Ilia Notin

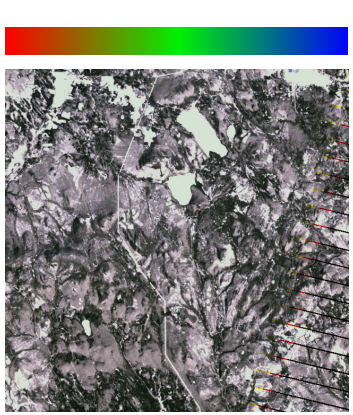
Mystery at the Wildlife Preserve: Multispectral Imagery

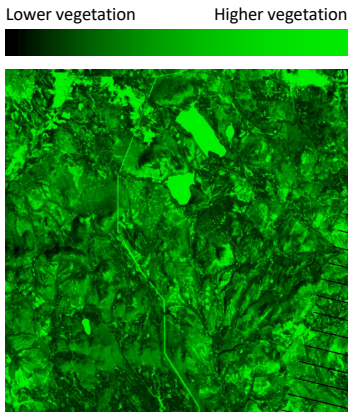
Problem

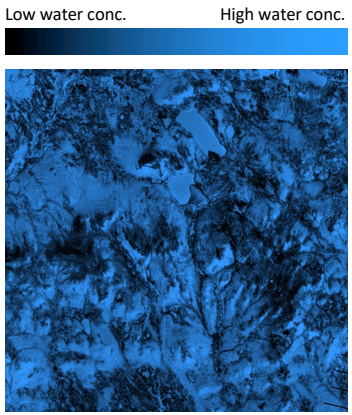
The number of nesting pairs of pipits is decreasing

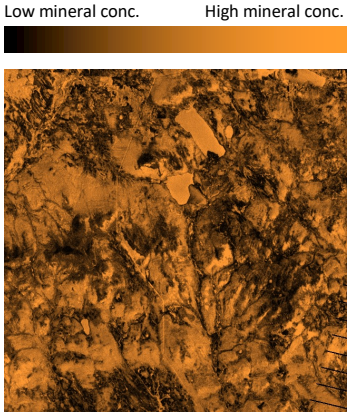
Find the reason given 12 multispectral satellite images of the habitat

