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Climatematch
Academy —

Team Ritenuto: Effects of land use change on albedo in Lake Chad Basin

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Motivation and context

Lake Chad has significantly decreased and split in the 2nd half of the 20th century

Sources of the shrinking: climate (droughts) and human activity (irrigation)

Implications: changing land use, population in the area is not long-term resilient

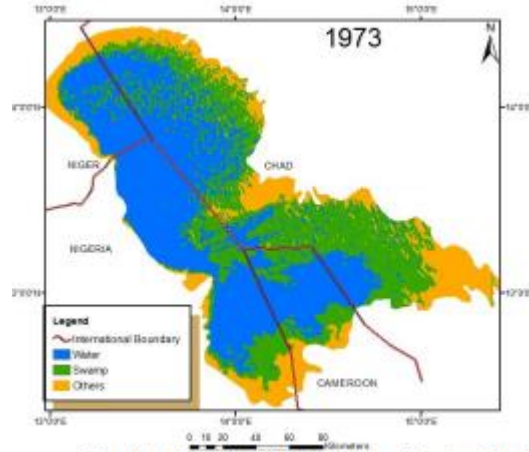


Fig. 2b. 1973 Classified Image of Lake Chad |

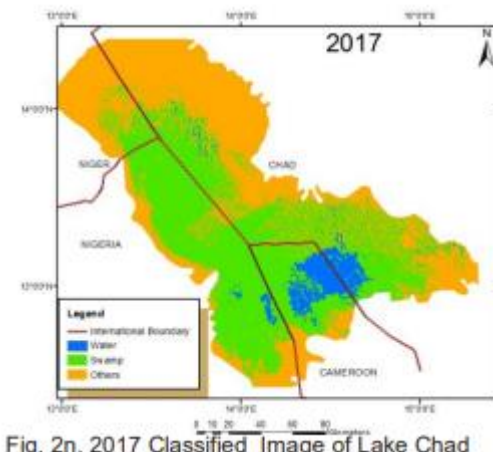
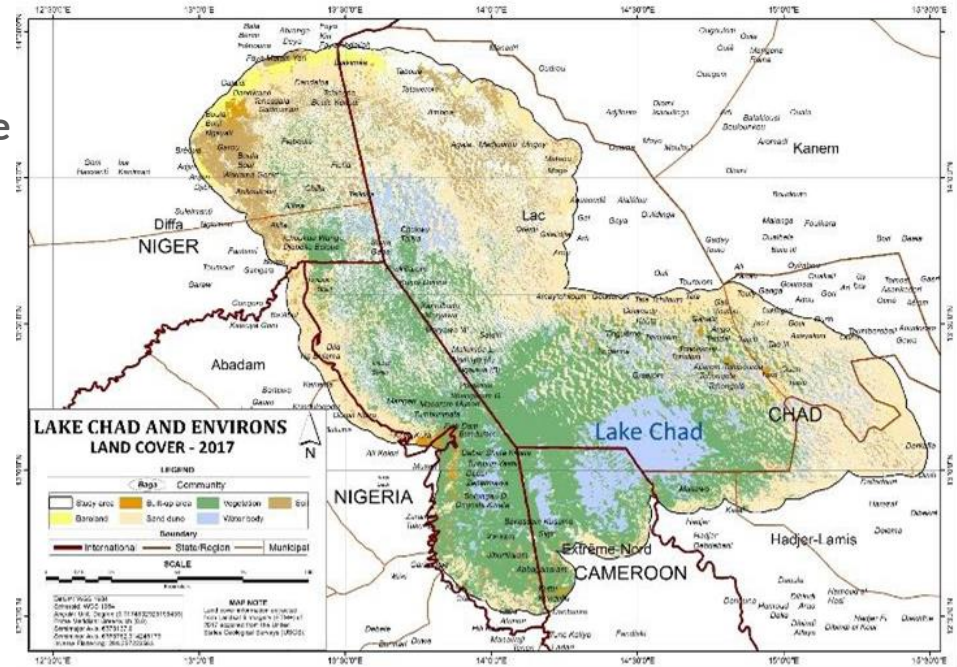


