Long-term Land Degradation in the Caucasus

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LCLUC Science Team Meeting, 4/10/2019

Goals

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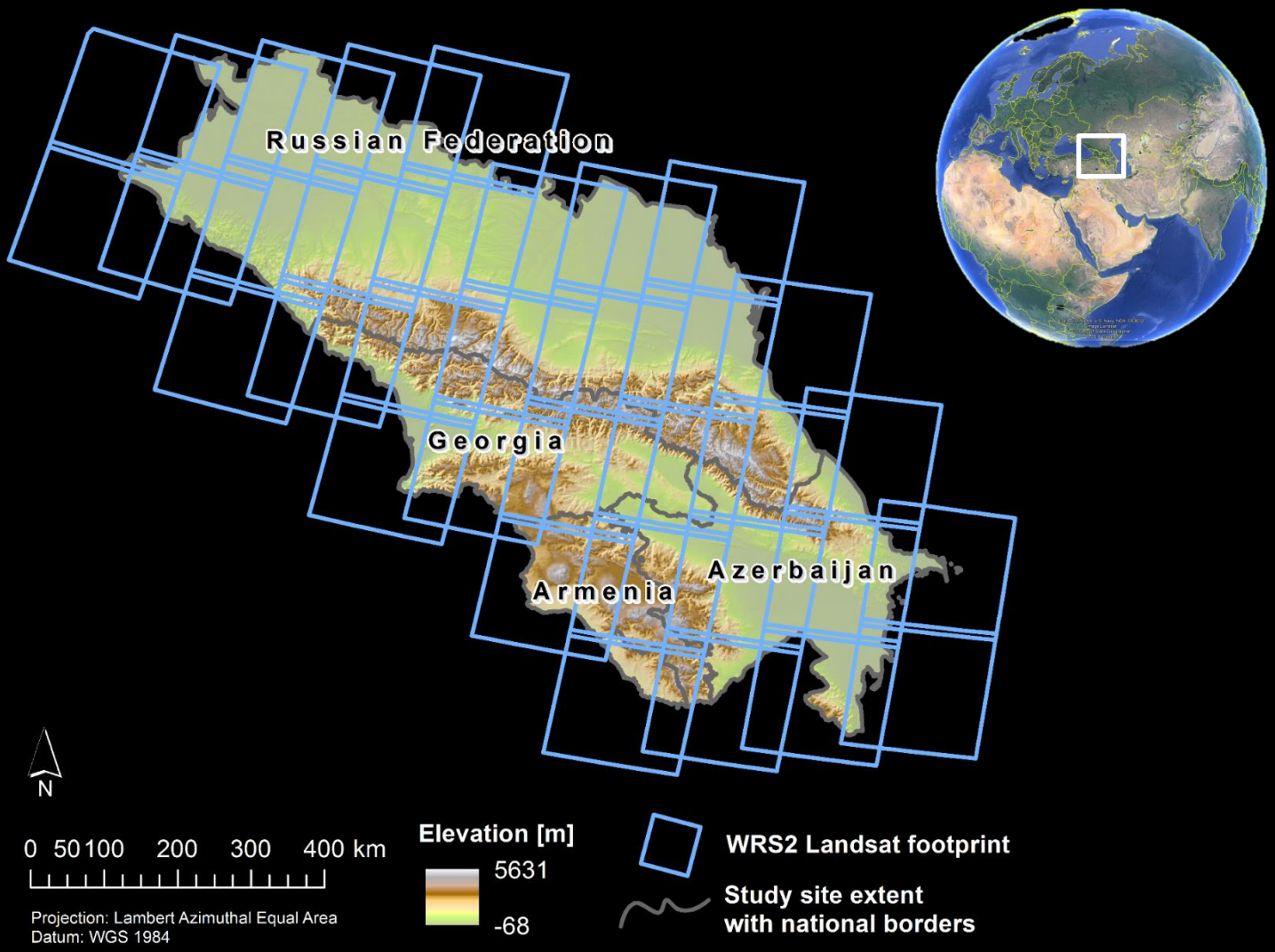
Objective 2: quantify long-term land use change with 1960s and ‘70s Corona imagery

Objective 3: assess the effects of economic cores on land use in peripheries within and across countries

Introduction



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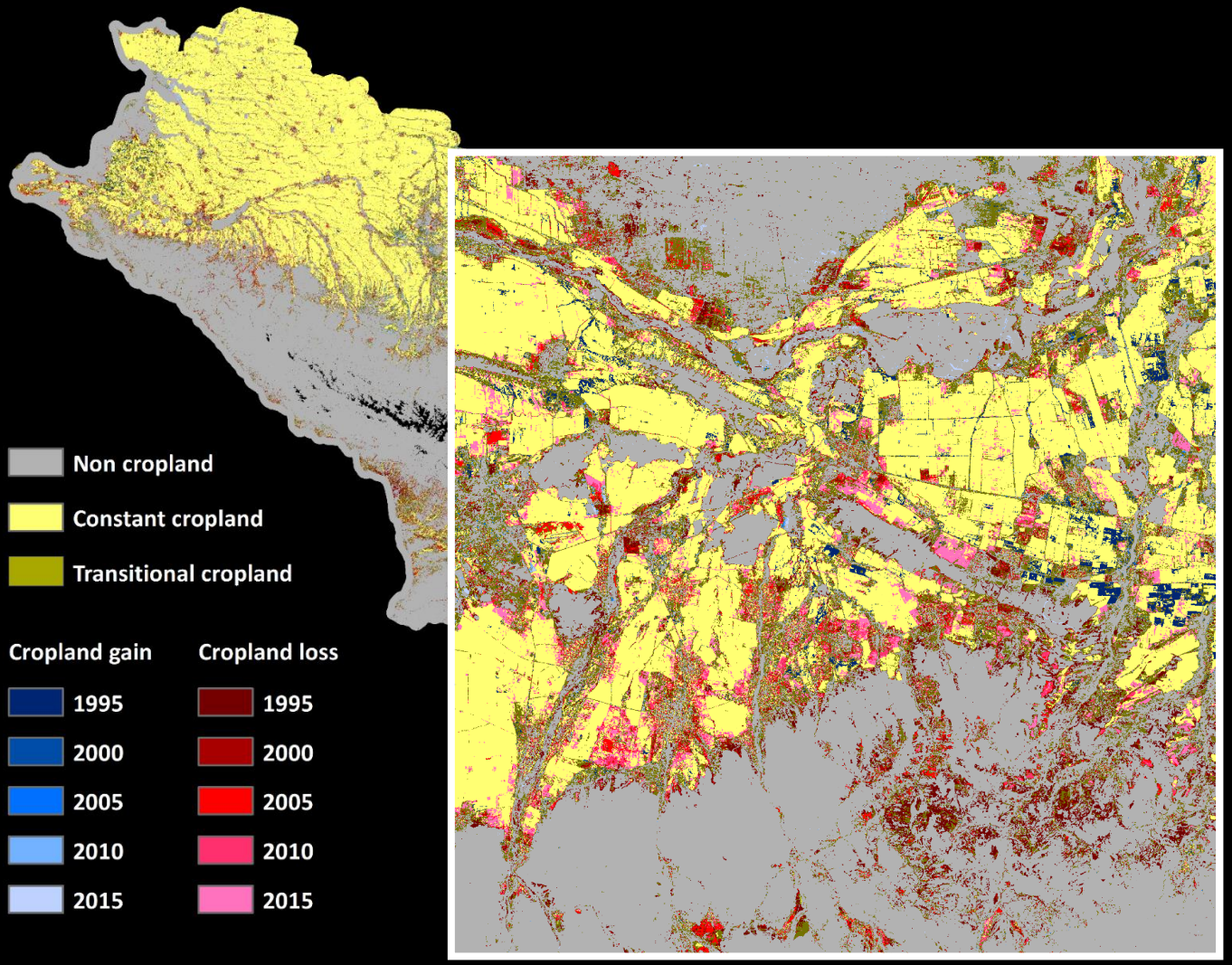

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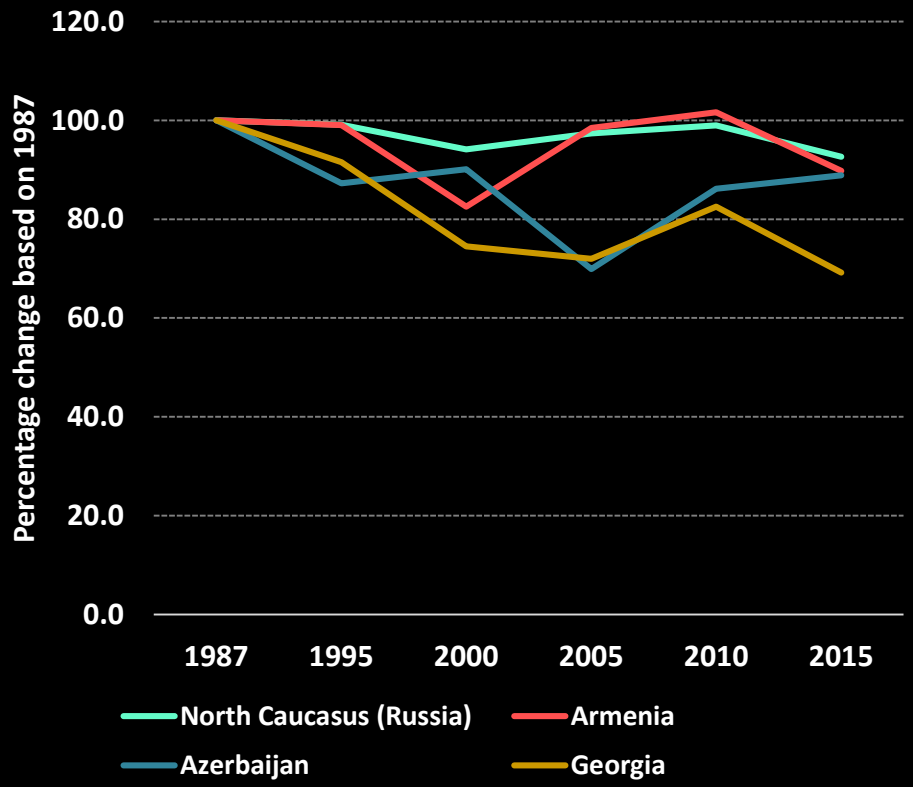

