Modeling albedo variation in Mozambique due to the 2010 wildfire event

[Speaker Zoom video]

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Albedo, Wildfire & Global Warming

[Speaker Zoom video]

- **The albedo effect is an important tool for understanding global warming**
  - While it is one of many factors contributing to climate change, tracking the earth's albedo over time can give us a sense of how much heat the earth is reflecting and absorbing, informing prediction models for future temperature changes.
  - Reminder: Albedo is a fraction of reflected radiation from 0 - 1, with a 0 value absorbing all heat and a 1 value reflecting all heat

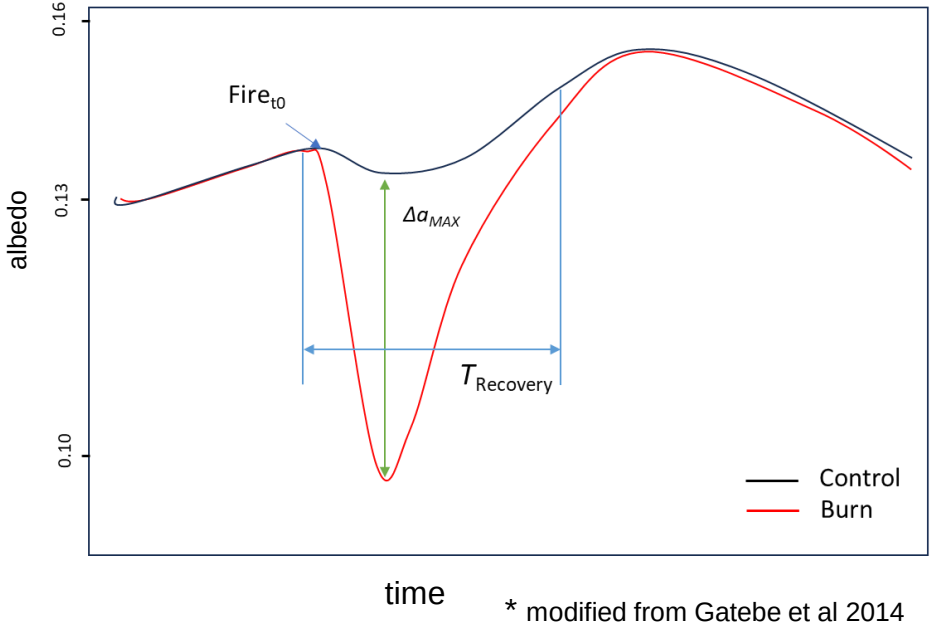
- **Wildfires can significantly alter the earth's surface albedo and cause long-lasting effects**
  - On shorter timescale the blackened surface following a fire can lead to some short-lived warming of the surface due to its lower albedo
  - The long-term effects of biomass burning on albedo can be related to the widespread replacement of low albedo forests with croplands and grasslands that have higher albedo

[Speaker Zoom video]

Case Study

Mozambique Wildfire Event (2010)

Hypothesis



* modified from Gatebe et al 2014

[Speaker Zoom video]

Surface albedo dynamics will show significant variation due to the 2010 intense fire-event in North East Mozambique

Datasets Used

[Speaker Zoom video]

- ERA5

Monthly temporal resolution and 0.1° spatial resolution

- CMIP6

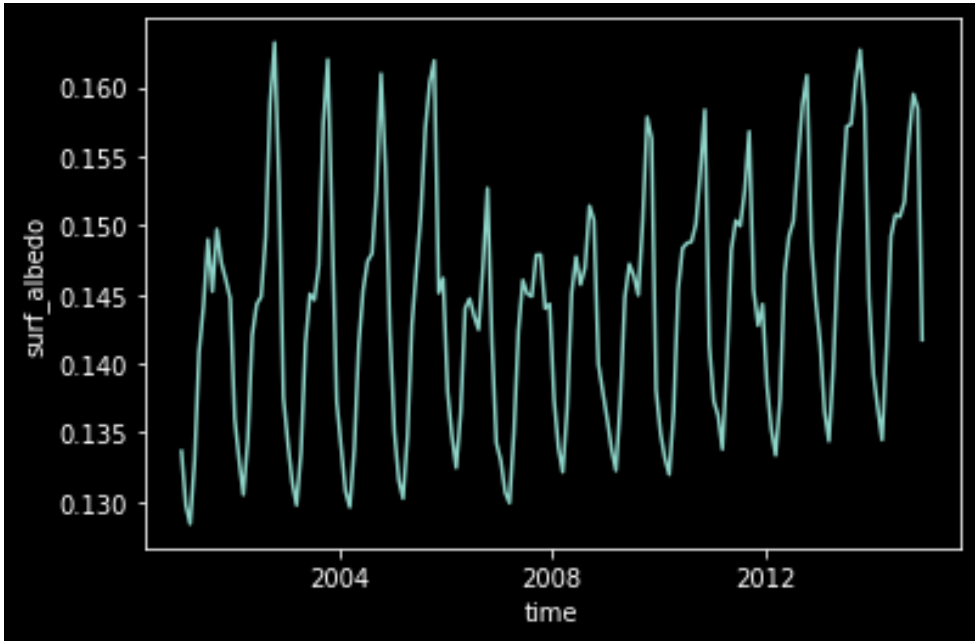
Monthly temporal resolution and 1° spatial resolution

