Phenology Maps

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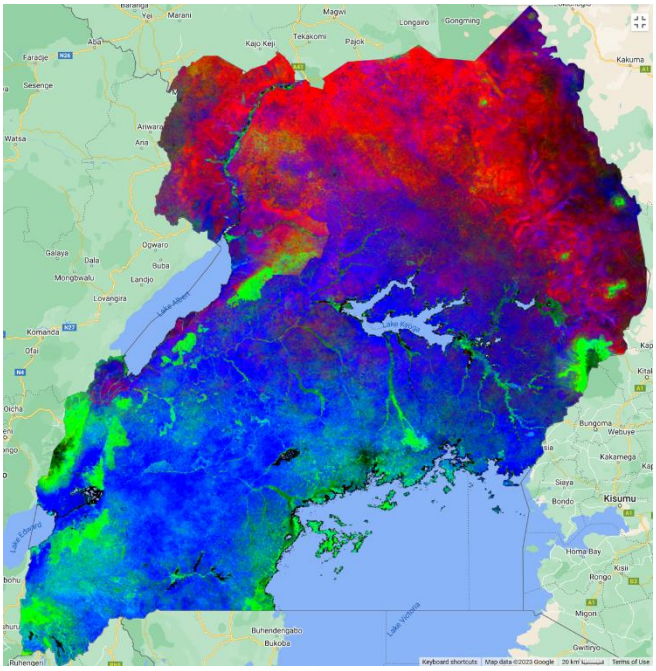
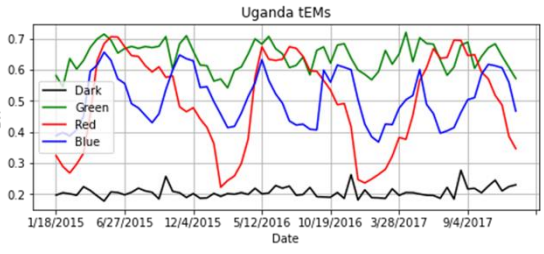
Spatiotemporal analysis of vegetation cycles and temporal mixture modeling can be used to create phenology Maps (Small, 2012). The pixel time series P_{tx} contained in the time space cube with x pixels and t timesteps is represented by a linear combination of spectra or in this case temporal end members (tEMs) C_{ti} and i number of fractions/weights F_{ix} with some residual error Ɛ.

$$P_{tx} = \sum C_{ti} F_{ix} + Ɛ$$

The fractions F_{ix} can then be visualized to study the vegetation phenologies.

Phenology maps were created at national scale using MODIS EVI for Nigeria, Burkina Faso and Uganda respectively. The temporal endmembers used to create the maps are shown next to the phenology maps. The evergreen vegetation is represented with green, single cropping cycle per year in red and two cropping cycles per year in blue. (Note that even though similar phenologies are used in the RGB channels of the false color composites, they can vary vastly from country to country. For example, the regions shown in red in Uganda which correspond to a single cropping cycle per year have a much smaller dry season than the single cropping cycles in Nigeria or Burkina Faso)





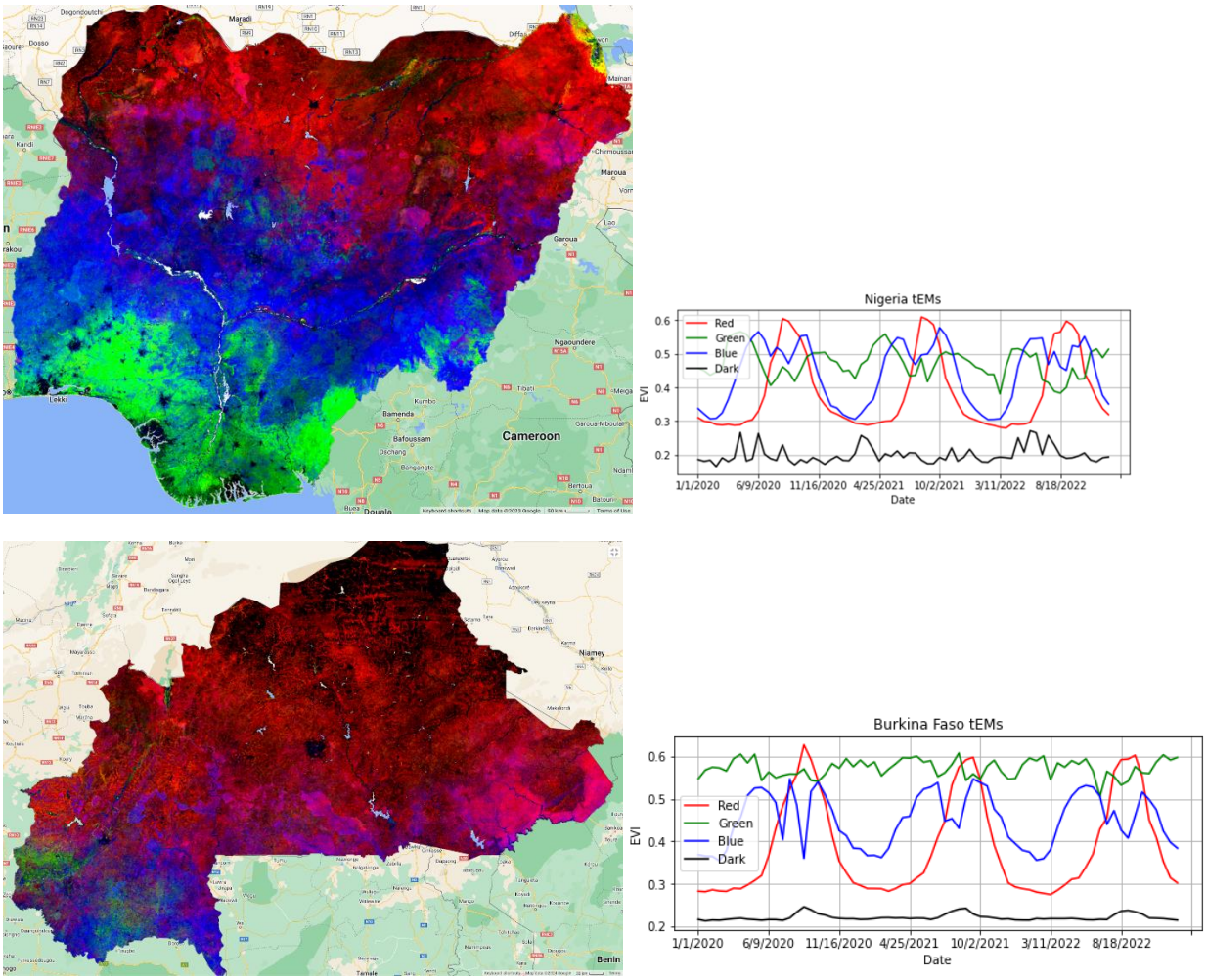


Figure 1: Phenology map for Uganda, Nigeria and Burkina Faso respectively using MODIS 250m imagery is shown. Areas in red represent regions with single cropping cycles per year with prolonged dry season where the irrigation detection methodology works well. Areas in blue represent regions with dual cropping cycles per year and green represent evergreen regions.