Fig. 2n. 2017 Classified Image of Lake Chad

Aiming to find areas with significant changes across the years in the dataset **we will investigate the albedo and land use developments in the Lake Chad Basin**

Hypothesis: We suggest that the **land cover changes** in the lake Chad basin are **connected with changes in the albedo**:

- Reduction of the water body between 1970s and 1990s leads to albedo increase
- Later changes in land use, due to agriculture and desertification has led to variable albedo changes



Methodology



Spatial analysis of provided datasets: CMIP6, ERA-5, GLASS

- Maps of differences in albedo/precipitation/land use for different decades
- Animated maps of these changes



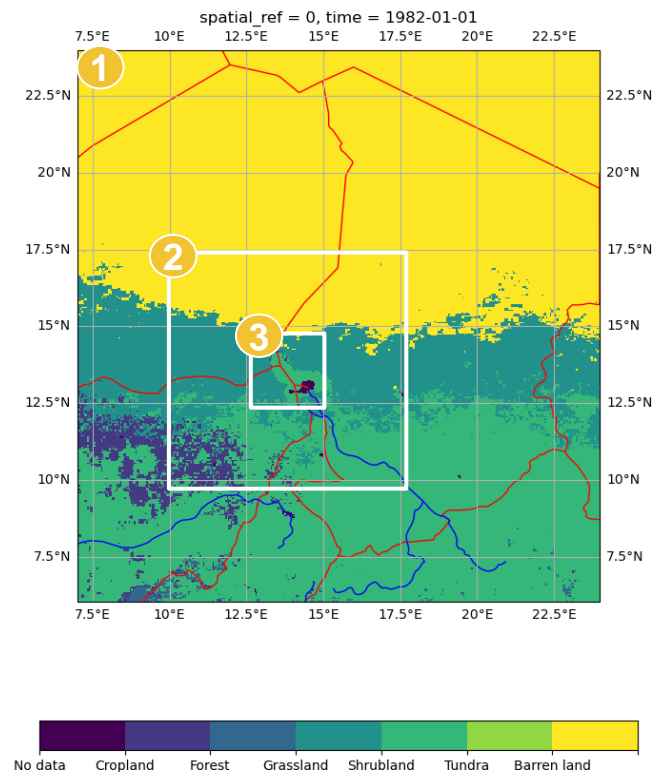
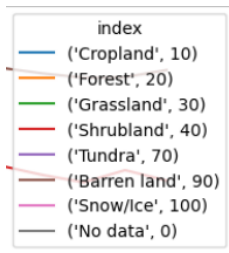
Correlation matrix between albedo, precipitation, gpp, land use, and temperature in the area (from CMIP6)

Results - GLASS data

Observed changes in land cover 1982-2015

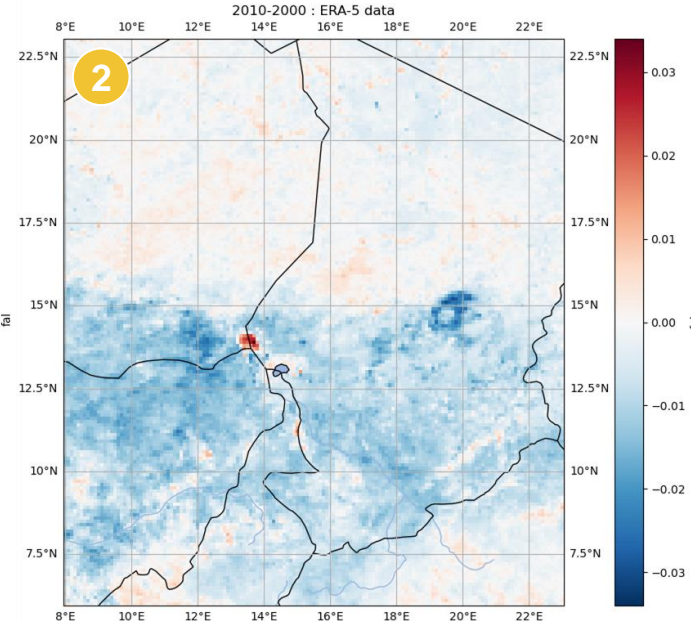
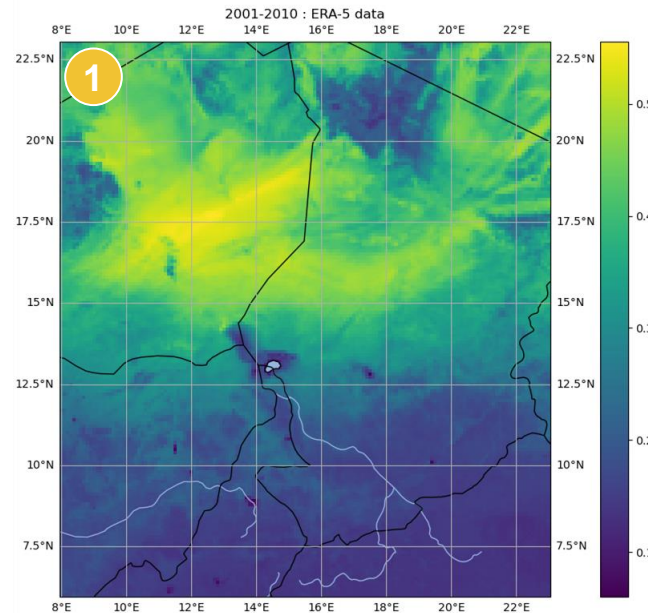
Zooming in on Lake Chad, variations in the mean become more prominent