Data









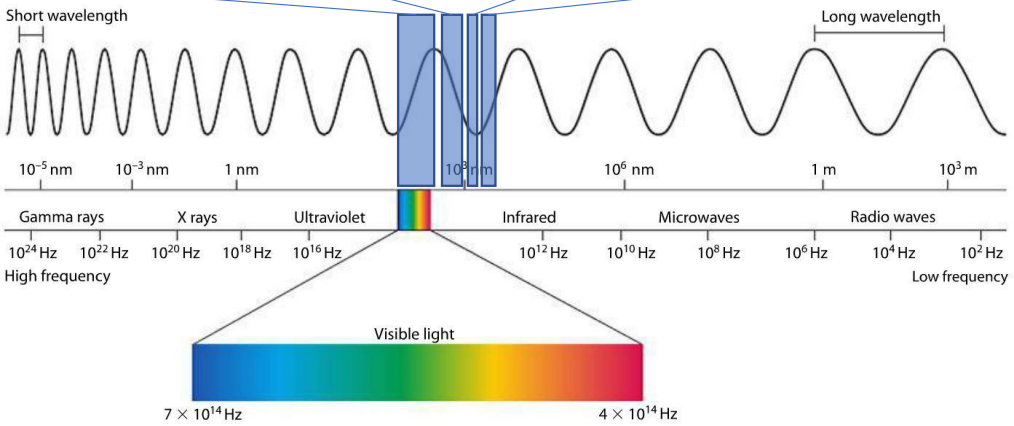
651 px

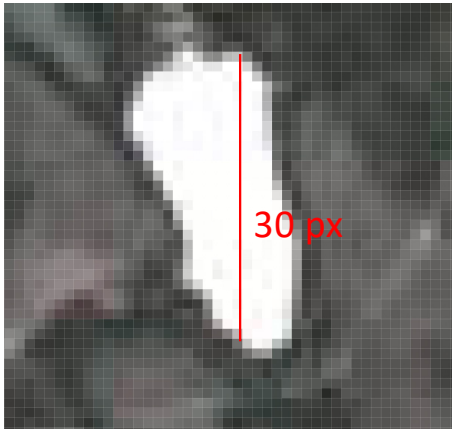
B1, B2, B3

B4

B5

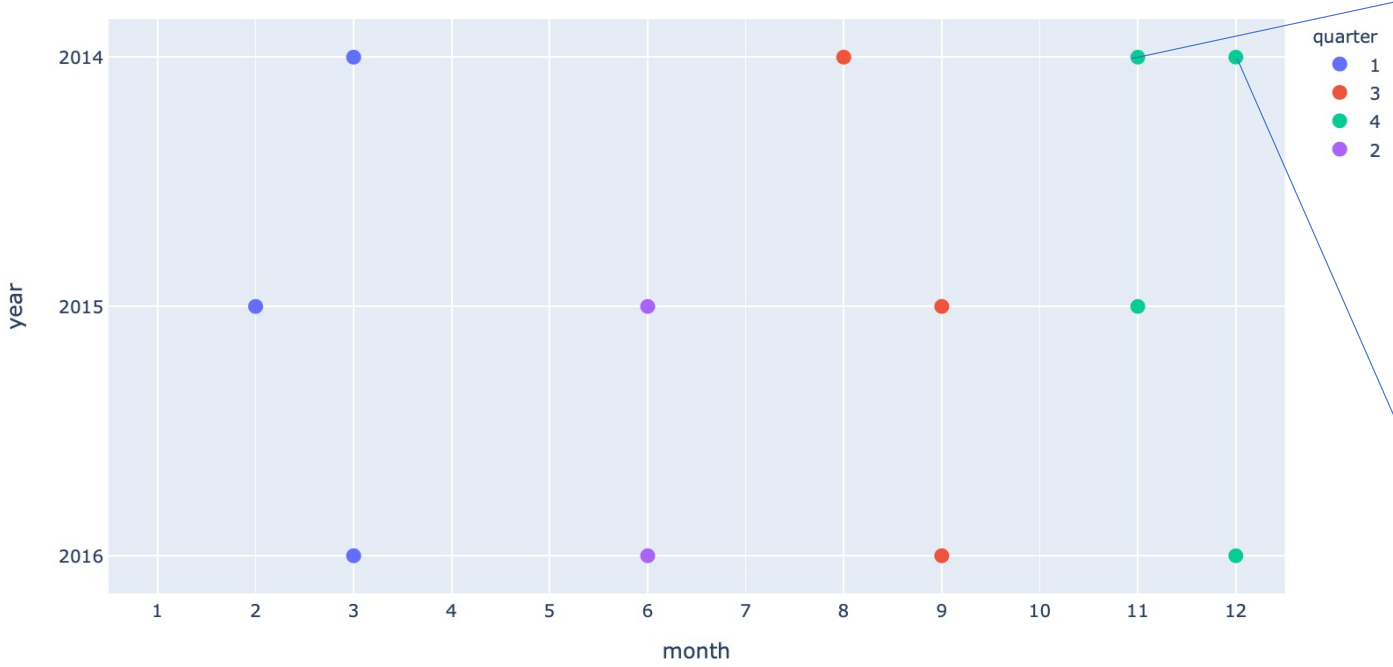
B6

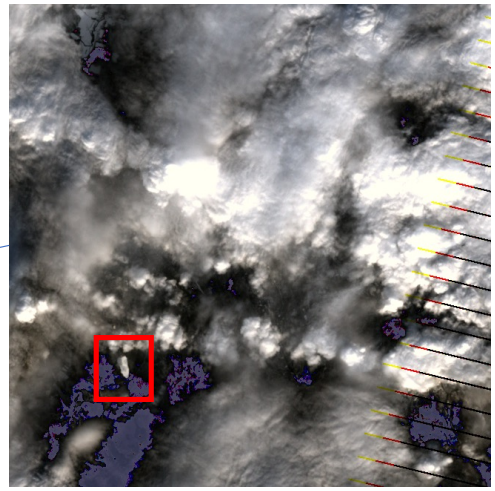


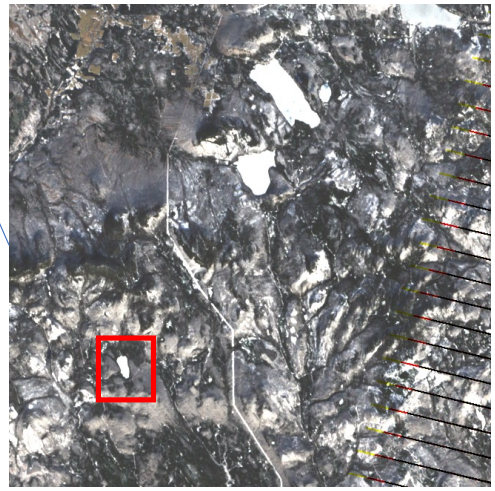