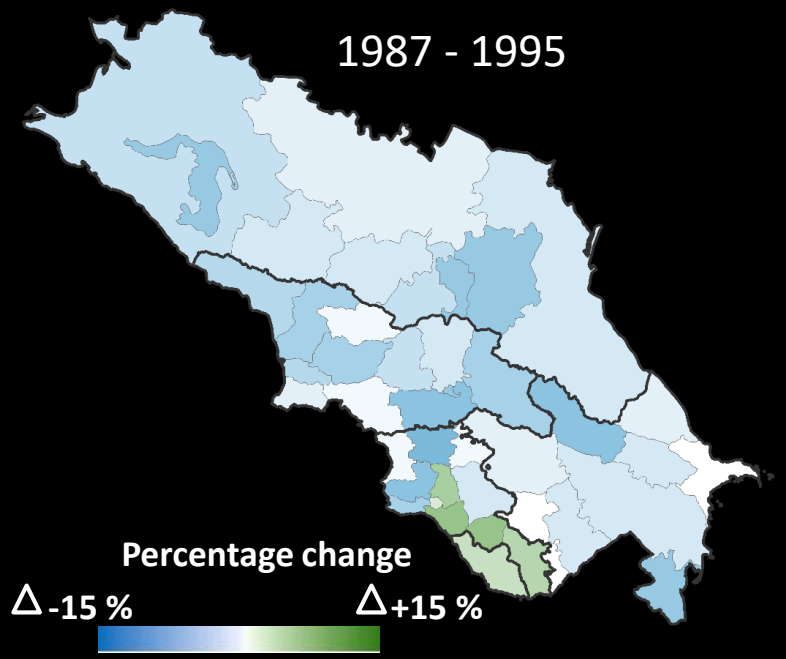

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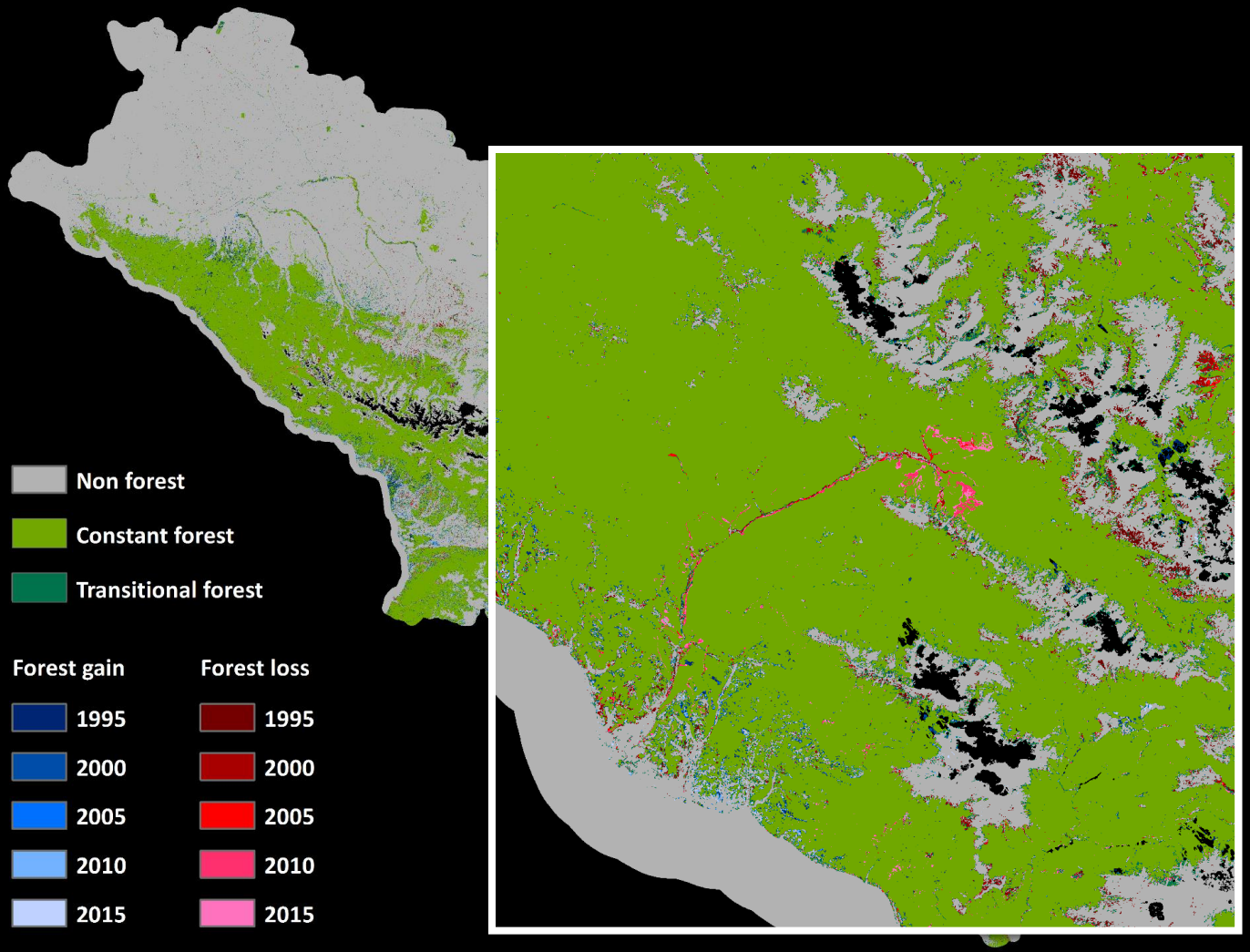

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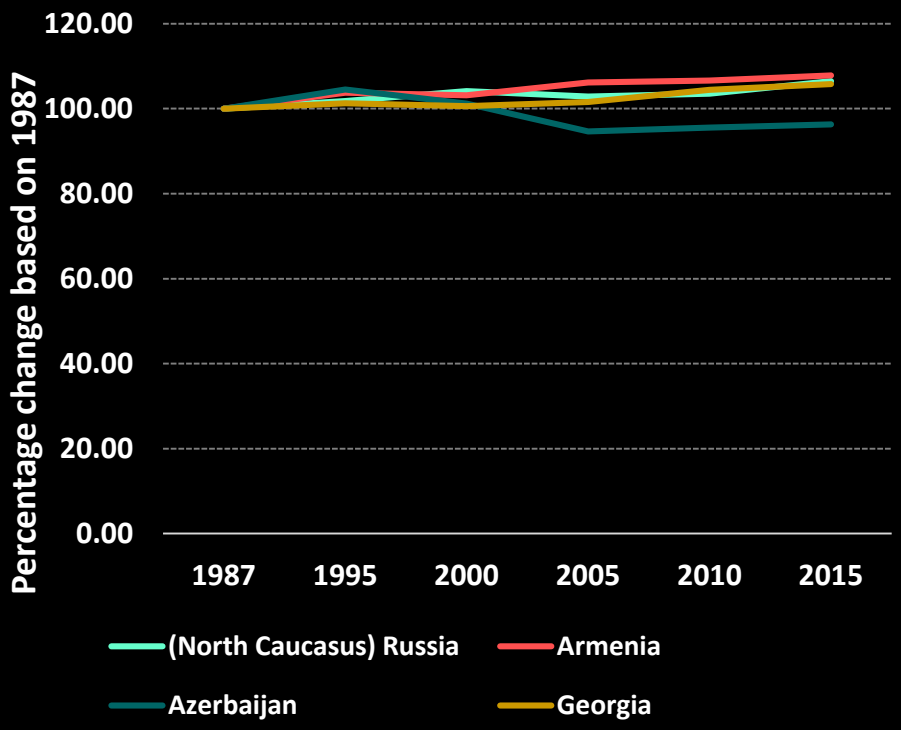

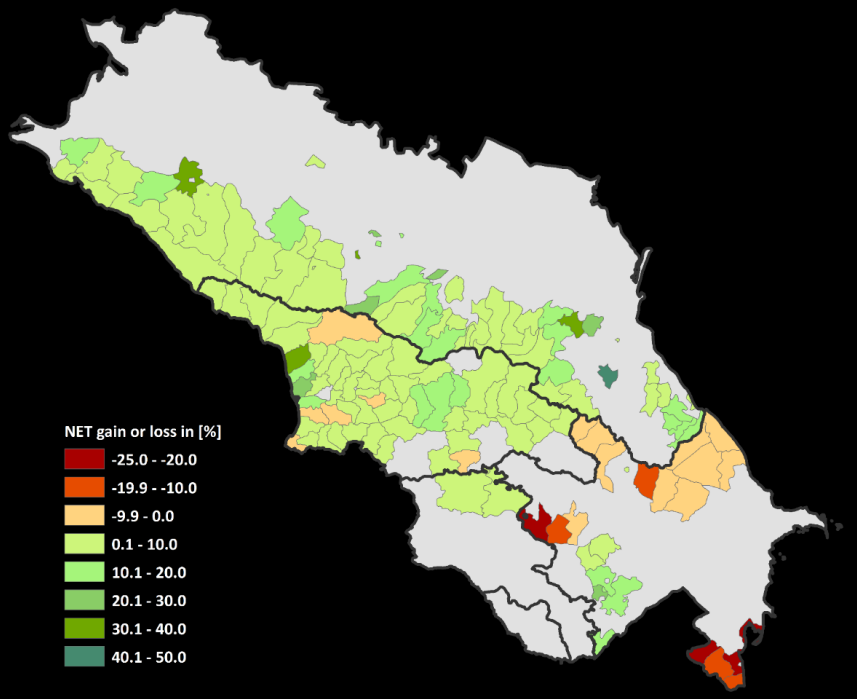

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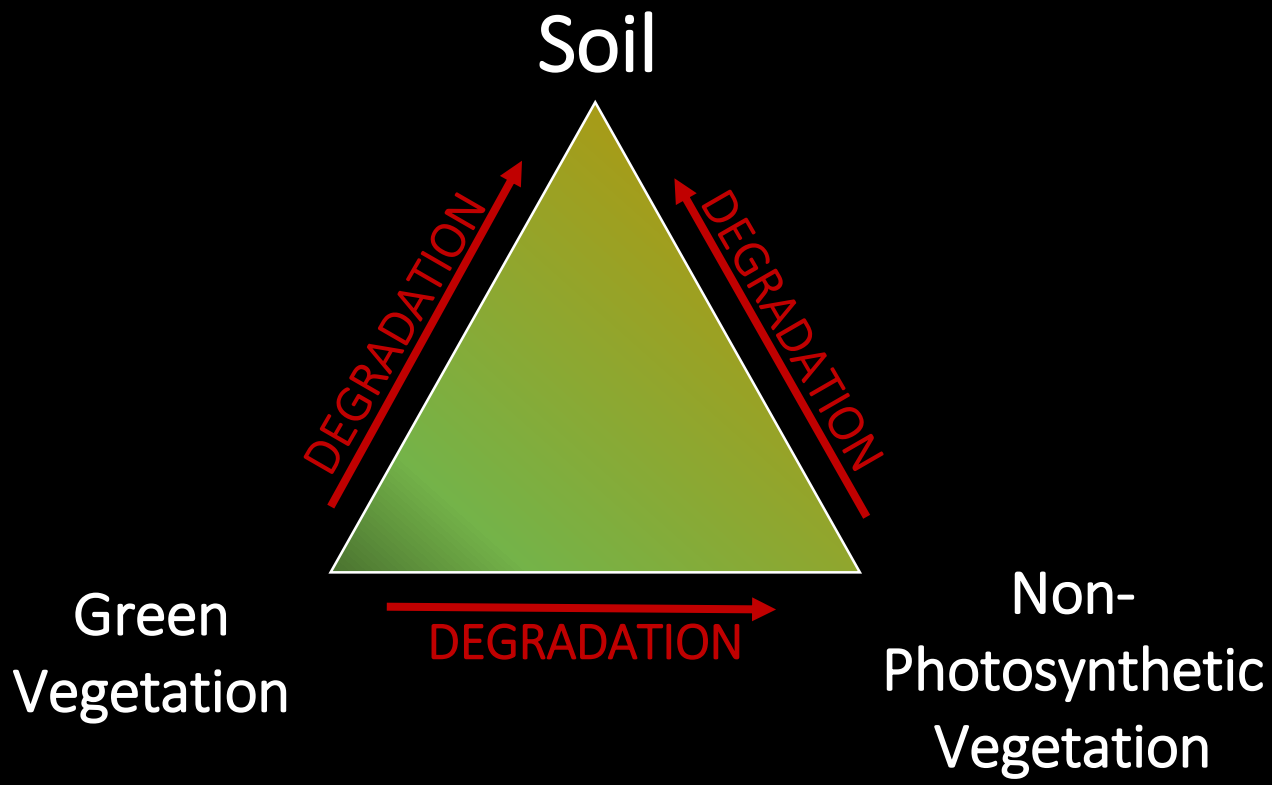
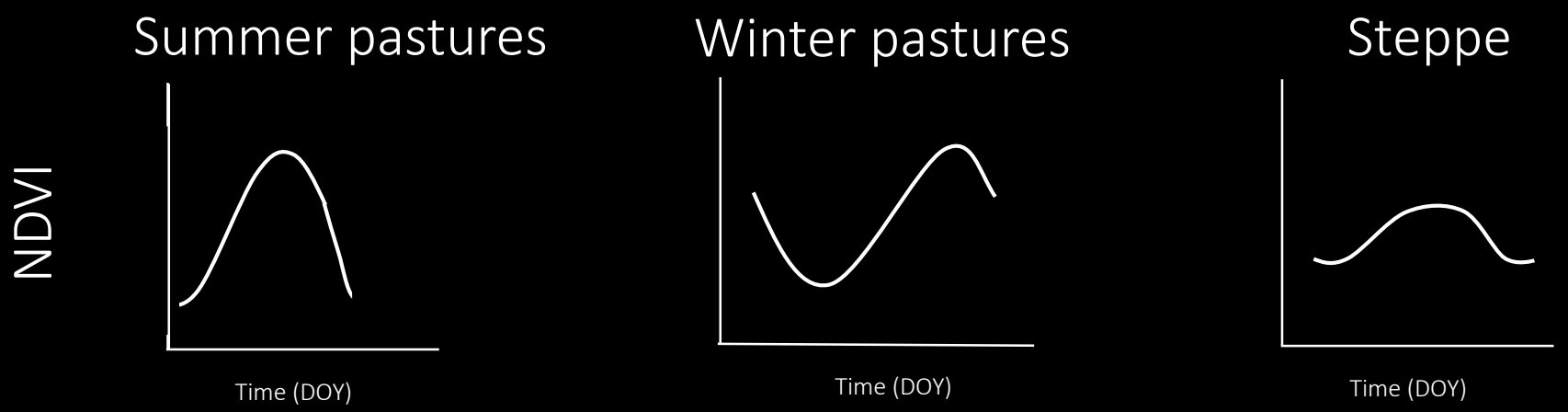
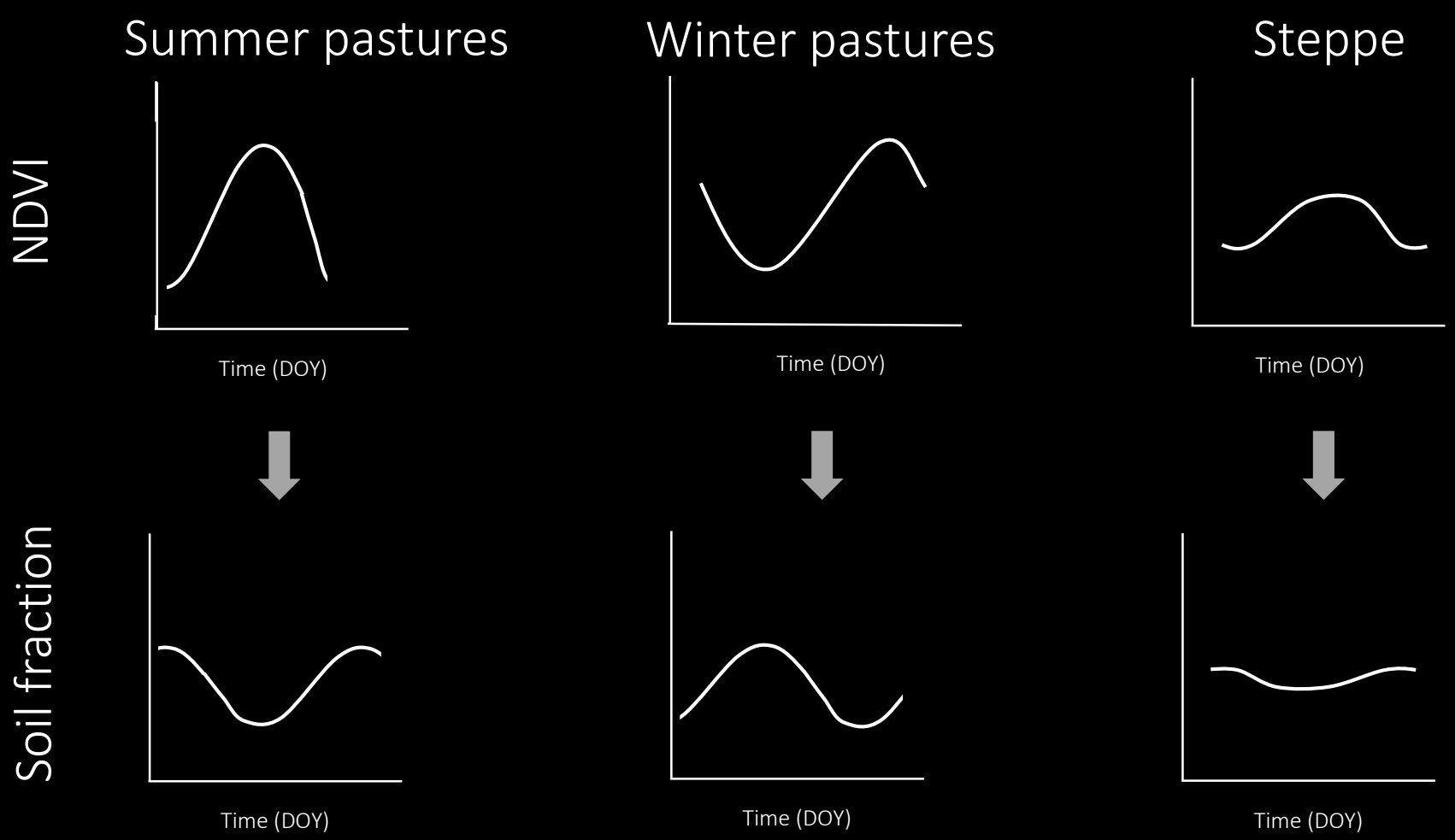
Methods


