

# Sentinel-2 based Land Surface Phenology in complex Southern African Landscapes

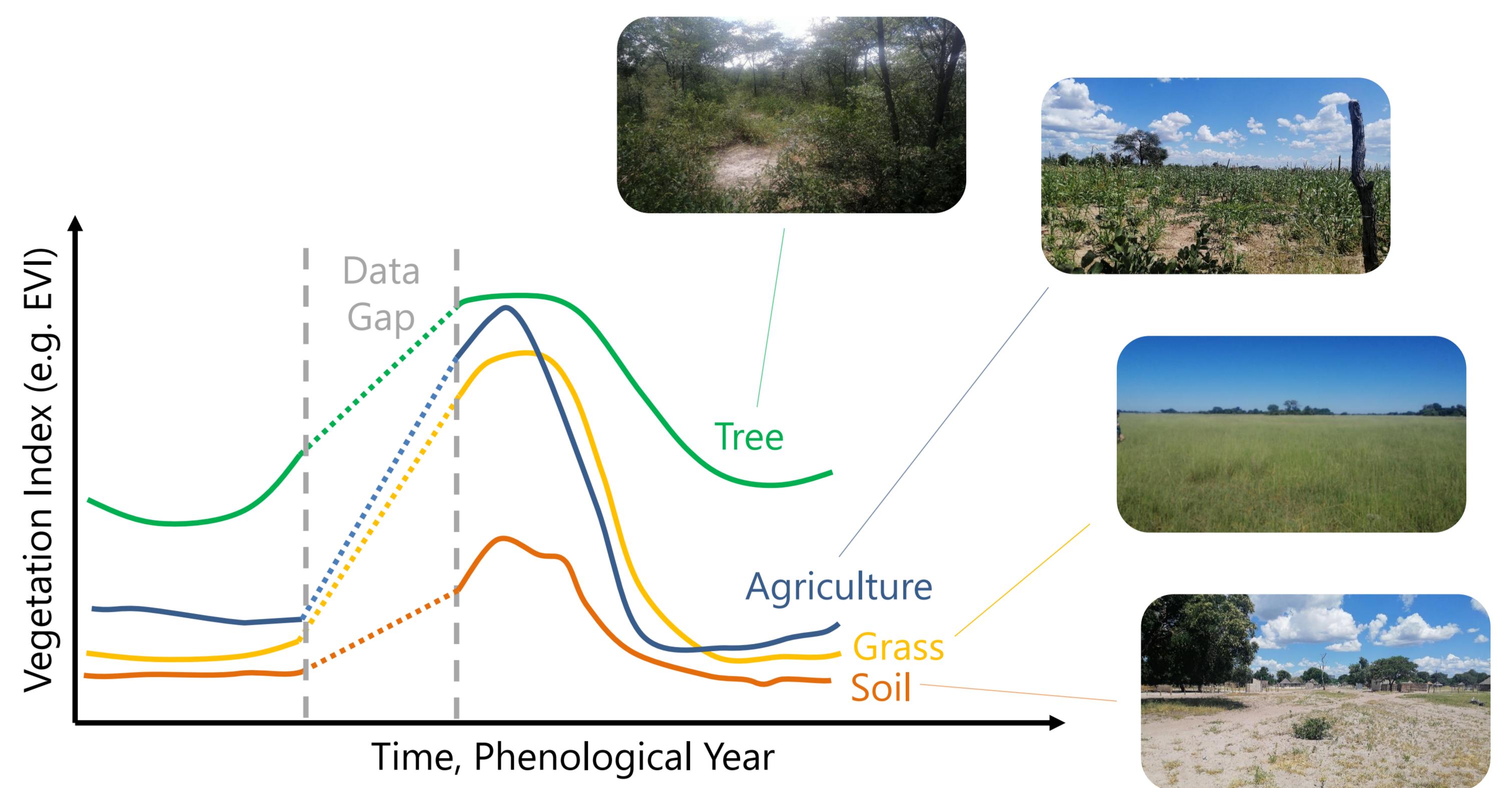
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## Land Surface Phenology