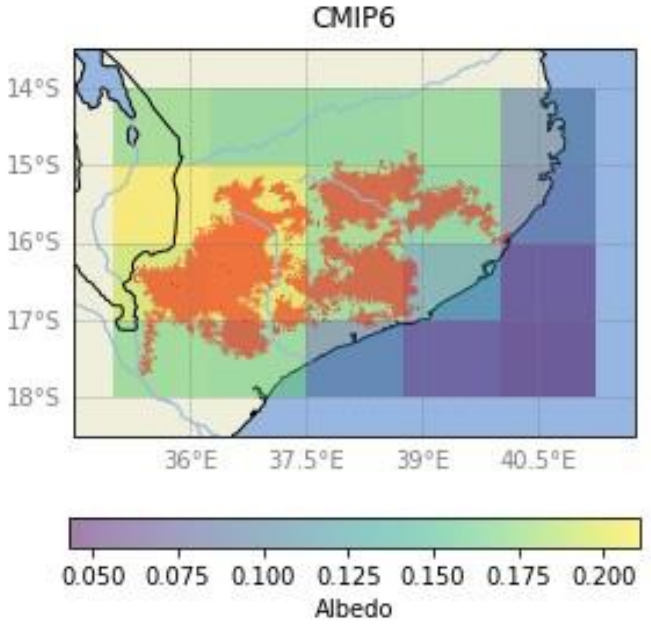
- GLASS (Global LAnd Surface Satellite)

Annual temporal resolution and 5 km spatial resolution

CMIP6 data for albedo

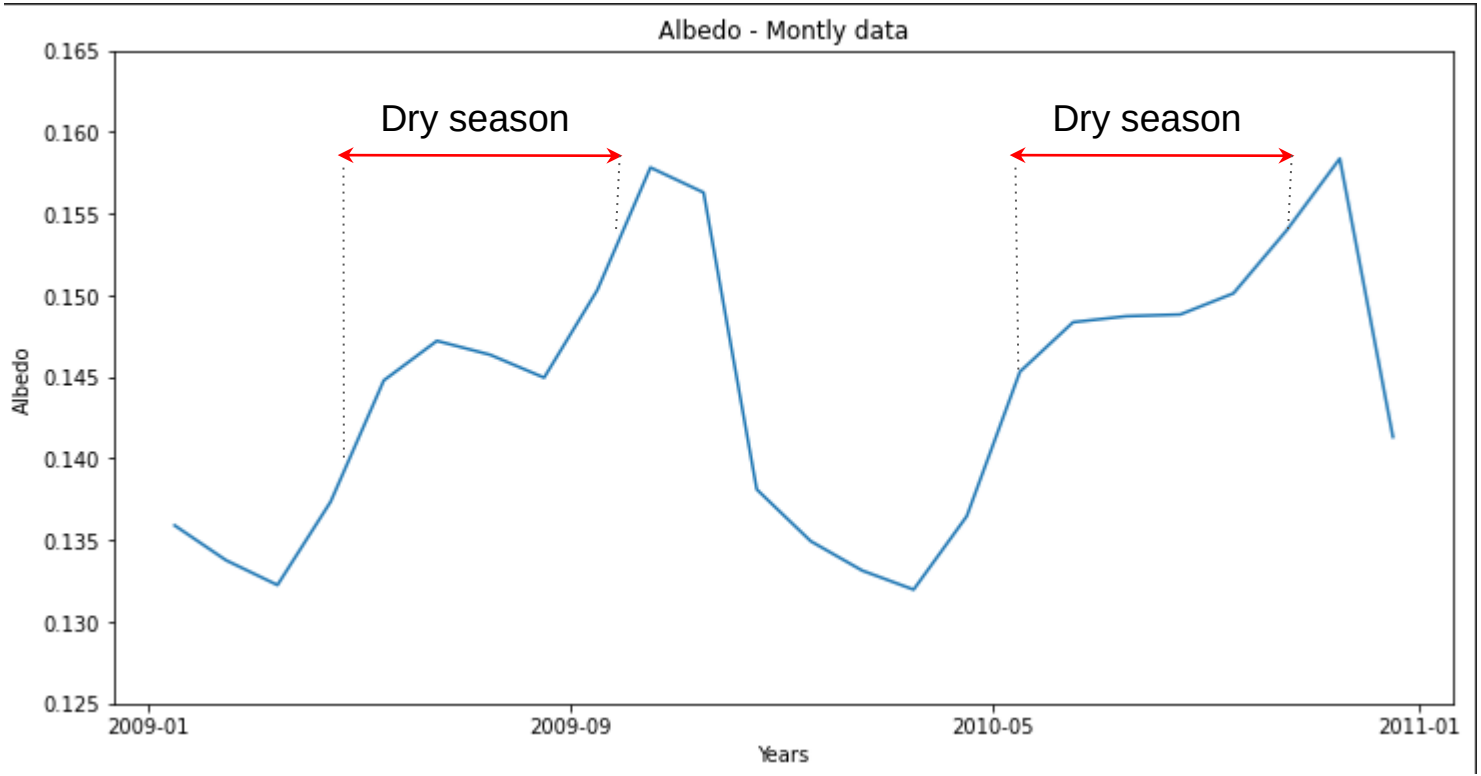
[Speaker Zoom video]