Soil
DEGRADATION
DEGRADATION
DEGRADATION
Green Vegetation
Non-Photosynthetic Vegetation

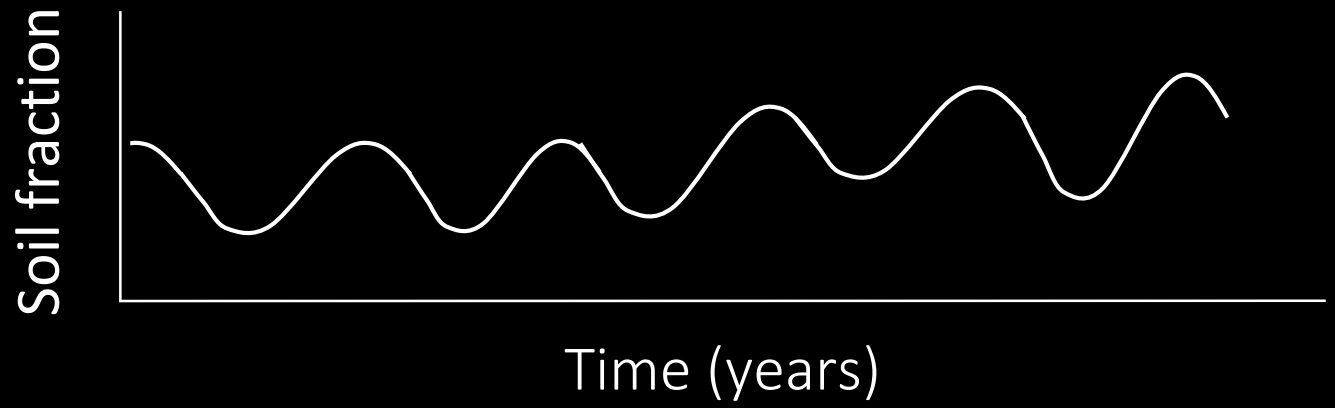
Methods


Summer pastures
Winter pastures
Steppe
NDVI
Time (DOY)
Time (DOY)
Time (DOY)

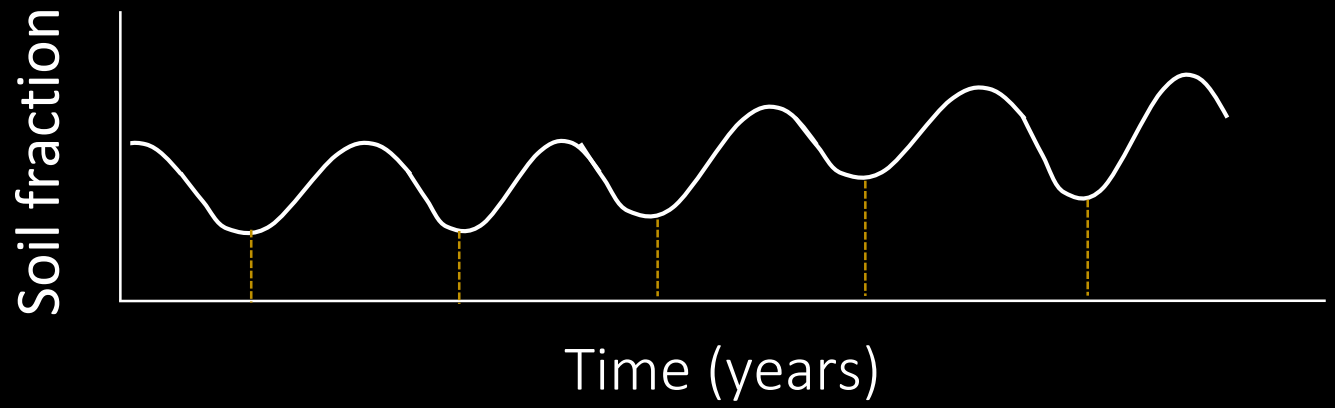
Methods


Summer pastures
Winter pastures
Steppe
NDVI
Time (DOY)
Time (DOY)
Time (DOY)
Soil fraction
Time (DOY)
Time (DOY)
Time (DOY)