1 px ≈ 100 feet ≈ 30 m

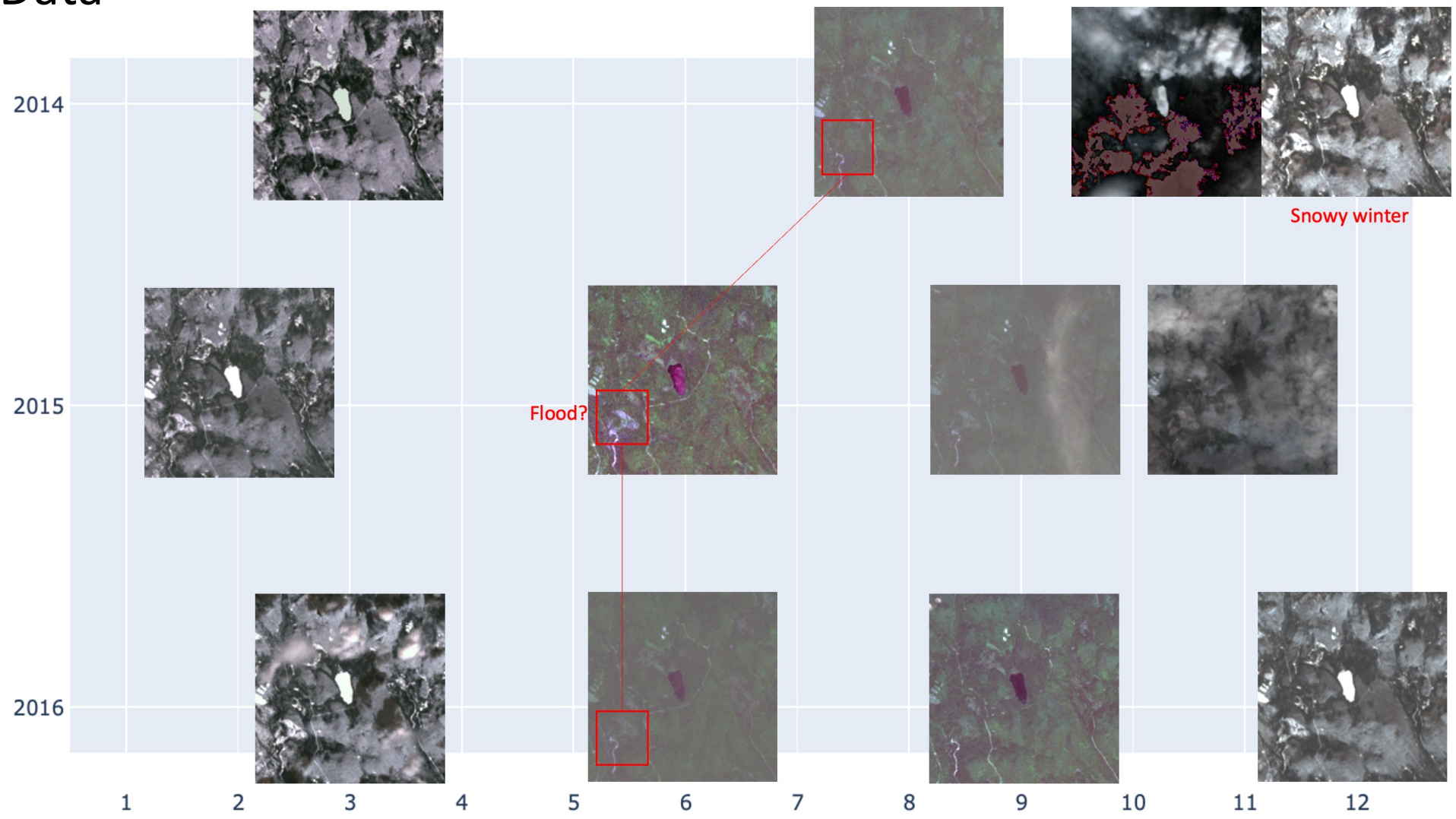
Data







Data

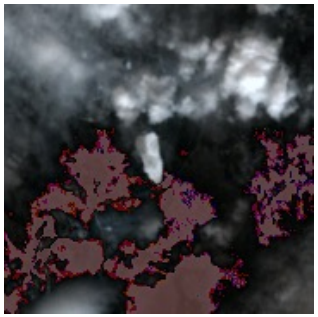


Choosing an approach

Idea #1
Detect objects for each image
Define the dynamics in object quantity/area and/or position