CMIP6 data for albedo

[Speaker Zoom video]

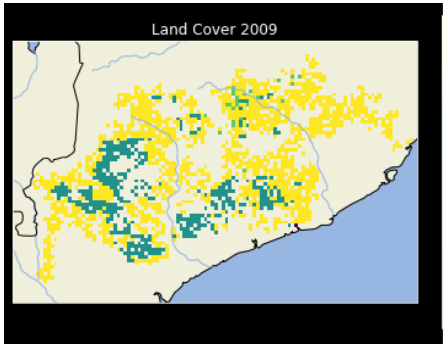


Changes in albedo values follow seasonal changes

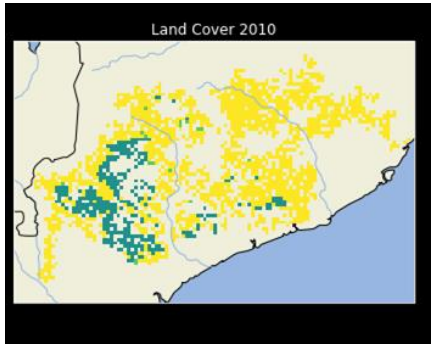
GLASS data for land cover

[Speaker Zoom video]

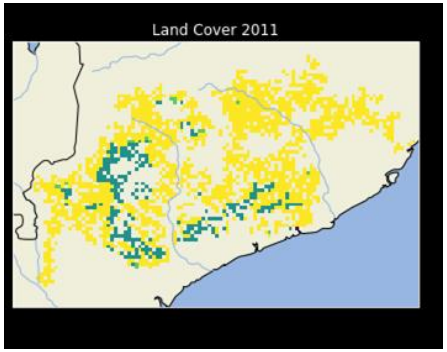
2019



2010

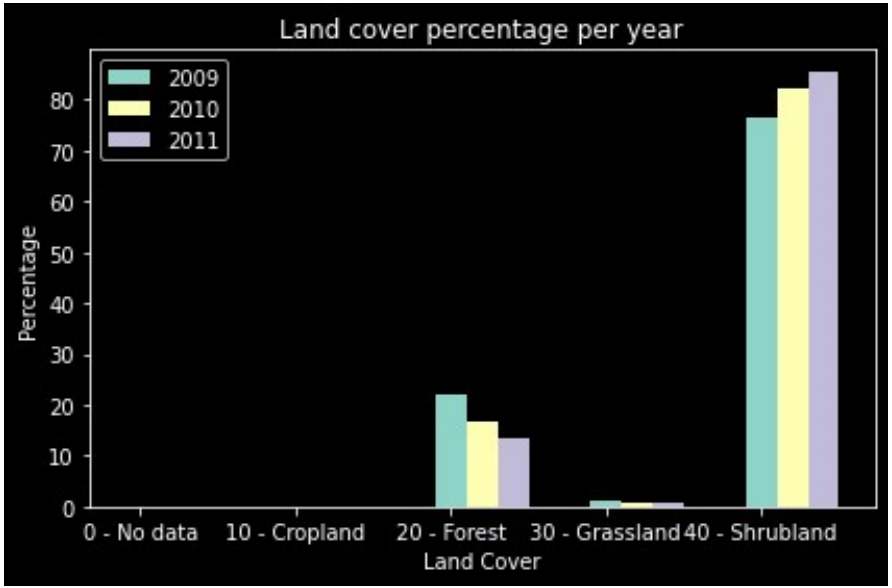


2011



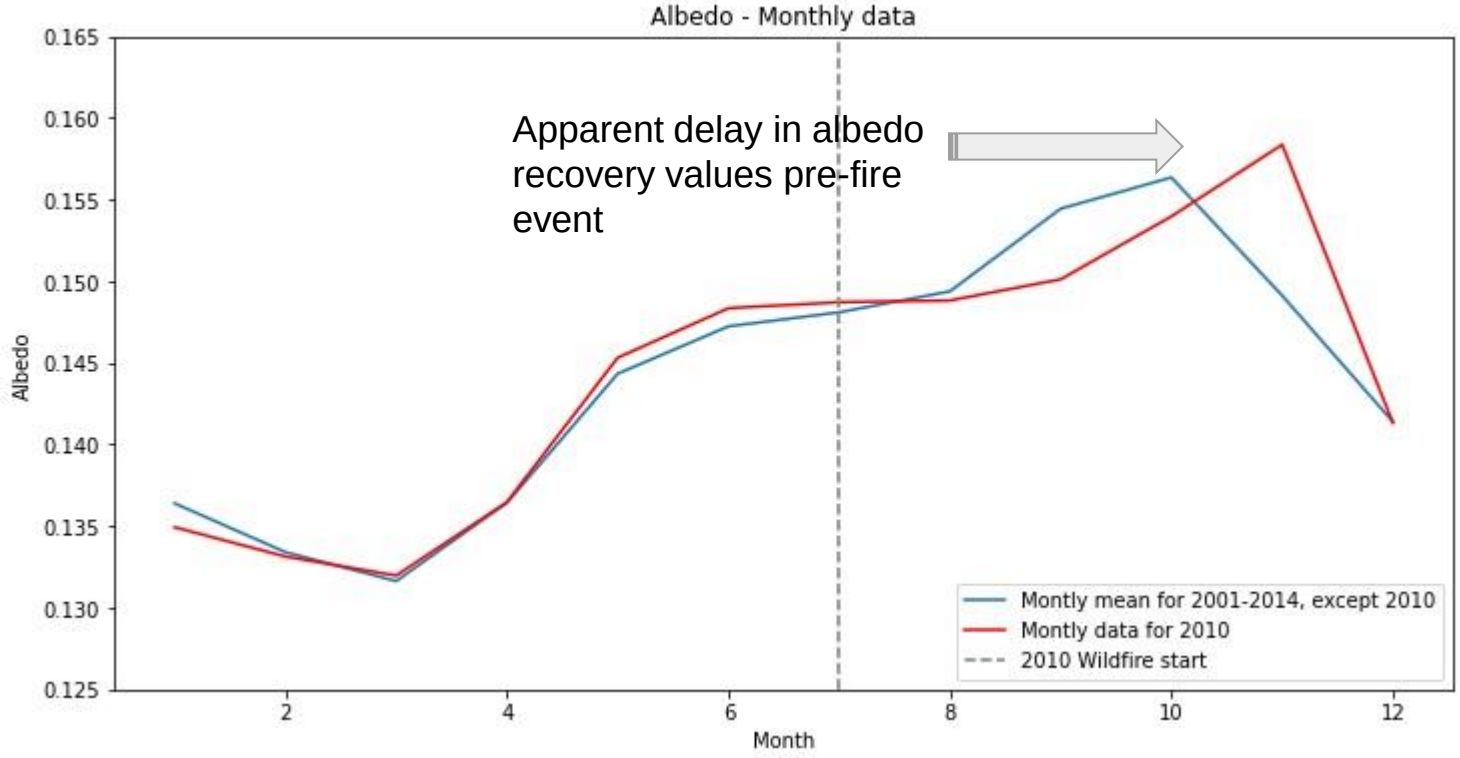
Land cover types

- Shrubland
- Forest



CMIP6 data for albedo

[Speaker Zoom video]