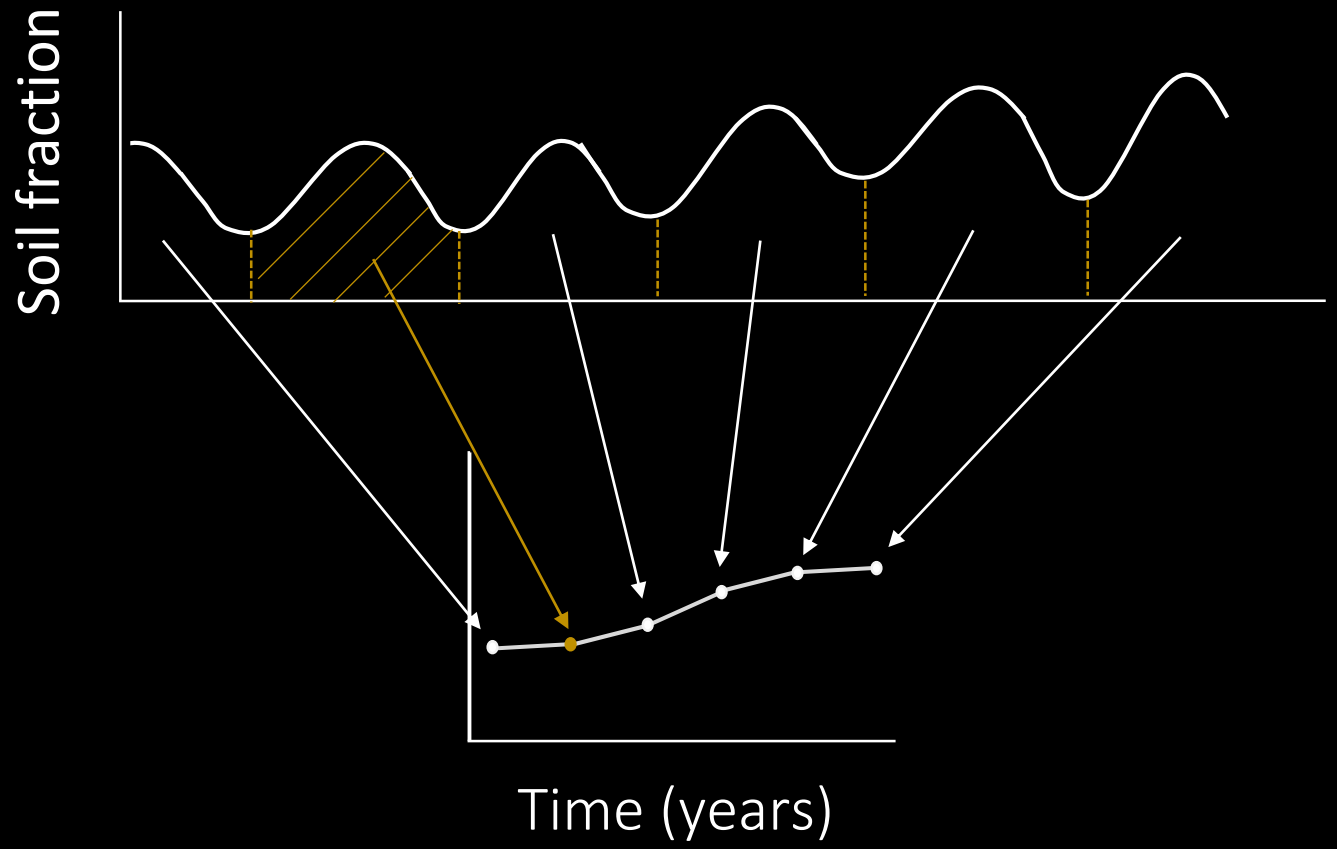
Methods



Methods



Methods



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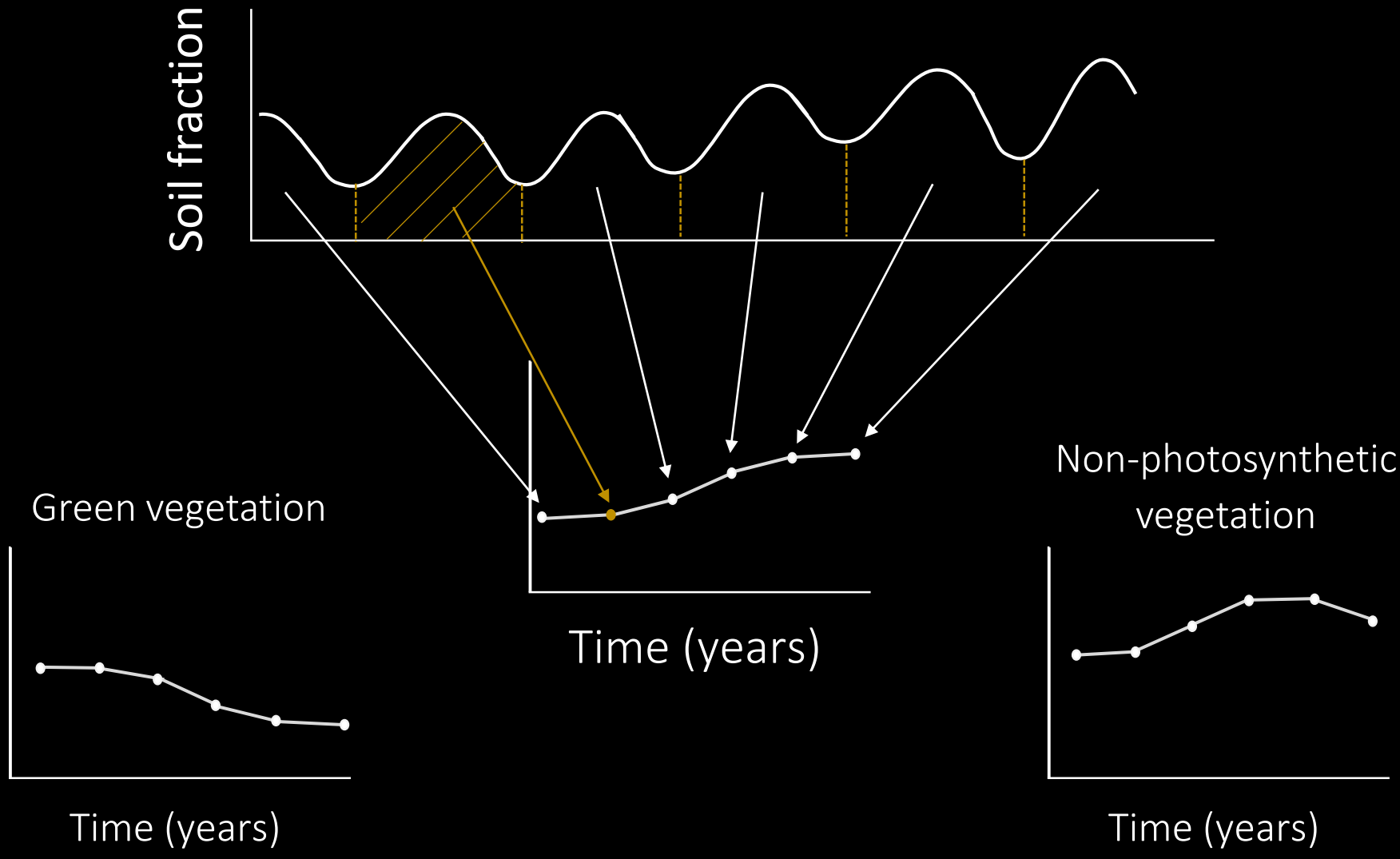
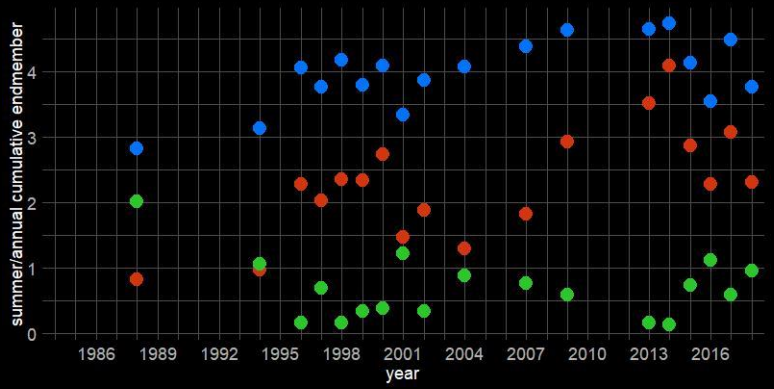

Soil fraction
Time (years)
Green vegetation
Time (years)
Non-photosynthetic vegetation
Time (years)

Results

Winter pasture

Landsat (1984-2018)

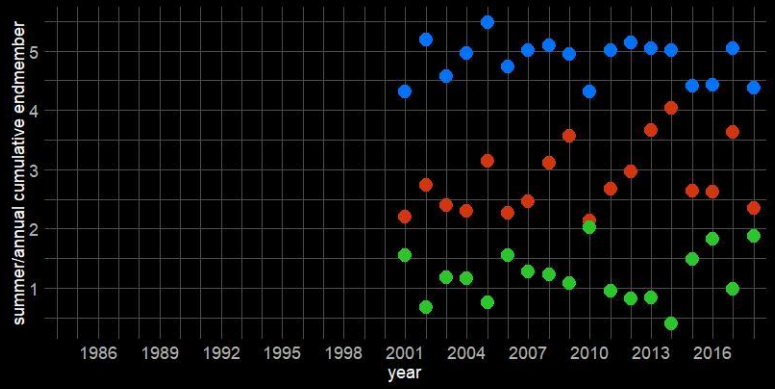


NPV

Soil

Green

MODIS (2001-2018)



Results

Winter pasture

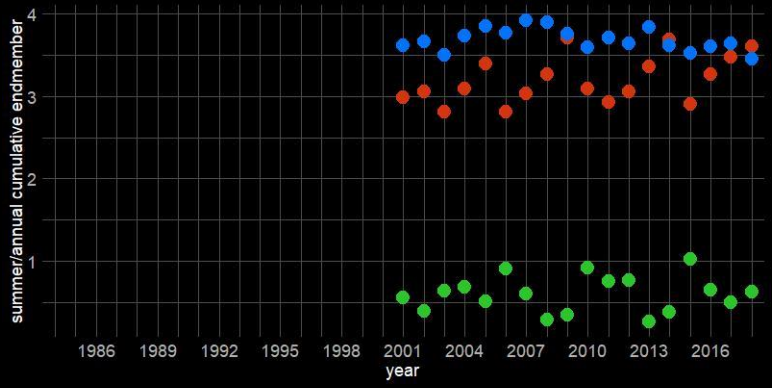
Landsat (1984-2018)

NPV

Soil

Green

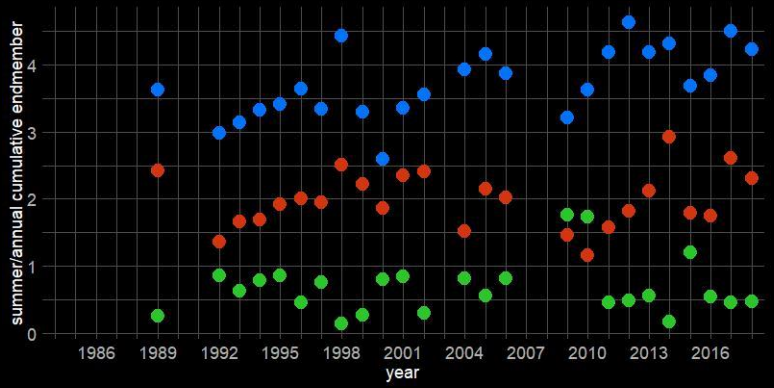
MODIS (2001-2018)



Results

Summer pasture

Landsat (1984-2018)

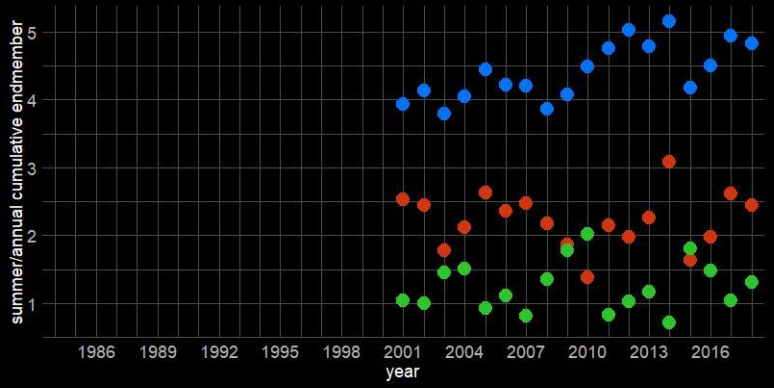


NPV

Soil

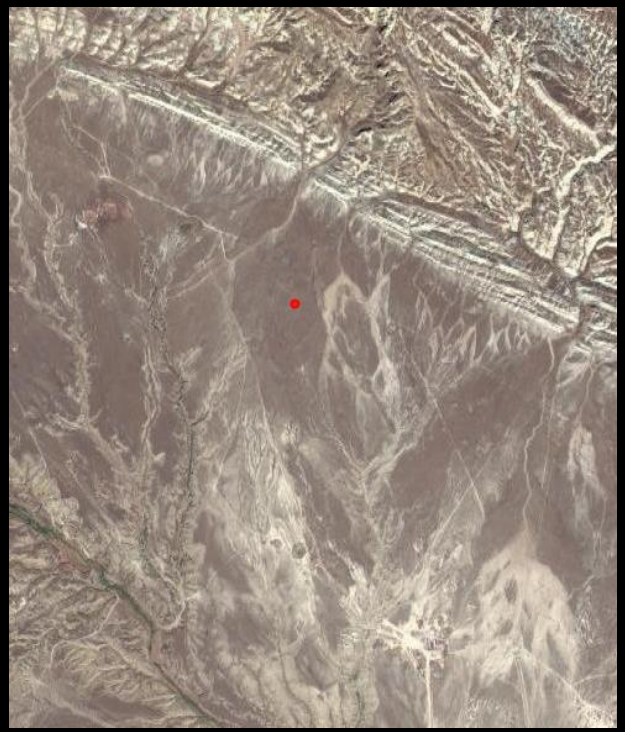
Green

MODIS (2001-2018)

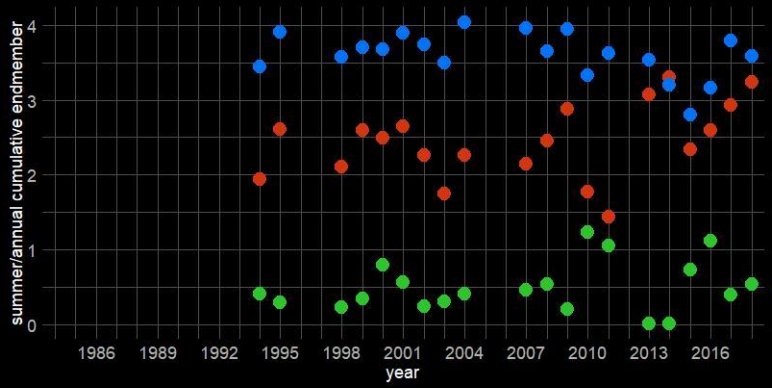


Results

Rangeland



Landsat (1984-2018)