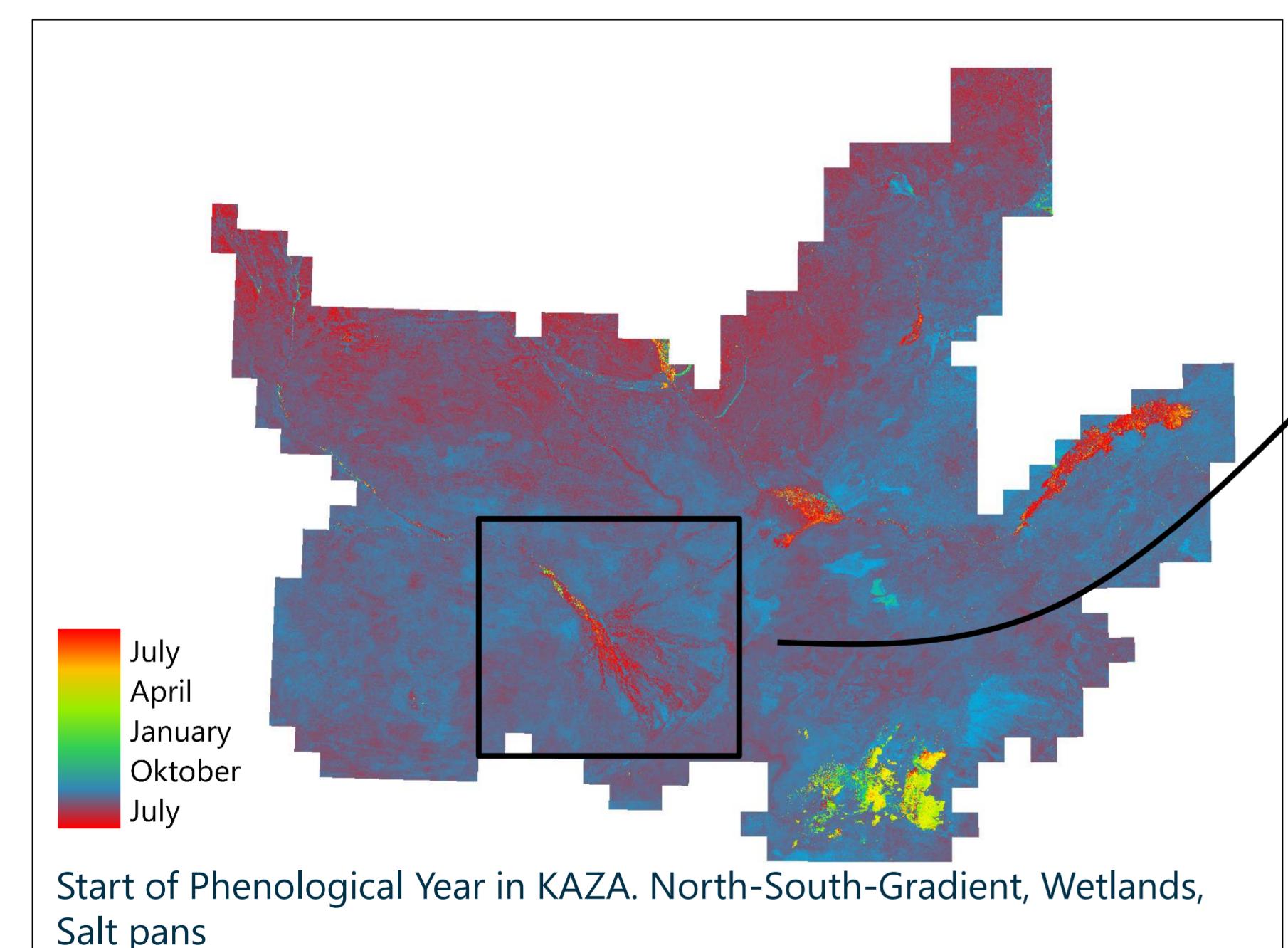
- Phenology is the study of timing and magnitude of ecological events (e.g. dormancy, leaf emergence and growth, peak photosynthetic activity, senescence)
- Land Surface Phenology (LSP) is understood as the temporal change of a Vegetation index (e.g. EVI) of a vegetation composite in a pixel (e.g. dense forest or shrub-grass-mix)
- Reduction of Sentinel-2 Time Series to parameters describing the EVI curve
- Intuitively understandable ecological parameters
- 39 Yearly parameters and Multi-year statistics (e.g. inter-annual variability, long-term average,...)
- 10m Resolution