Tools
A model for object detection

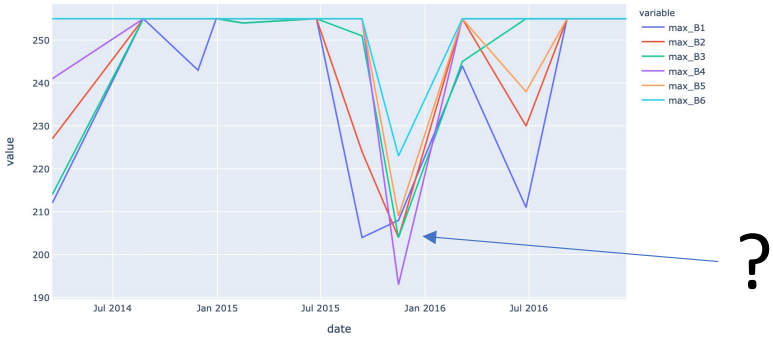
Requirements
Ready-to-use pretrained model or labeled dataset (appropriate one not found)
Train custom model (only 12 images)



Idea #2
Quantify data for each channel
Define the dynamics of changes
Define the key factors based onthe observed dynamics

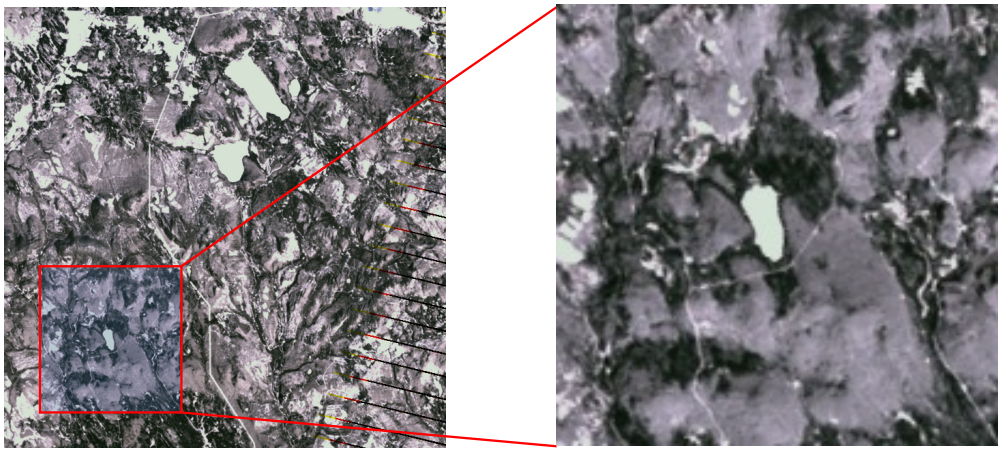
Tools
Image processing
Statistics

Requirements
Multispectral images in matrix form (available)