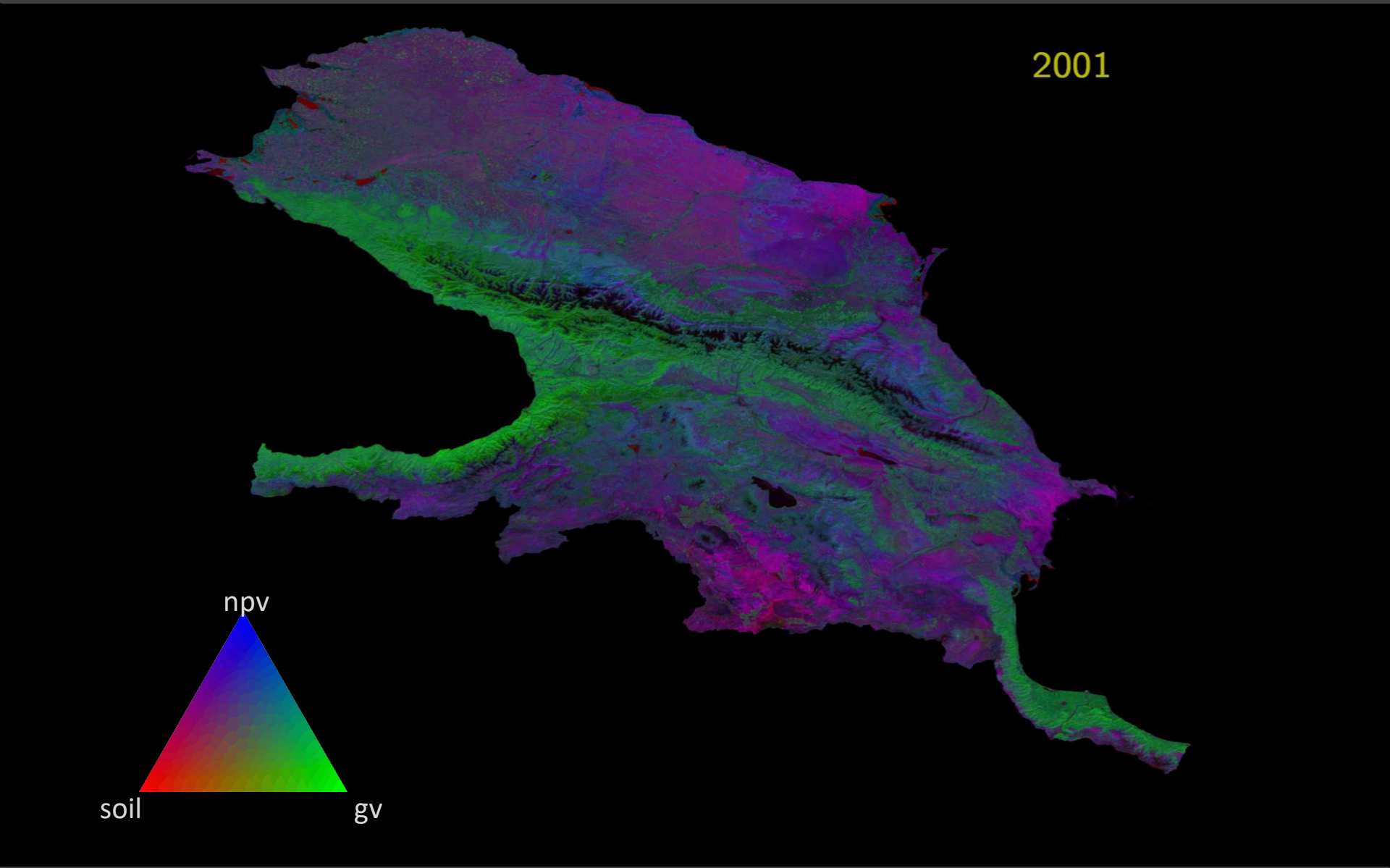
NPV

Soil

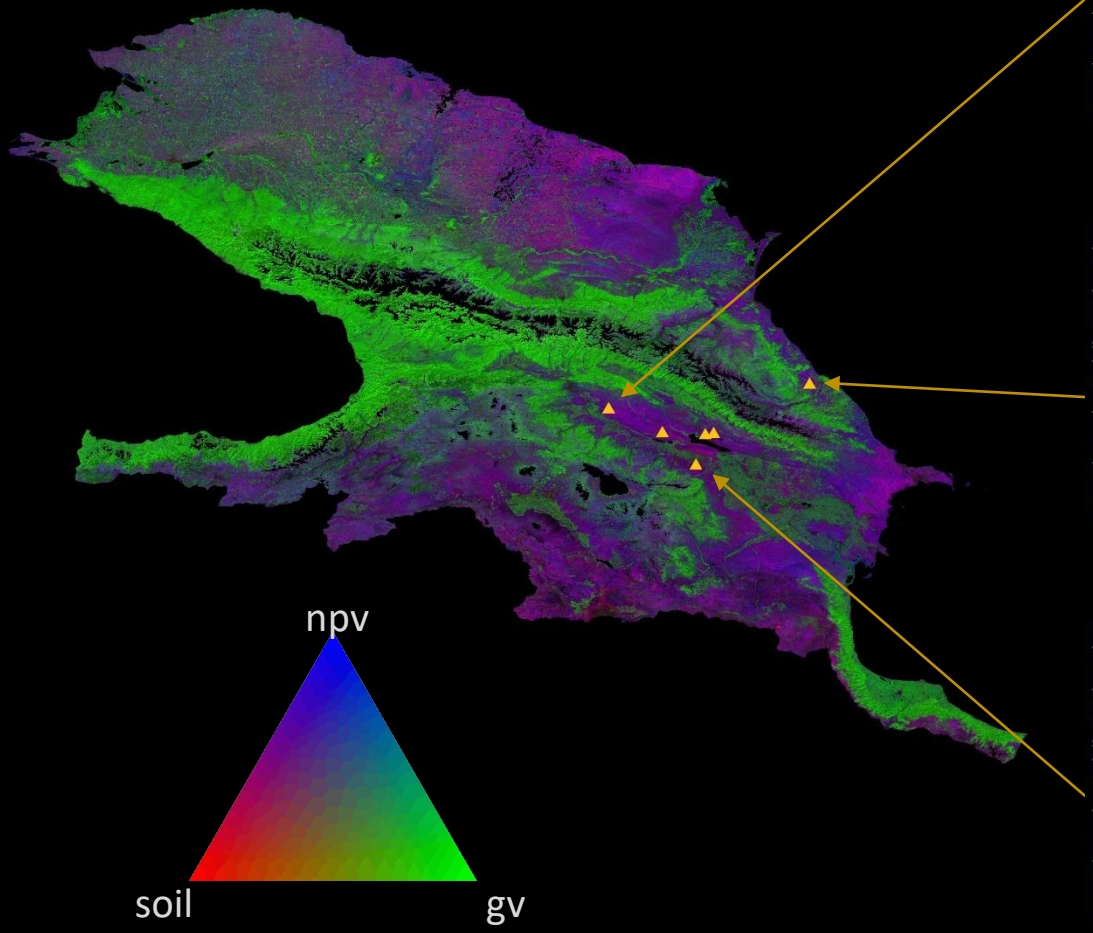
Green

MODIS (2001-2018)

Results



Results


npv
soil
gv


summer/annual cumulative endmember
0
2
4
6
2001
2004
2007
2010
2013
2016
2018
year


summer/annual cumulative endmember
1
2
3
4
5
2001
2004
2007
2010
2013
2016
2018
year


summer/annual cumulative endmember
0
1
2
3
4
2001
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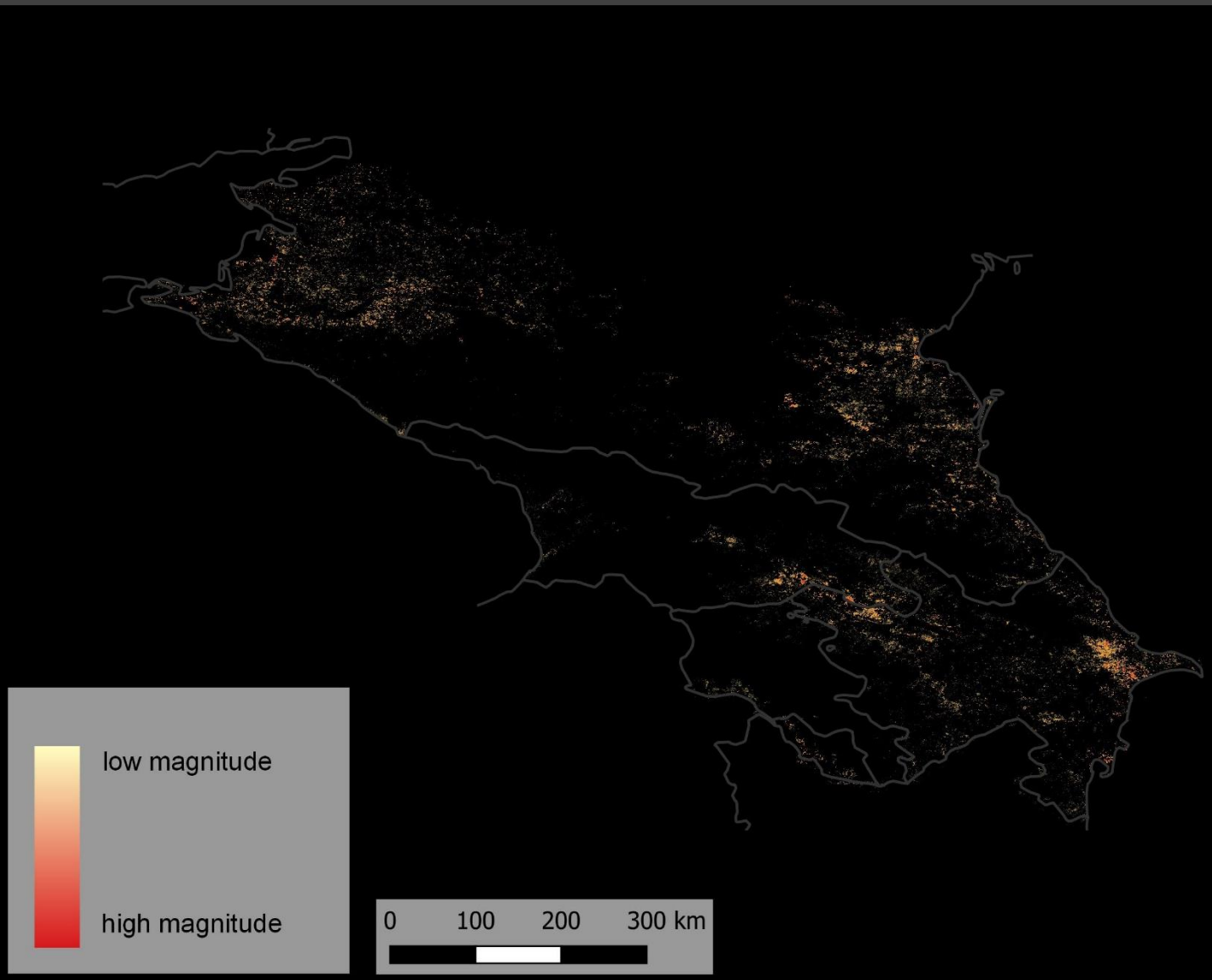
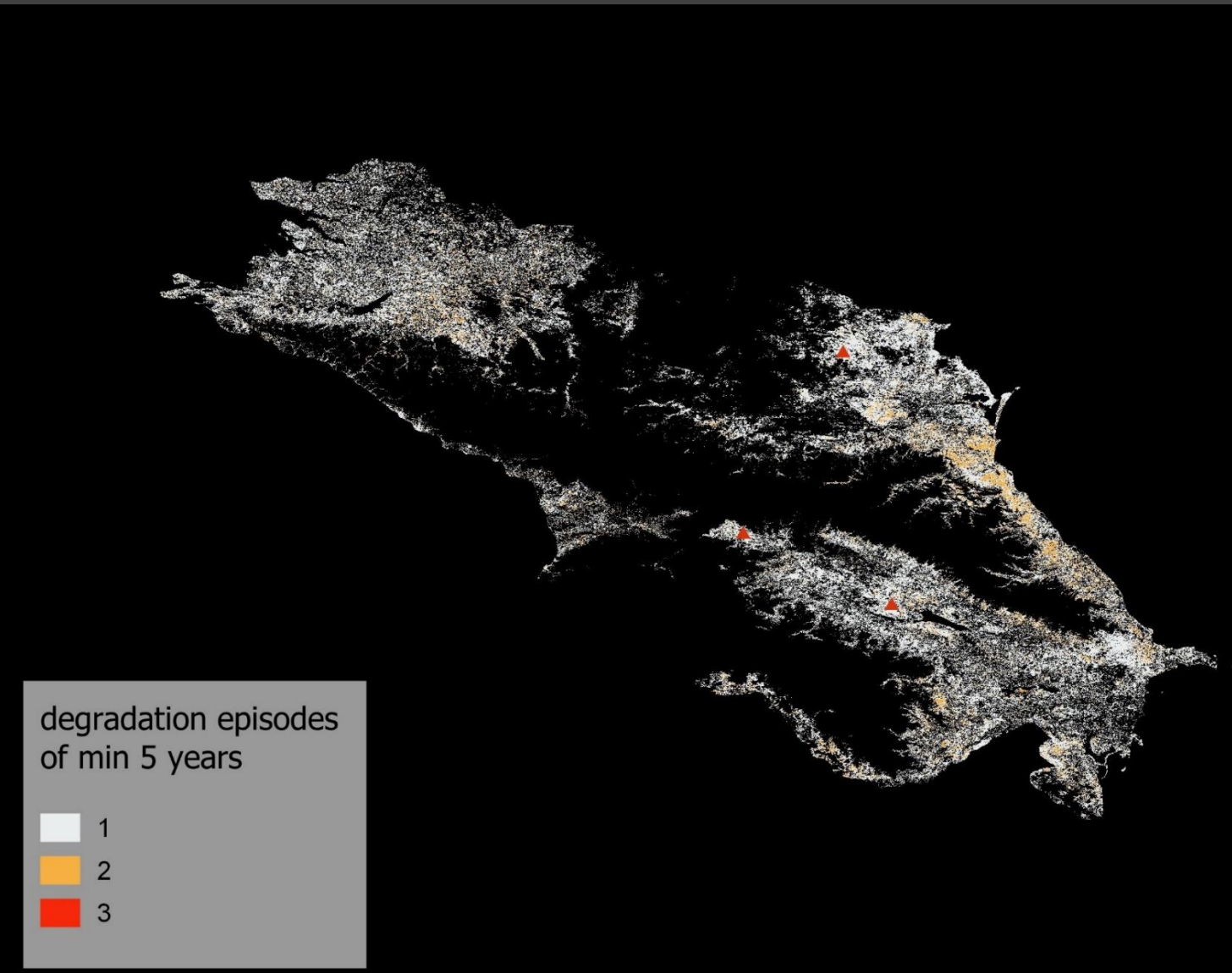
year

