Land Degradation Mapping

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MODIS
Landsat & Sentinel-2
Commercial Satellite Data
AVHRR to identify long-term trends

Freely available data
Regional Scale to Local Scale
Tied directly to Primary Productivity
Why use the NDVI for Land Degradation?

NDVI = \frac{(\text{NIR}-\text{red})}{(\text{NIR}+\text{red})}

- Available..., accurate, objective, consistent, & scales
- Proxy for gross primary production

- 1981 → now NDVI3g from AVHRR instruments at 8 km
- Landsat 1982 → now at 30 m + Sentinel-2a & Sentinel-2b
- 2000 & 2002 → from MODIS at 250 m
- 1998 – 2000+ → from other sources (S10, VIIRS, etc.)
- 2007-2015 disaggregation with commercial satellite data to 50 cm level
MODIS & AVHRR NDVI

Integrated mid-March to mid-Nov. 2000 to 2012 for three areas:
51-56 N x 40-54 E;
47-53 N x 54-60 E; &
50-57 N x 60-72 E

Int AVHRR = 0.99*Int MODIS + 13.7
r² = 0.97
AVHRR-MODIS Integrated NDVI
Moldova
NDVI Time Series Detection of Degradation & Intensification

MODIS 250 16-day NDVI time series to identify areas
Africa completed 2000 - 2015
Non-stationary non-linear time series analyses (Hilbert-Huang method)

Confirm areas of degradation or intensification with Landsat and Commercial satellite data

Next we’ll try it with NDVI3g time series from 1981 to 2015
MODIS NDVI Time Series Analysis

Zimbabwe: 18.93445 S x 30.08191 E; double-cropping from 2000-2006, then abandonment
MODIS NDVI Time Series Analysis

Zimbabwe: 18.93445 S x 30.08191 E; double-cropping from 2000-2006, then abandonment
Zimbabwe Land Degradation
18.93 S x 30.08 E

Double cropping 2000-2006 then single cropping since

2005
Zimbabwe
Land Degradation
18.93 S x 30.08 E

Double cropping 2000-2006 then single cropping since
MODIS NDVI Time Series Analysis

Zimbabwe: 18.83133 S x 29.73165 E; double-cropping from 2001-2004, and then again from 2011-2014
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Commercial Satellite Panchromatic Data Mosaic
2000 scenes
100 x 100 km blocks
not blended
Commercial Satellite Panchromatic Data Mosaic
1000 scenes
100 x 100 km blocks
not blended