Digital Earth Africa 6-Week Training Course

Week 4: Band indices

What is a band index?

- Satellites collect data in ‘bands’

Spectral range	Landsat 8 bandwidth (micrometres)	Sentinel-2 bandwidth (micrometres)
Blue	Band 2 0.45 – 0.51	Band 2 0.458 – 0.523
Green	Band 3 0.53 – 0.59	Band 3 0.543 – 0.578
Red	Band 4 0.64 – 0.67	Band 4 0.650 – 0.680
Near infrared (NIR)	Band 5 0.85 – 0.88	Band 8 0.785 – 0.899
Short-wave infrared 1 (SWIR 1)	Band 6 1.57 – 1.65	Band 11 1.565 – 1.655

- Water, bare soil, vegetation, snow etc. all absorb and reflect different wavelengths of radiation
- Band index: uses data from one or more bands to calculate a metric that shows a terrain feature

Band index example: NDVI

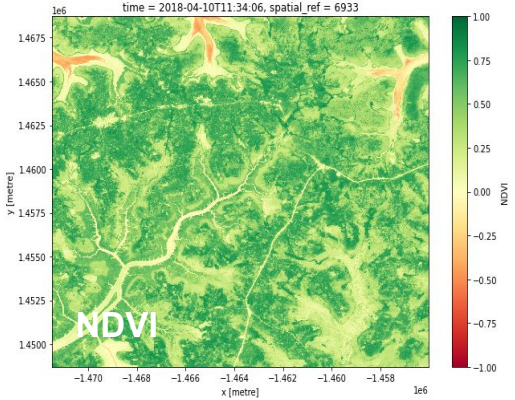
- Healthy green vegetation:
  - Absorbs visible light
  - Reflects near infrared (NIR)

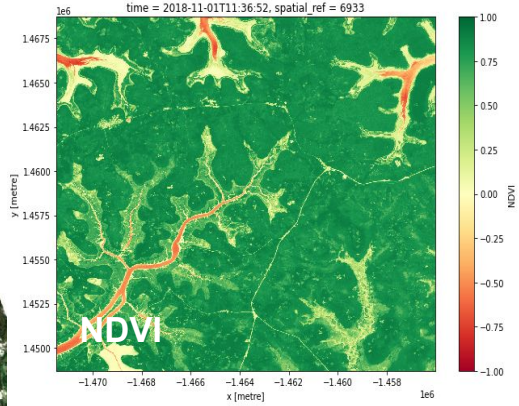
- Normalised Difference Vegetation Index (NDVI)

$$\text{NDVI} = \frac{\text{NIR} - \text{Red}}{\text{NIR} + \text{Red}}$$

- NDVI values range from -1 to 1
- Closer to 1: green vegetation
- Closer to 0, or less than 0: Clouds, waterbodies, soil

Plotting NDVI





- A value of NDVI is calculated for each pixel
- Green = high likelihood of green vegetation
- Yellow/Red = Unlikely to be green vegetation
- Easier to analyse NDVI than RGB data

Other band indices

- Many other types of band indices
- For example:
  - Modified Normalised Difference Water Index (MNDWI)

$$\text{MNDWI} = \frac{\text{Green} - \text{NIR}}{\text{Green} + \text{NIR}}$$

  - Normalised Burn Ratio (NBR)

$$\text{NBR} = \frac{\text{NIR} - \text{SWIR}}{\text{NIR} + \text{SWIR}}$$

Getting help

GitHub wiki:
github.com/digitalearthafrica/deafrica-sandbox-notebooks

Slack: opendatacube.slack.com/

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