversity [DS 194, 195, 203]

HyspIRI and mapping PFTs (theory)

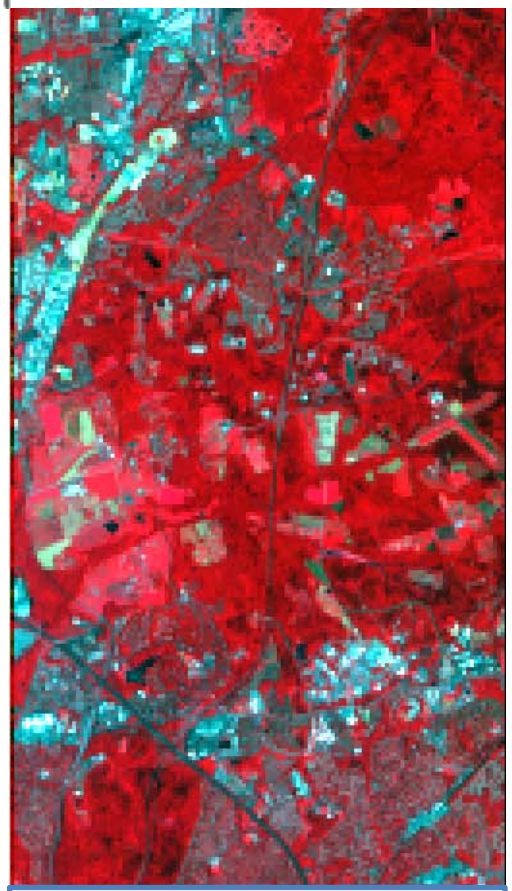
- HyspIRI measures continuous VSWIR spectral feature and even more frequent TIR characteristics to provide ecosystem physiology and energy balance information.

- The value of using TIR in vegetation classification has been recognized, especially for land surface processes modeling purposes at global scale, because of the correlation with ET and LST.

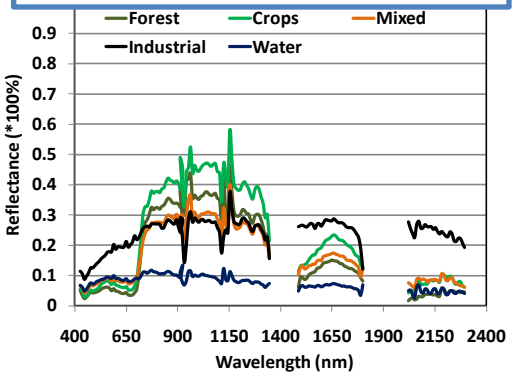
Bonan et al. 2002a,b; Hansen et al. 2000, 2003

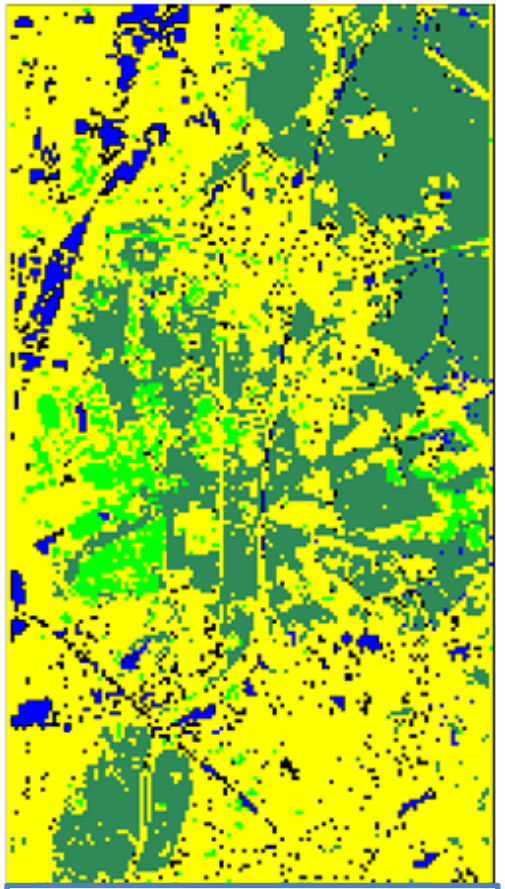
HysplRI and mapping PFTs (tech)

- Utilize cutting edge classifiers to take advantage of BOTH VSWIR and TIR observations
- Spectral features vs. spatial distribution
- Pixel based spectral discrimination vs. Object based segmentation analysis