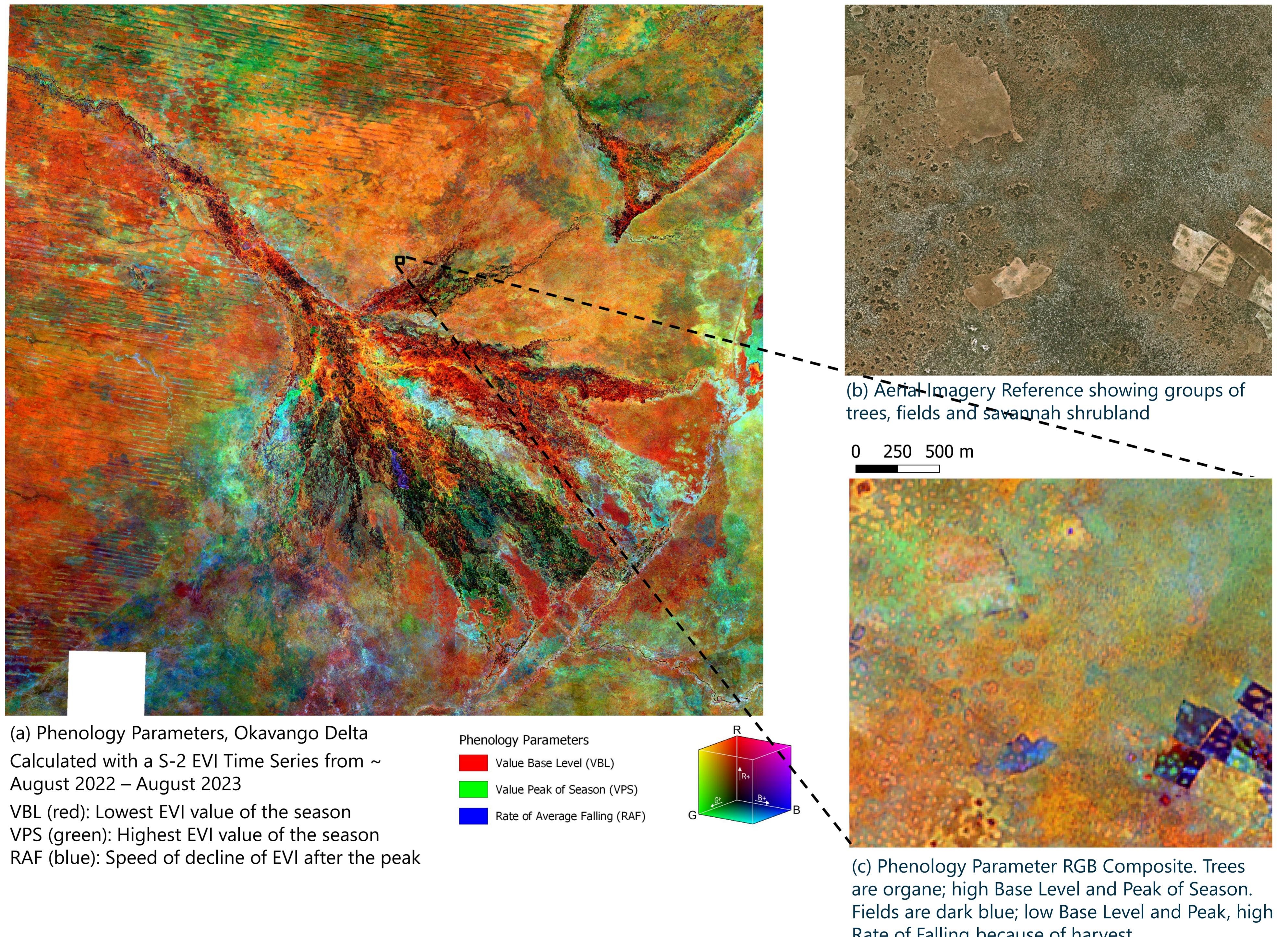
## Study Area KAZA



- The Kavango-Zambezi Transfrontier Conservation Area (KAZA) is the largest network of environmental protection areas
- It has a large climatic gradient and heterogeneous ecosystems
- North, south, savannah and wetlands have different phenological timings and require a individual pixel-specific calculation
- Polar-based Transformation transforms time as Day-of-Year (DOY) into a circular variable (after DOY 365 follows DOY 1) [2]
- This is used to calculate the pixel-specific long-term average start of the phenological year



Start of Phenological Year in KAZA. North-South-Gradient, Wetlands, Salt pans



## Next Steps

- Identification of underlying variables (factor analysis + dimensionality rotation)
- Reduction to a small set of only the most important key phenological parameters
- Classification of vegetation types
- Comparison to MODIS and Landsat Satellite Data

## References

- [1] Frantz, D. (2019): FORCE—Landsat + Sentinel-2 Analysis Ready Data and Beyond. *Remote Sensing* 11 (9): 1124. <https://doi.org/10.3390/rs11091124>.
- [2] Brooks, B.-G.J.; Lee, D.C.; Pomara, L.Y.; Hargrove, W.W. (2020): Monitoring Broadscale Vegetational Diversity and Change across North American Landscapes Using Land Surface Phenology. *Forests* 2020, 11, 606. <https://www.mdpi.com/1999-4907/11/6/606>
- [3] Frantz, D.; Hostert, P.; Rufin, P.; Ernst, S.; Röder, A.; van der Linden, S. (2022): Revisiting the Past Replicability of a Historic Long-Term Vegetation Dynamics Assessment in the Era of Big Data Analytics. *Remote Sens.* 2022, 14, 597. <https://doi.org/10.3390/rs14030597>

