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Normalized Difference Vegetation Index (NDVI)

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Overview of Talk

- Overview/History of NDVI
- NDVI Calculation
- NDVI Uses
- OSSIM Band Algebra

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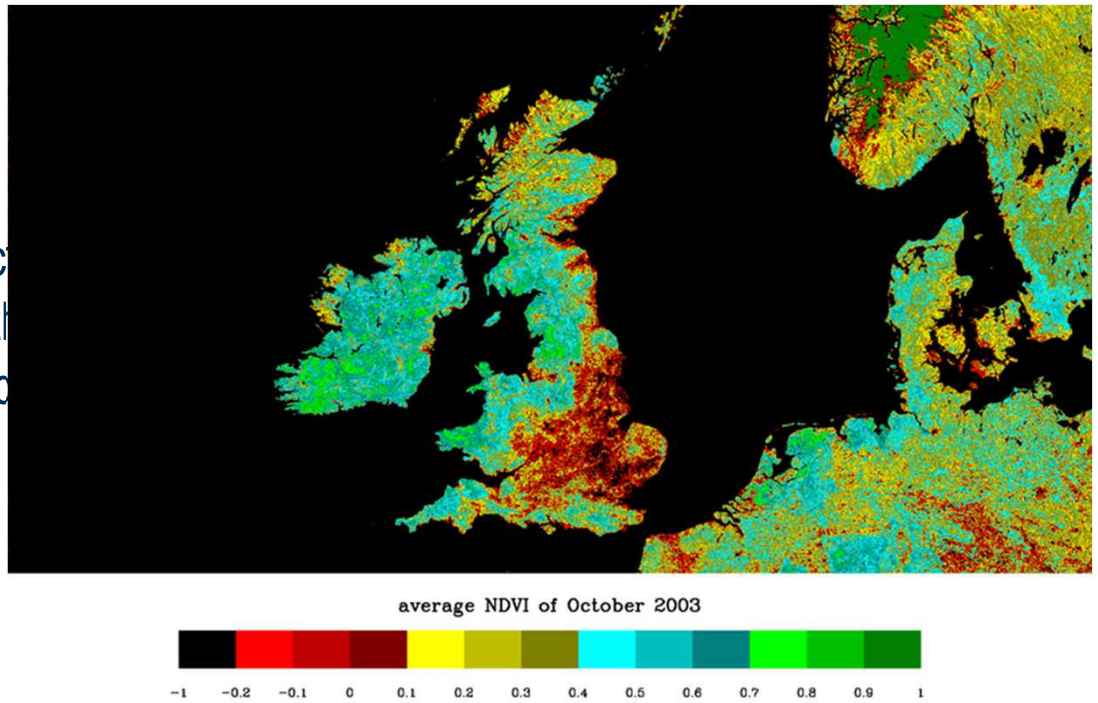
What is NDVI?

- The Normalized Difference Vegetation Index (NDVI) is a simple graphical indicator that can be used to assess whether the target being observed contains green vegetation or not

- Determines the density of
  green on a patch of land

- Based on the principle that
  when light strikes an objec
  light of different wavelengt
  are absorbed and reflected



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NDVI Calculation

- Plants absorb light for photosynthesis
  - Absorbs greatly in the 400nm – 700nm range (VIS)
  - Reflects greatly in the 700nm – 1100nm range (NIR)

- How many leaves a plant has affects the amount of absorption/reflection

$$NDVI = \frac{(NIR - VIS)}{(NIR + VIS)}$$

- Calculations for NDVI always between [-1, 1]
  - No green leaves ≈ 0
  - Highest possible density ≈ +1
  - Clouds and snow < 0

NDVI Calculation - Sensitivities

- Atmospheric effects – specifically water vapor and aerosols
- Clouds – large clouds are easy to filter, but thin clouds may affect measurements, as well as the shadow of those clouds
- Soil Effects – reflectance of soil is directly related to water content; wet soil can effect measurements
- Anisotropic Effects – target geometry and observation time may effect measurements
- Spectral Effects – measurements will vary depending on the sensor used due to the inherent differences between each type of imaging sensor