Results



Results



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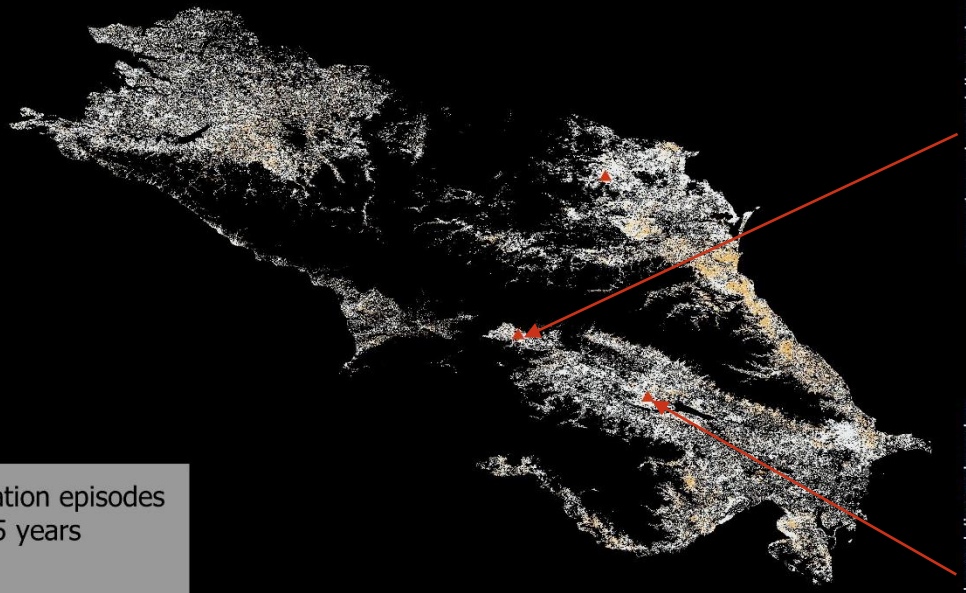
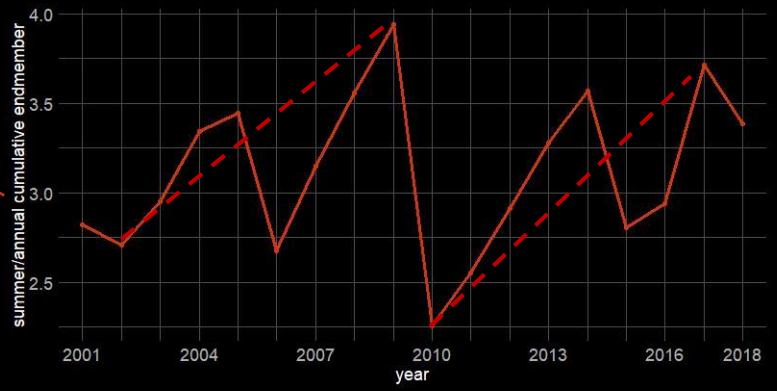


degradation episodes
of min 5 years

1
2
3



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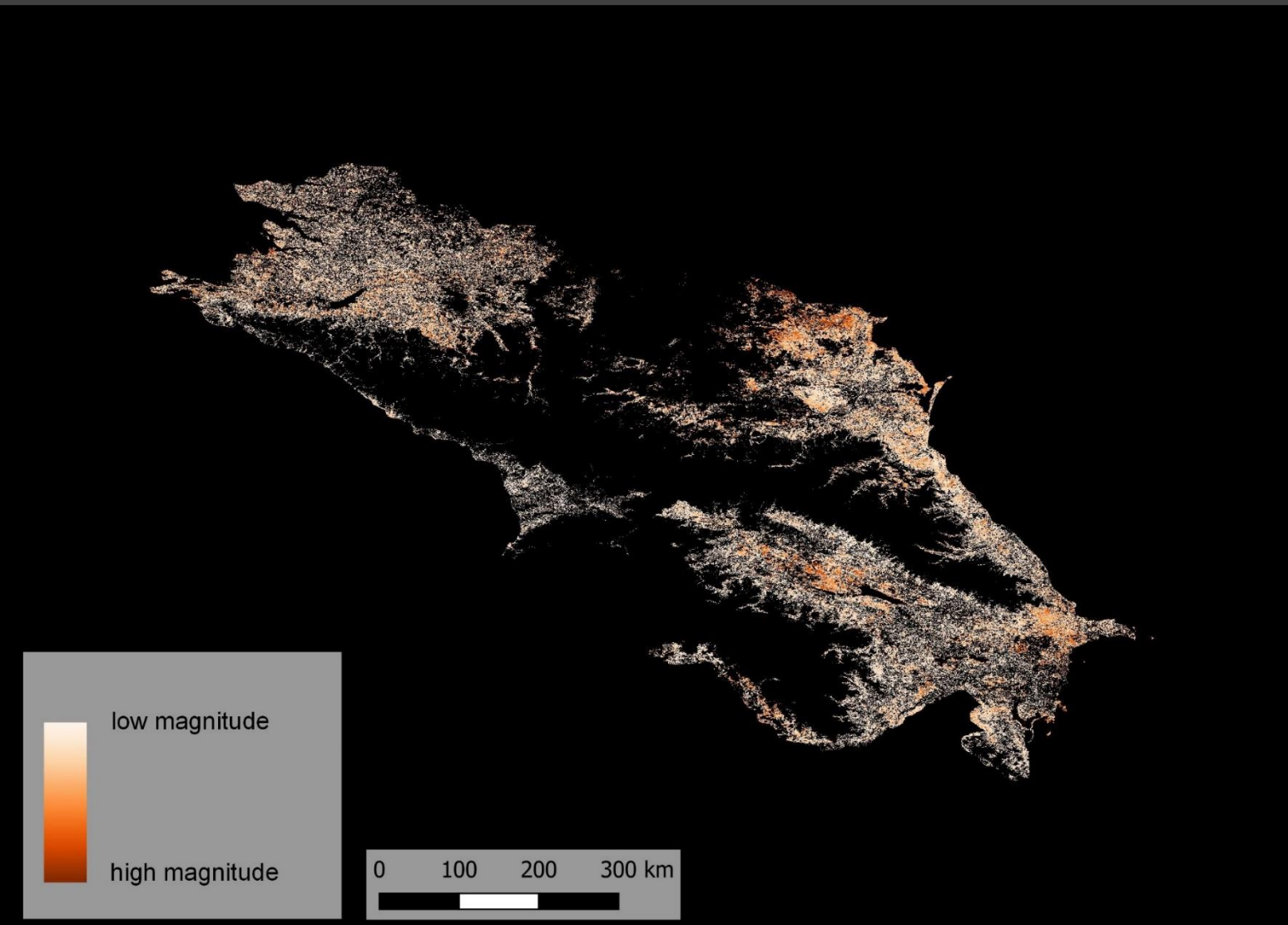

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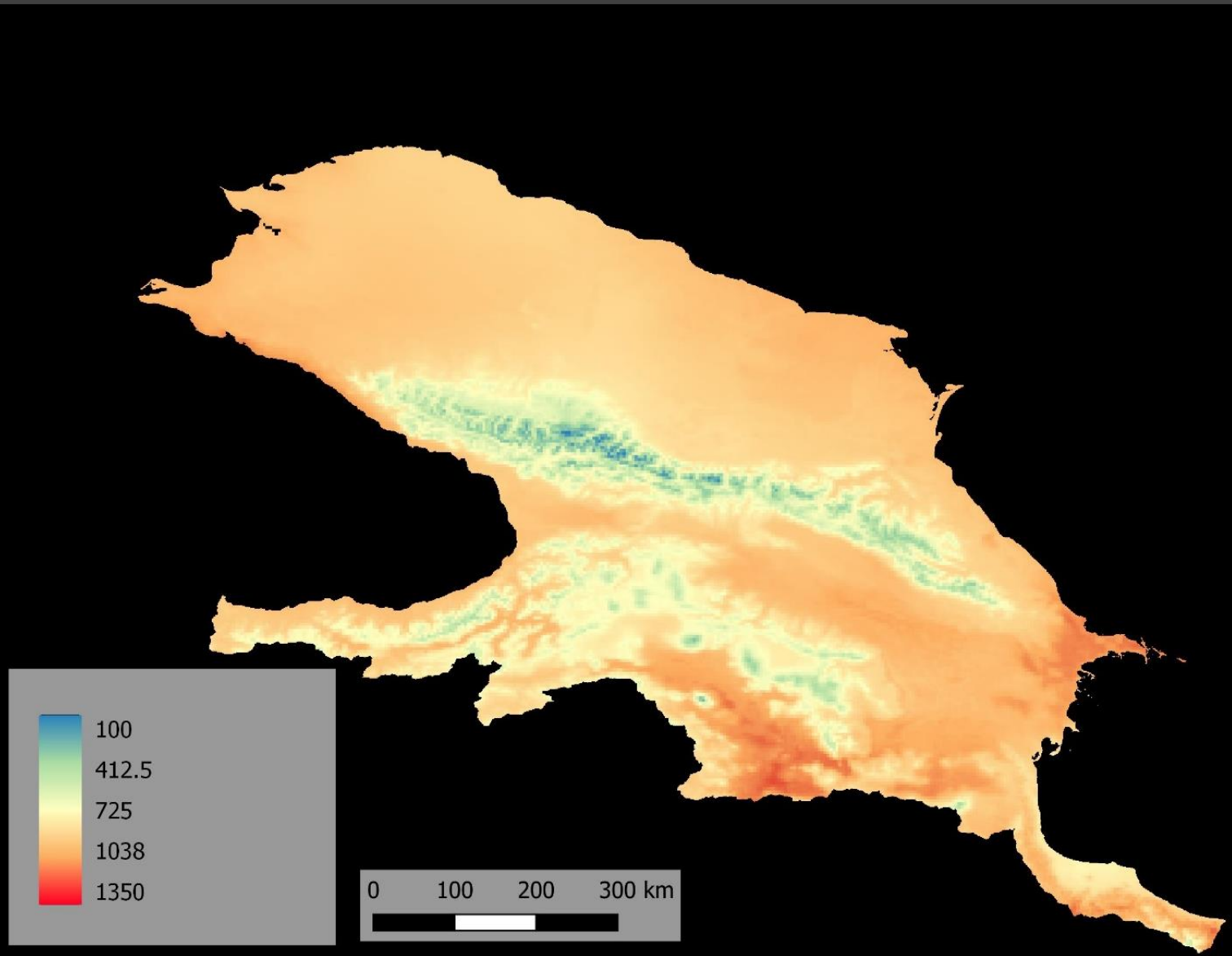

