

# Monitoring changes in snowfall in Kyrgyzstan using satellite earth observation

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## Why snow?

Herding communities in Kyrgyzstan traditionally rely on melting snow for water during spring and summer. The water provides irrigation for agriculture and fodder crops, which sustain their livestock during the winter. Herding communities are increasingly reporting that snow has become a less reliable source of irrigation. The purpose of this project was to investigate **snow percentage** (number of snowy days in a 10 day period) from satellite data over a range of time to see whether there were any significant changes. With this information, the herders can better prepare themselves and build climate resilience.



Kyrgyzstan is a very mountainous country, well suited to yaks which are very hardy animals. (photo by Nick Walker)

## The approach

Acquire MODIS and VIIRS sensor data from the DataCube



Load historical data from 2003-2020 for winter time period (Typically Oct – Apr in Kyrgyzstan) and take an average



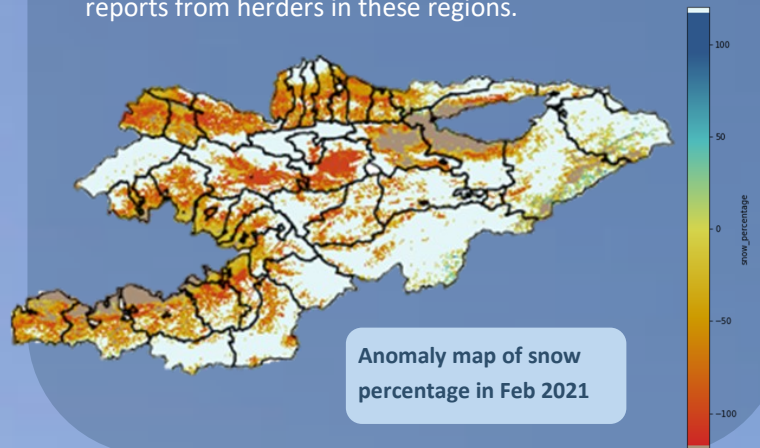
Compare each winter to the historical average by plotting an anomaly graph. Anomaly calculated by finding difference between historical and current data



Distinguish typical high and low data points from unusually high and low data points by creating a custom colour map

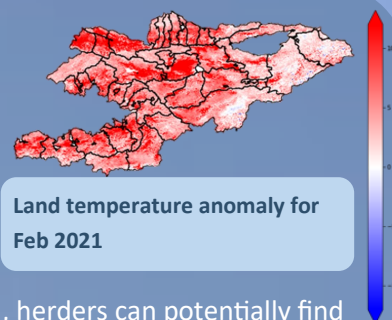
## The results

- Recent winters (2017-18, 18-19 and 19-20) appear to show a general decrease in snow percentage indicating possible lower snow depth
- 2007 seemed to show unusually low snow percentage across the country, but the general trend is that previous years have little change compared to historical average or sometimes higher than average snow percentage
- General trend of data from 2003-2021 hard to find since the variability is very high, but regional analysis shows that in the coldest winter month (February), Talas, Chuy and Jalal-Abad are particularly affected. This result agrees with reports from herders in these regions.



## Measuring snow depth

Satellites can see whether there is snow on the ground with relatively high resolution (~10 m). However, measuring snow depth is much more difficult, and is only possible at km resolutions. A potential solution to this would be to derive snow depth from satellite data such as snow persistence and land temperature. There is a negative correlation between land temperature and snow percentage. If snow depth can be derived, herders can potentially find regions where melted snow is likely to produce a reasonable amount of water. Machine learning could be used to identify particular regions that typically have the highest snow depth.



## Acknowledgements

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