Grassland negatively correlates with the barren land

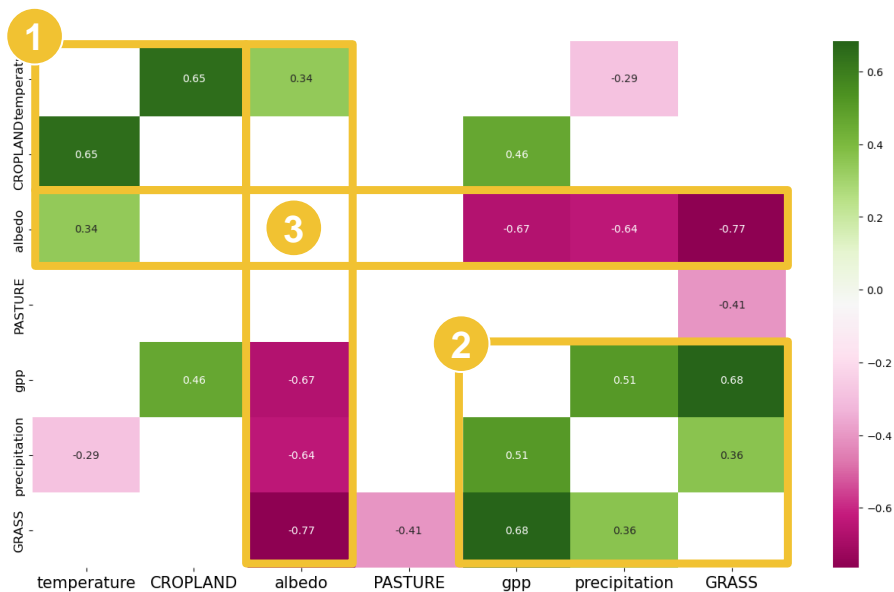


Results - ERA-5 data

- 1 The **albedo** map from 2000s indicates the original size of the lake Chad, suggesting wet conditions
- 2 The **albedo** of the northern part of lake Chad increased in 2000s, suggesting gradual drying



Results - Correlation matrix (CMIP6)



- 1 CROPLAND area
 - Positively correlated with Temperature
- 2 Precipitation, GRASSLAND area GPP and
 - had a strong positive correlation
- 3 Albedo
 - Negatively correlated with GRASSLAND area, Gpp and precipitation
 - Slightly positively correlates with temperature



Conclusions

- From our hypothesis, we have confirmed the **albedo increase**
- The **cropland area** percentage and temperature in Lake Chad Basin continuously increased from 1960s, correlating with each other
- The **albedo** negatively correlated with precipitation, Gross Primary Production (GPP) and grassland area
- Lake Chad feeds a lot of people (agriculture, fishing, etc), so the lake shrinking is a real threat for these people livelihood.
- We need future research focused on the reasons its decrease and methods of its regulation.