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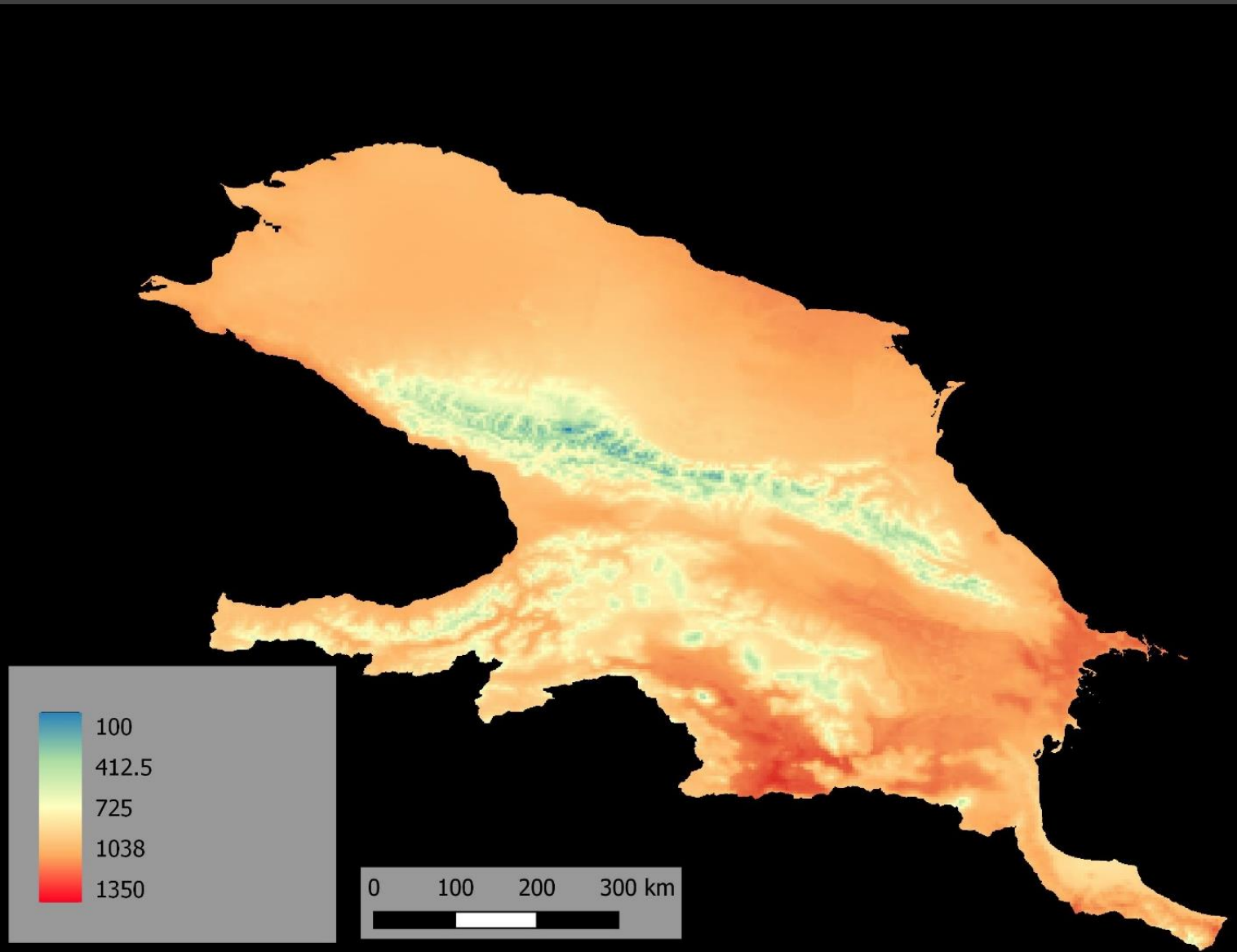

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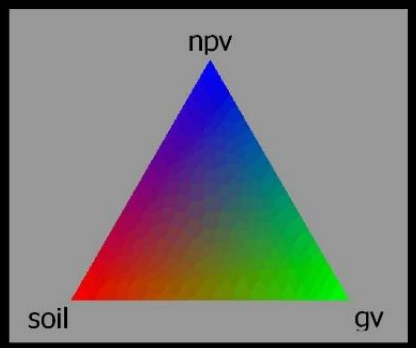

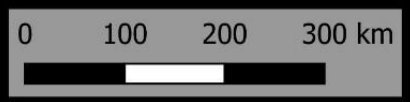

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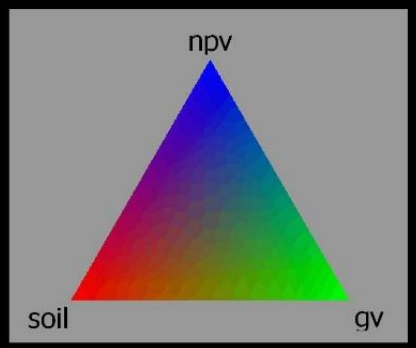

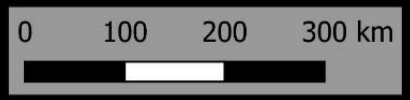

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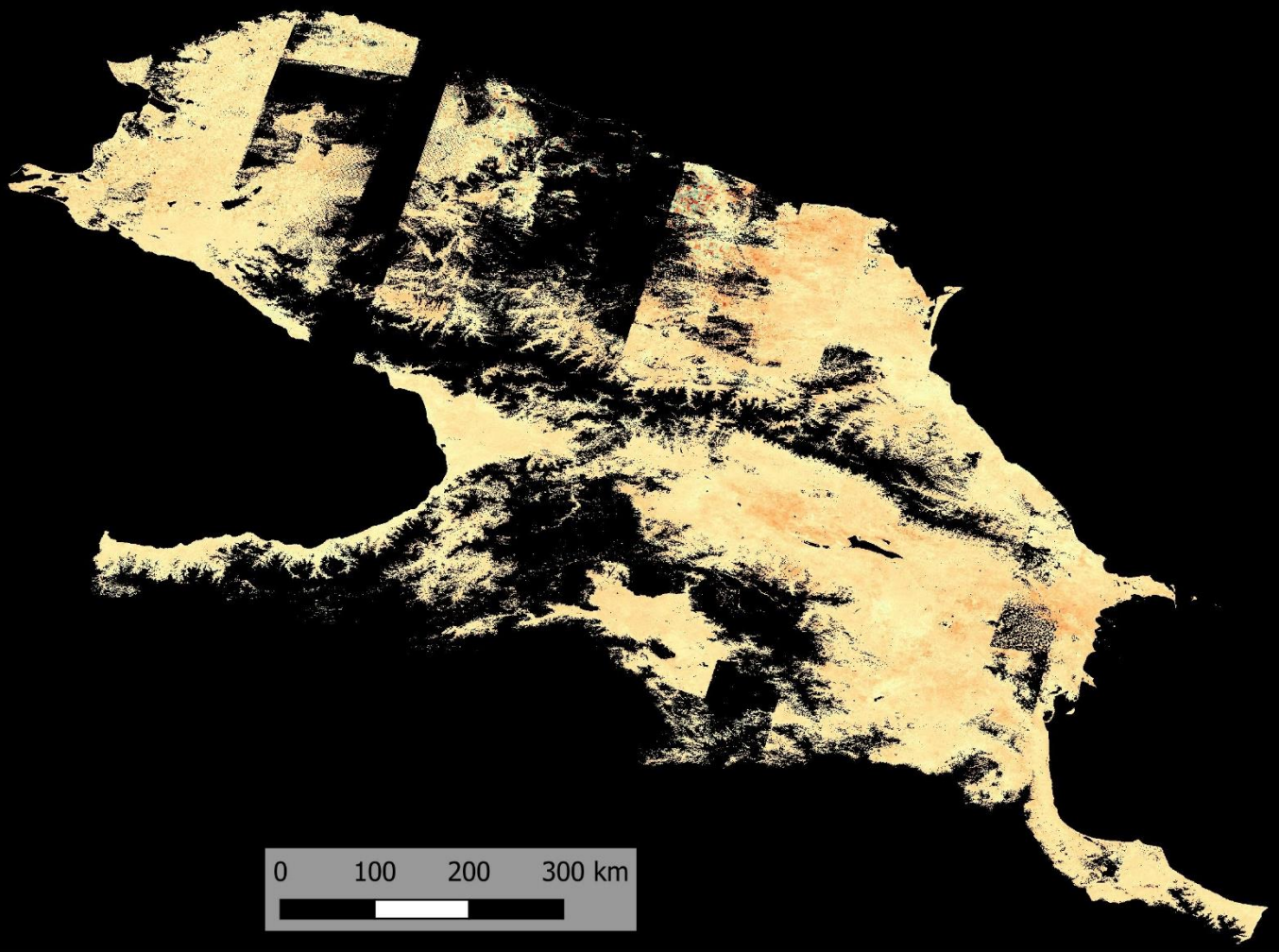

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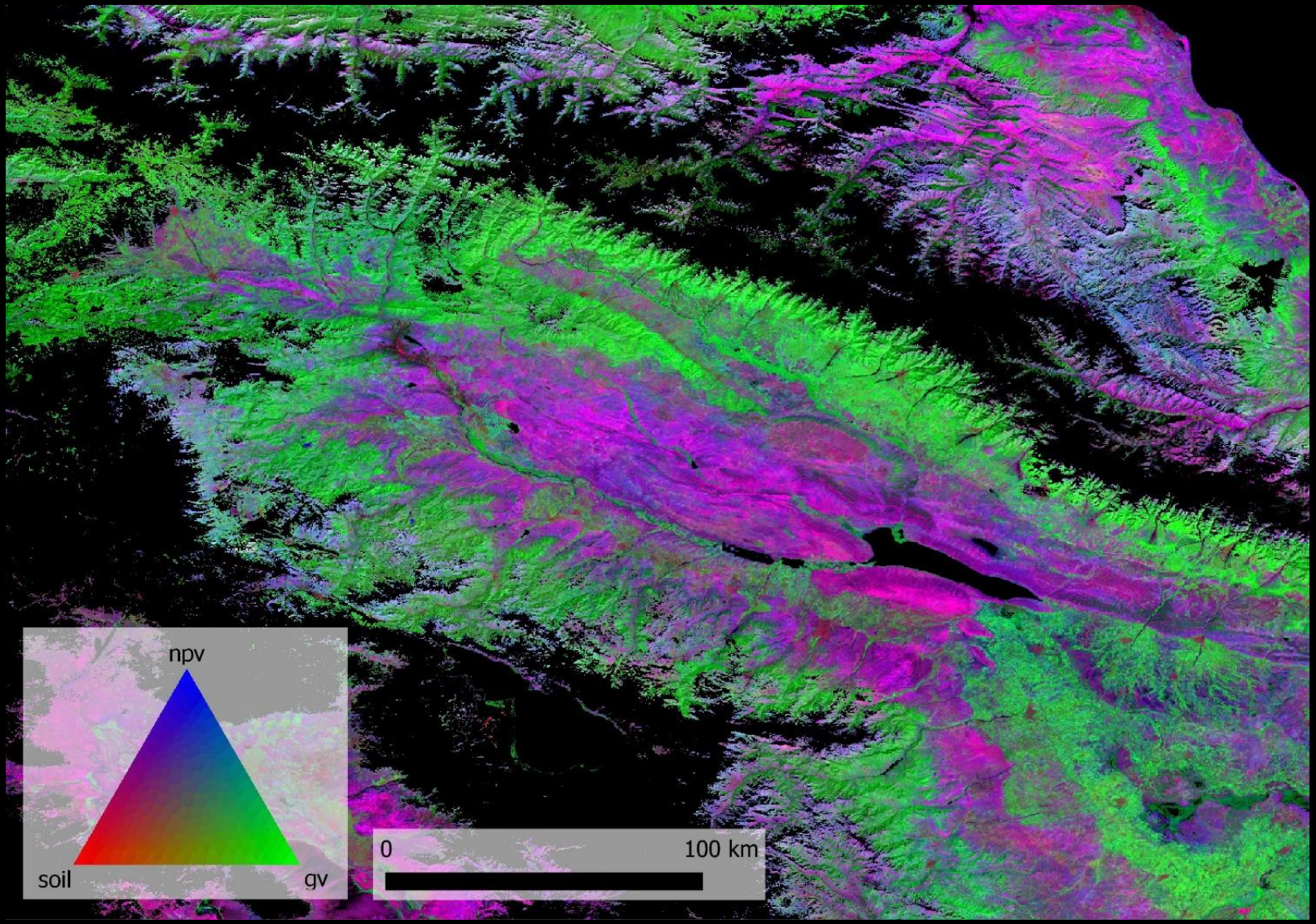