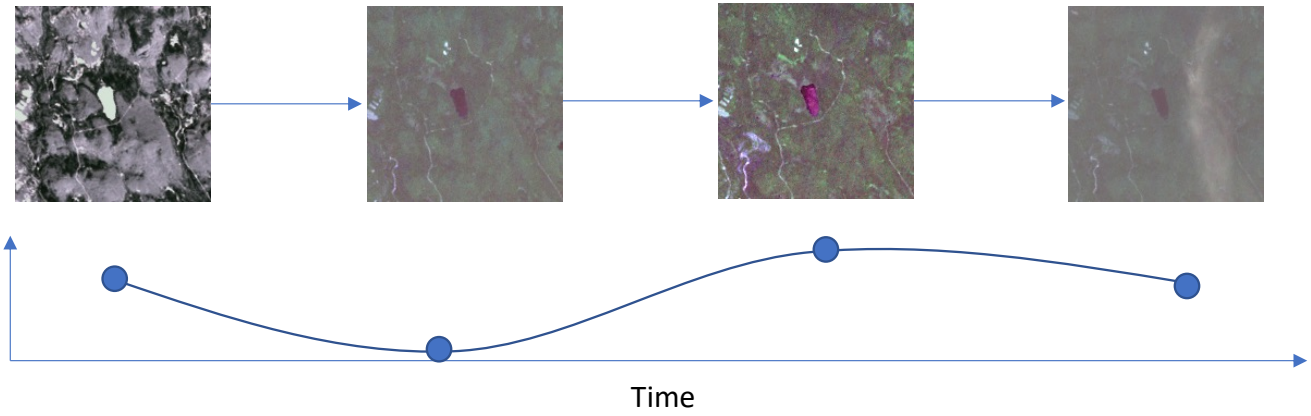
https://github.com/chrieke/awesome-satellite-imagery-datasets