Conclusions

[Speaker Zoom video]

- Lack of strong relationship between changes in albedo values before and after the 2010 fire event

- Albedo reached maximum values as the dry season progressed
- Lowest albedo values shown in wet season + highest values for NDVI and EVI (reported by wildfire project team)

- We identified several factors that could have affected our ability to clearly detect the relationship between albedo and fire

- We observed that the minimum value for albedo each year has increased, which must indicate a shift in land cover that we were unable to explain

Societal Significance

- Albedo, wildfire, climate, and human impacts are all linked and must be better understood
- Mozambique has lost 11% of forest cover between 2001 and 2018
- Biodiversity concerns with forests
- 70% of labor in the country involves agriculture

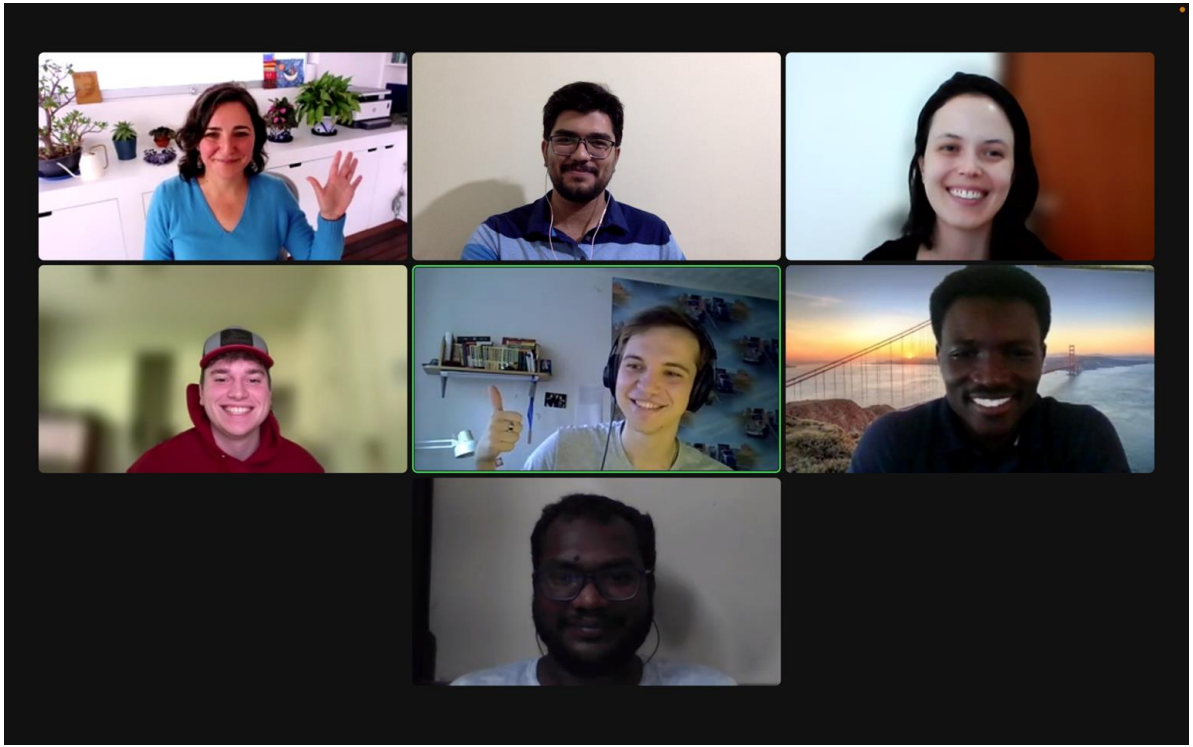
[Speaker Zoom video]

Future Study

[Speaker Zoom video]

- Larger area of analysis
- Increase the study time size to include more fire events
- Evaluate albedo dynamics of burned vs. non-burned areas across different land-cover types
- Assess effect of biomass recovery by land cover types (e.g., changes in net primary productivity after fire event)
- Interactions with other disturbances in the region (e.g., deforestation and desertification, slash and burn)

Thank you Climatematch Academy
for this great educational journey



[Speaker Zoom video]

Microraptor_Khattak_Scherzando, Climatematch Academy, 2023