EO-1 Hyperion VSWIR





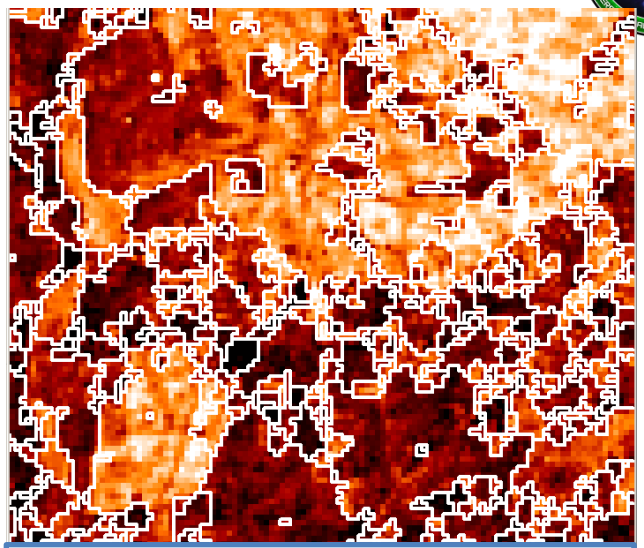
Greenbelt, MD

Mixed Forest

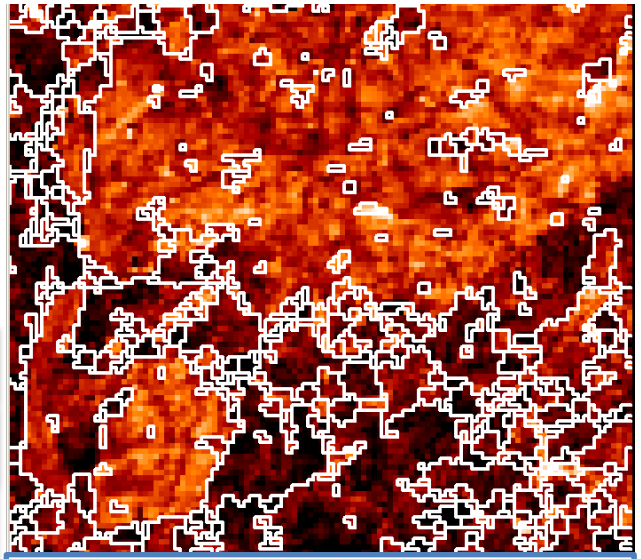
Crops

Residential / Grassland

Business / Industrial

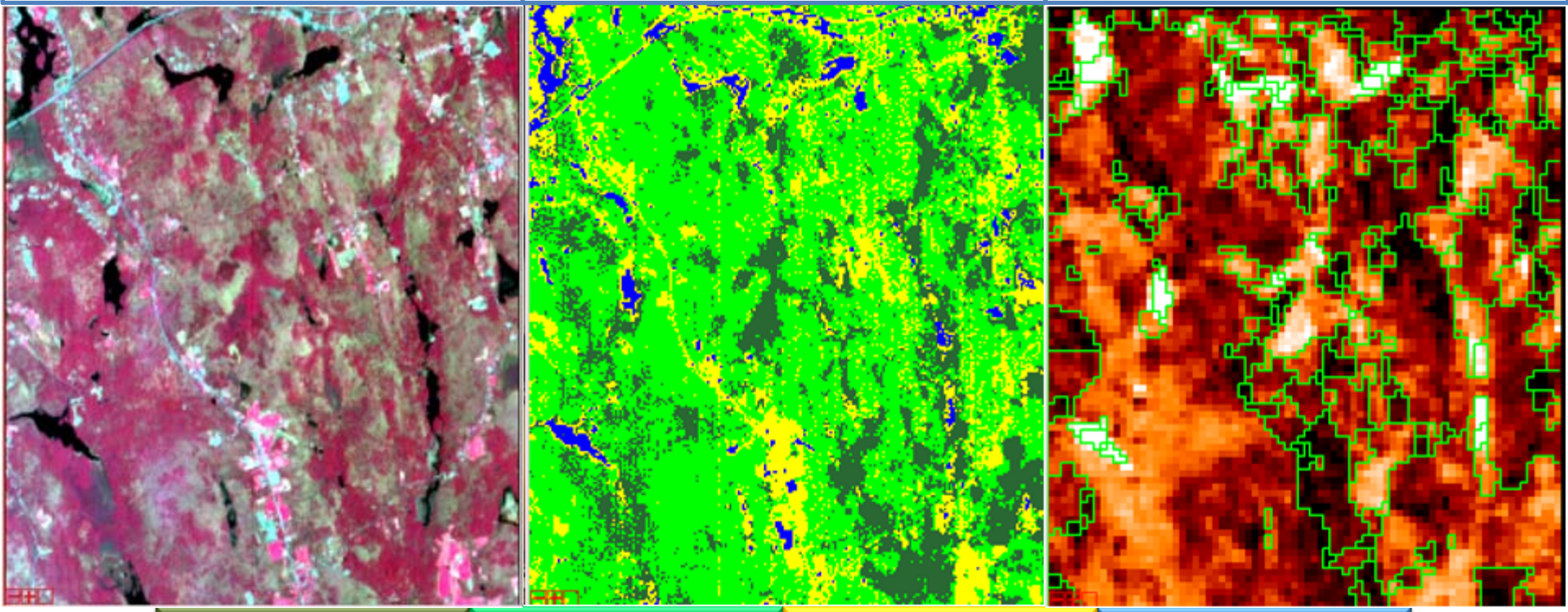


ASTER TIR 04/18/2009



ASTER TIR 11/28/2009

EO-1 Hyperion VSWIR	Harvard Forest, MA	ASTER TIR



Evergreen Needle Leaf	Deciduous Hardwood	Grassland	Water / Road

Accurate assessment of spatial and temporal distribution of PFTs will help us to:

- understand the effects of climate change to terrestrial ecosystems.
- assess feedbacks from ecosystems to the atmosphere.
- provide input parameters essential to land surface and climate modeling.

Thank you!!