Approach

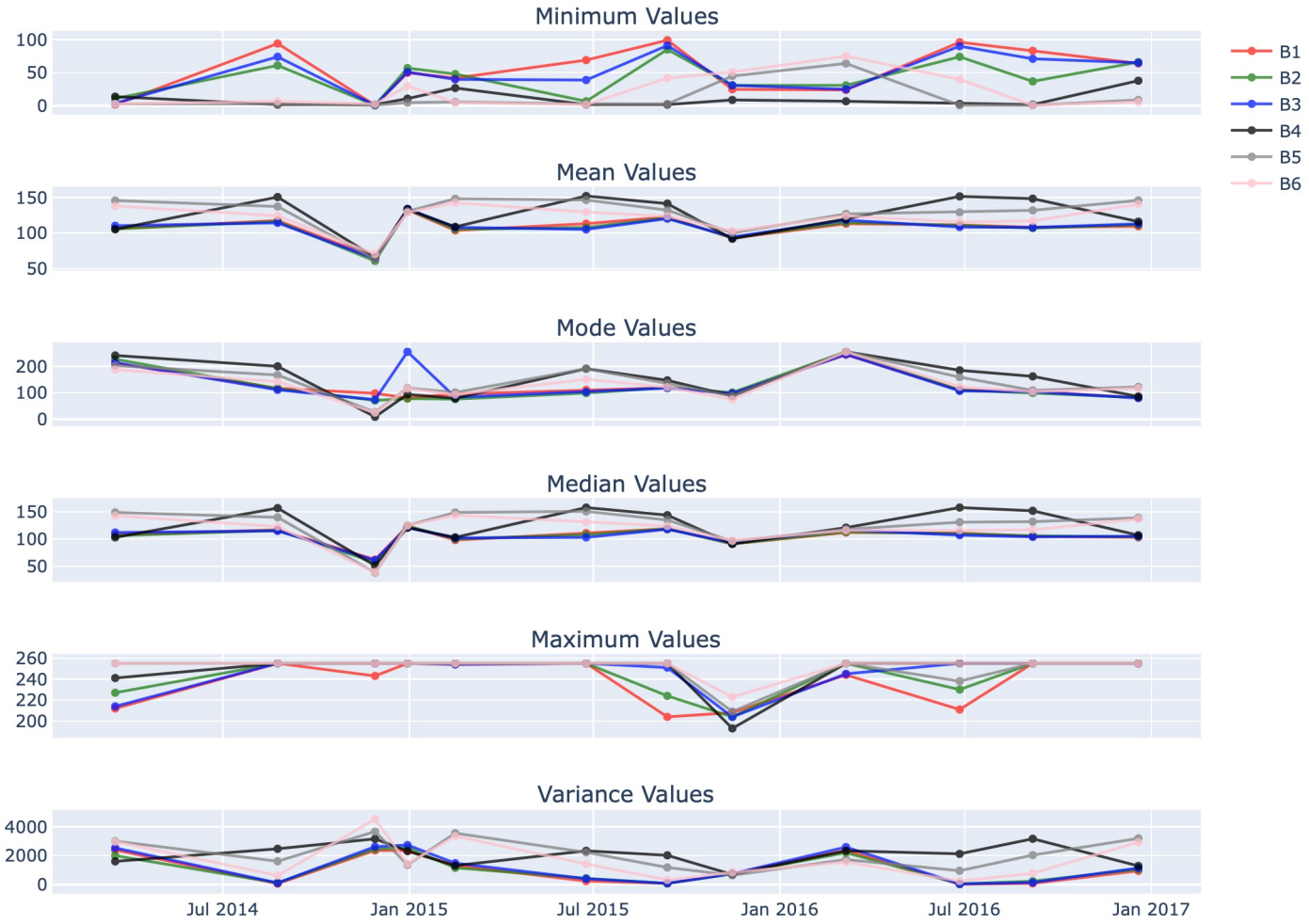


Metrics for each channel

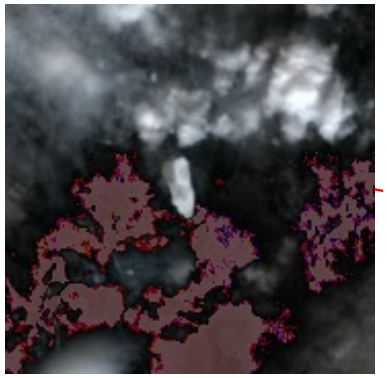
- Min
- Max
- Median
- Mean
- Variance



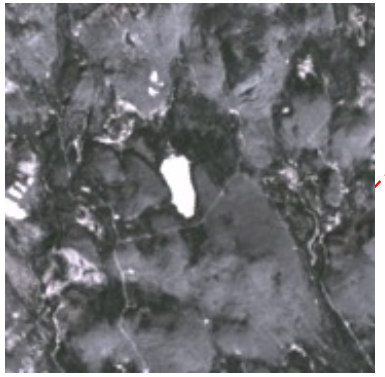
Results


Minimum Values
100
50
0
Mean Values
150
100
50
Mode Values
200
100
0
Median Values
150
100
50
Maximum Values
260
240
220
200
Variance Values
4000
2000
0
Jul 2014
Jan 2015
Jul 2015
Jan 2016
Jul 2016
Jan 2017
B1
B2
B3
B4
B5
B6