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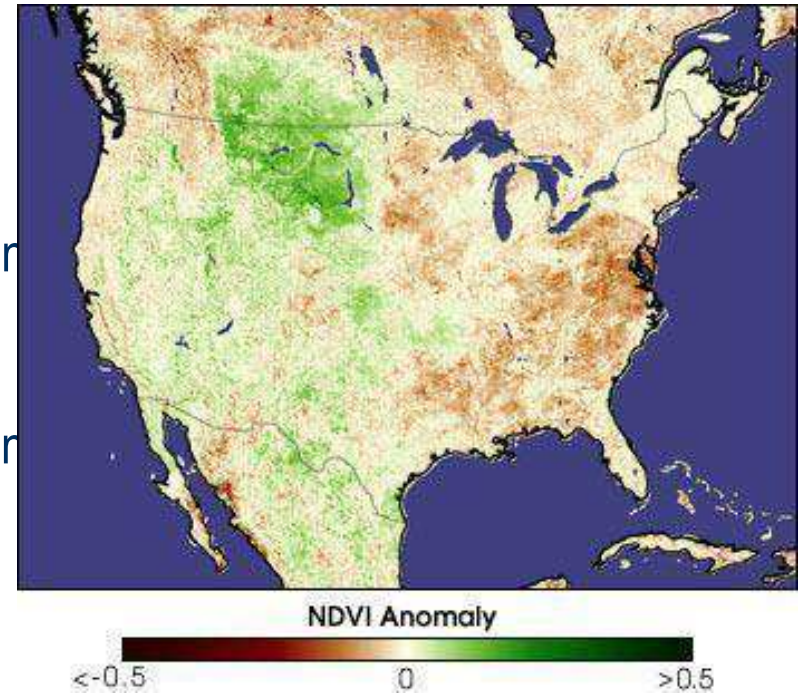
NDVI Used as an Indicator

- NDVI measurements allow for the quantification of absorbed radiation by vegetation
- Photosynthesis is directly related to absorbed photosynthetically active radiation
  - The more visible light absorbed, the more productive the plant
- A region's absorption and reflection of photosynthetically active radiation over a period of time can help to characterize the productivity of that region's vegetation
- When these characteristics are compared to data repositories, the health of a region for a particular time period can be compared that region's norm value



NDVI Example Image

- LandSat7 Image –
  `..\Day02\imagenes\*_HRF.fst`

LandSat 7 Imagery

Band 1 Visible (0.45 – 0.52 µm) 30 m

Band 2 Visible (0.52 – 0.60 µm) 30 m

Band 3 Visible (0.63 – 0.69 µm) 30 m

Band 4 Near-Infrared (0.77 – 0.90 µm) 30

Band 5 Near-Infrared (1.55 – 1.75 µm) 30 m

Band 61 Low Gain Thermal (10.40 – 12.50 µm) 60 m

Band 62 High Gain Thermal (10.40 – 12.50 µm) 60 m

Band 7 Mid-Infrared (2.08 – 2.35 µm) 30 m

NDVI Example Code

- `..\Day06\codigo\bandAlgebra.zip`
- Need to modify the batch files
- Build the project using Cmake
- Compile the solution using Visual Studio
- Copy and modify the runProject.bat file
- Run the project

Resources and References

- Nasa Earth Observatory
  http://earthobservatory.nasa.gov/Features/MeasuringVegetation/measuring_vegetation_1.php

- Tucker, C.J. 1979. Red and photographic infrared linear combinations for monitoring vegetation. Remote Sensing of the Environment, v. 8, p.127-150.

- Jackson, R.D., P.N. Slater, and P.J. Pinter, 1983. Discrimination of growth and water stress in wheat by various vegetation indices through clear and turbid atmospheres. Remote Sensing of the Environment, v. 15, p.187-208.

- Tucker, C. J., W. W. Newcomb, S. O. Los, and S. D. Prince, 1991. Mean and inter-year variation of growing-season normalized difference vegetation index for the Sahel 1981-1989. International Journal of Remote Sensing, v. 12, p.1113-1115.

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Questions?

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