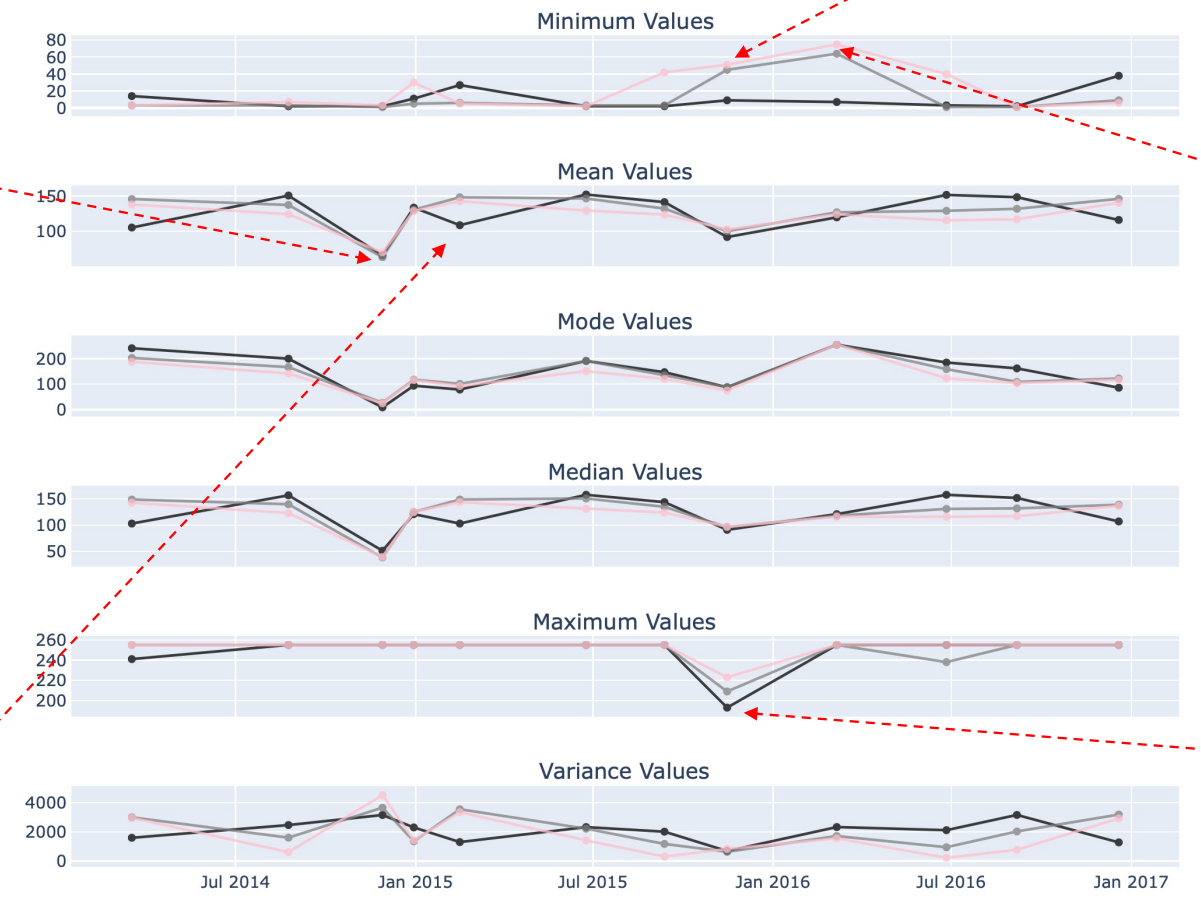
Results

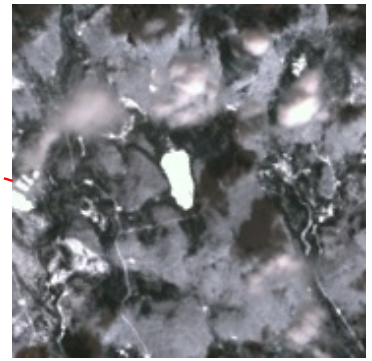


11.2014

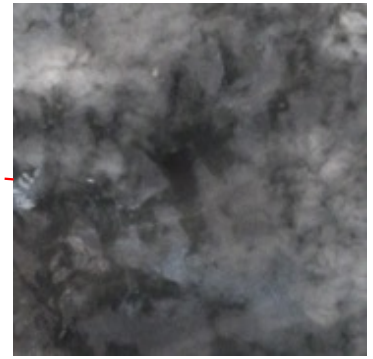


02.2015





03.2016



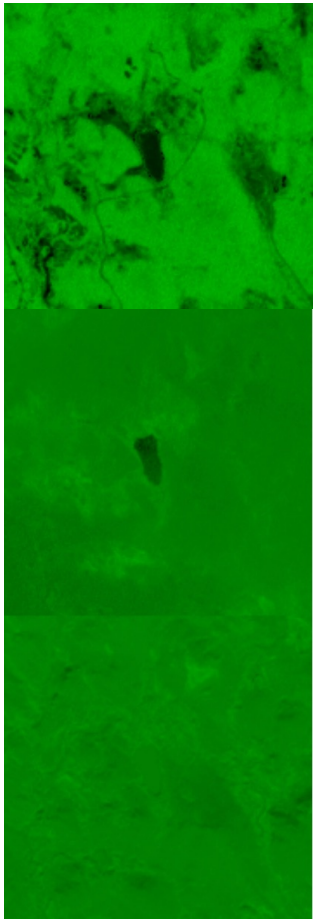
11.2015

Conclusion

- The possible reason for pipit population reduction is a snowy winter which lead to floods in the region
- Next steps:
  - Get data on population dynamics
  - Try to gain more images
  - Analyze weather data for the region (compare amount of precipitation, temperatures, wind data to satellite images and population)
  - Analyze news data for the region (define the most frequent ones using NLP)

Normalized Difference Vegetation Index

NDVI = (B4 - B3) / (B4 + B3)



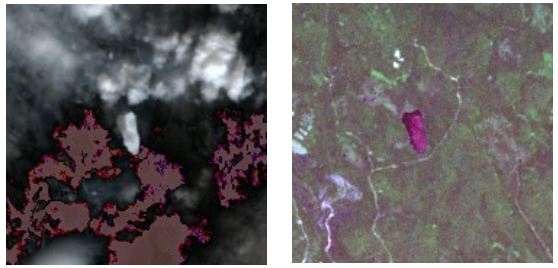
Summer

Summer (flood)

Winter

Questions to be addressed to the source

Are the images post-processed?



Are the images obtained with the same settings of sensors?