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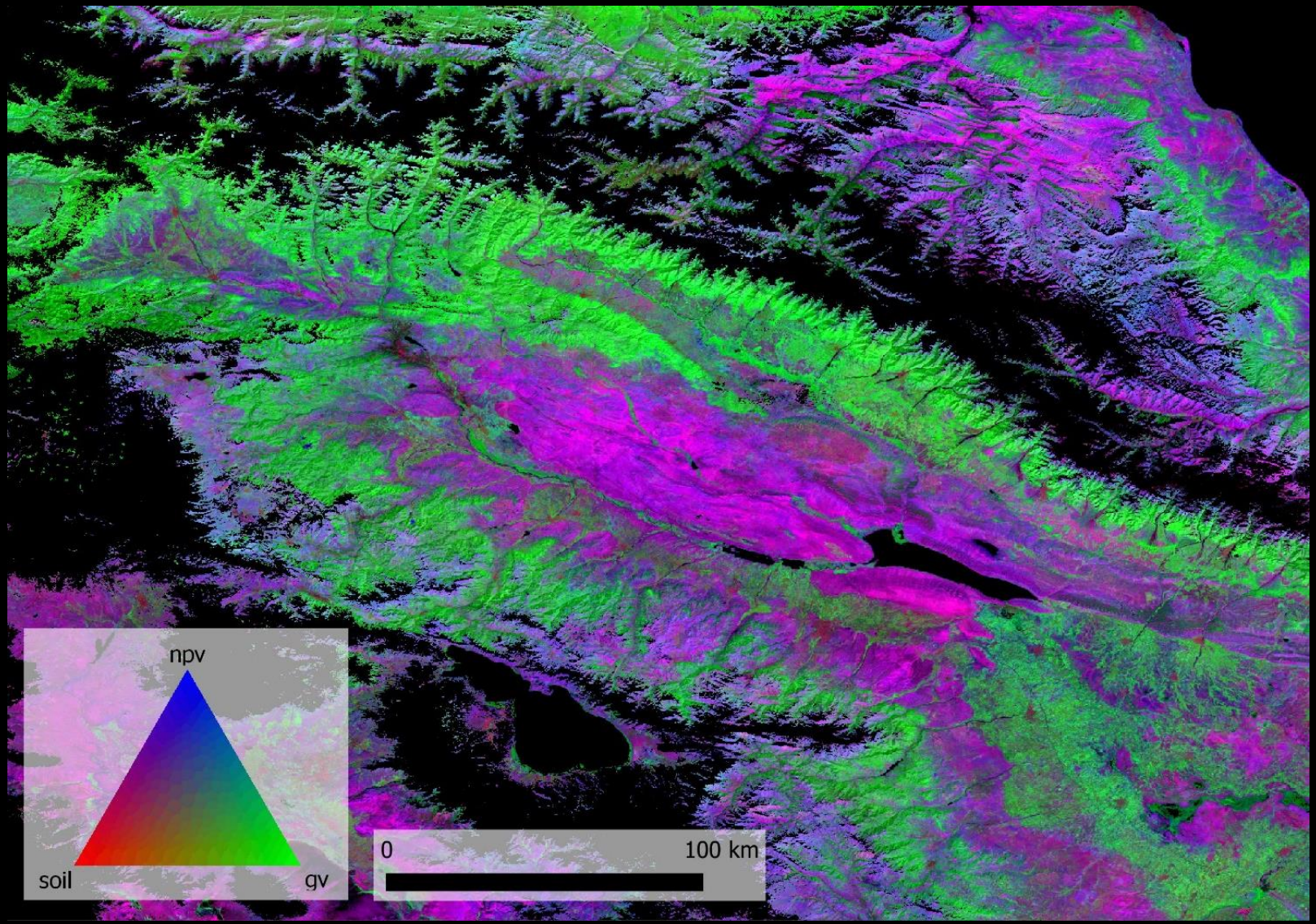

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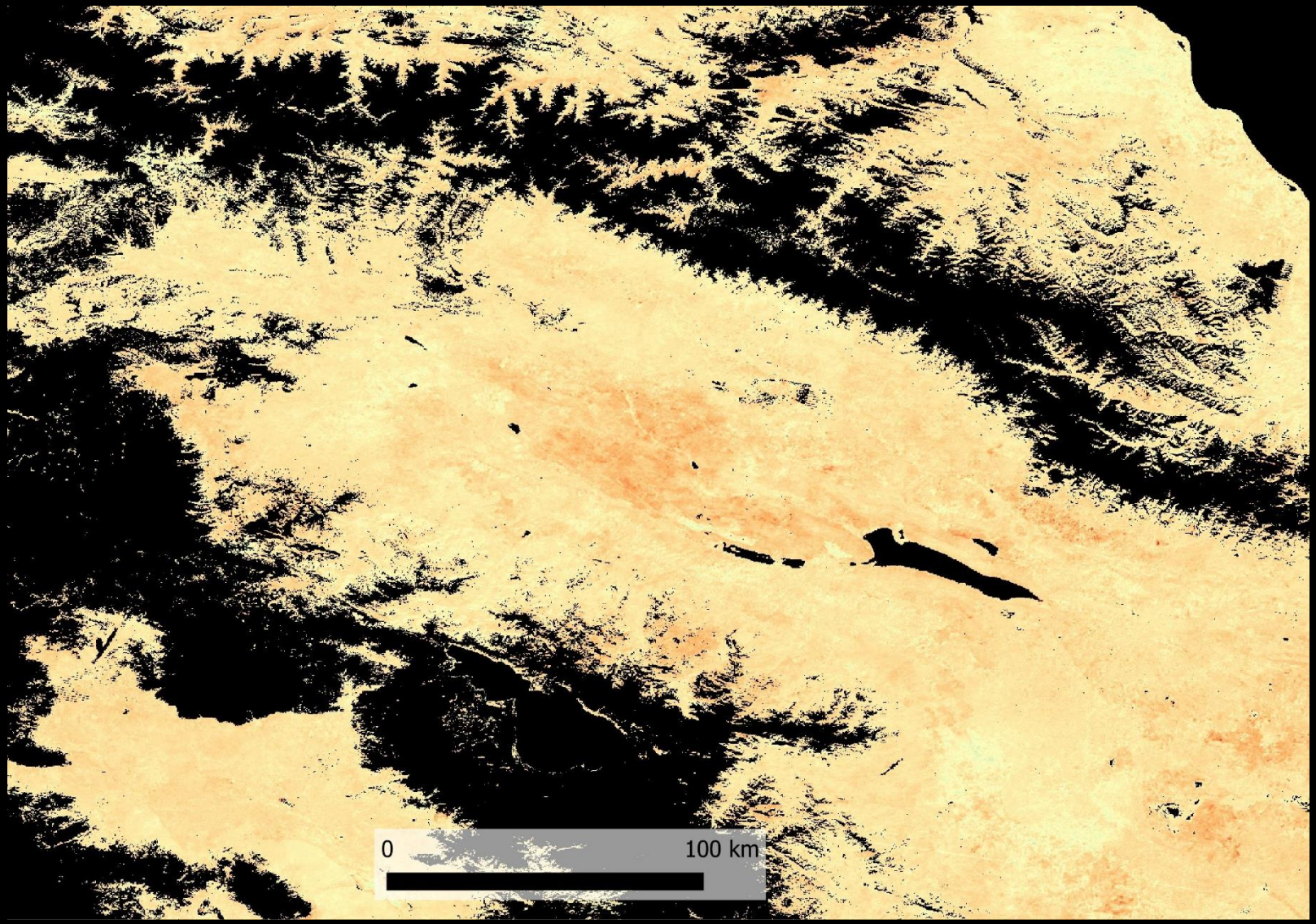

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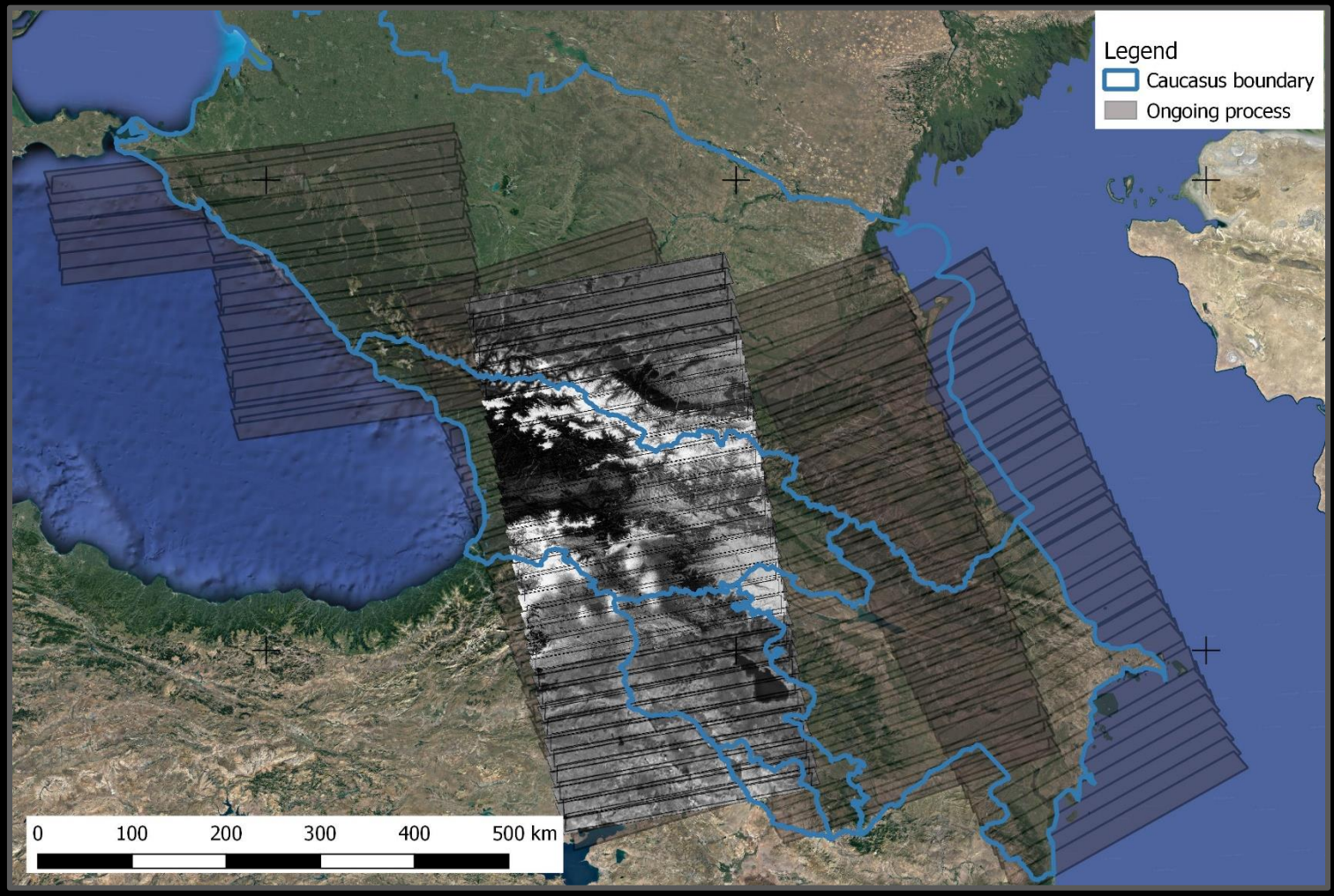
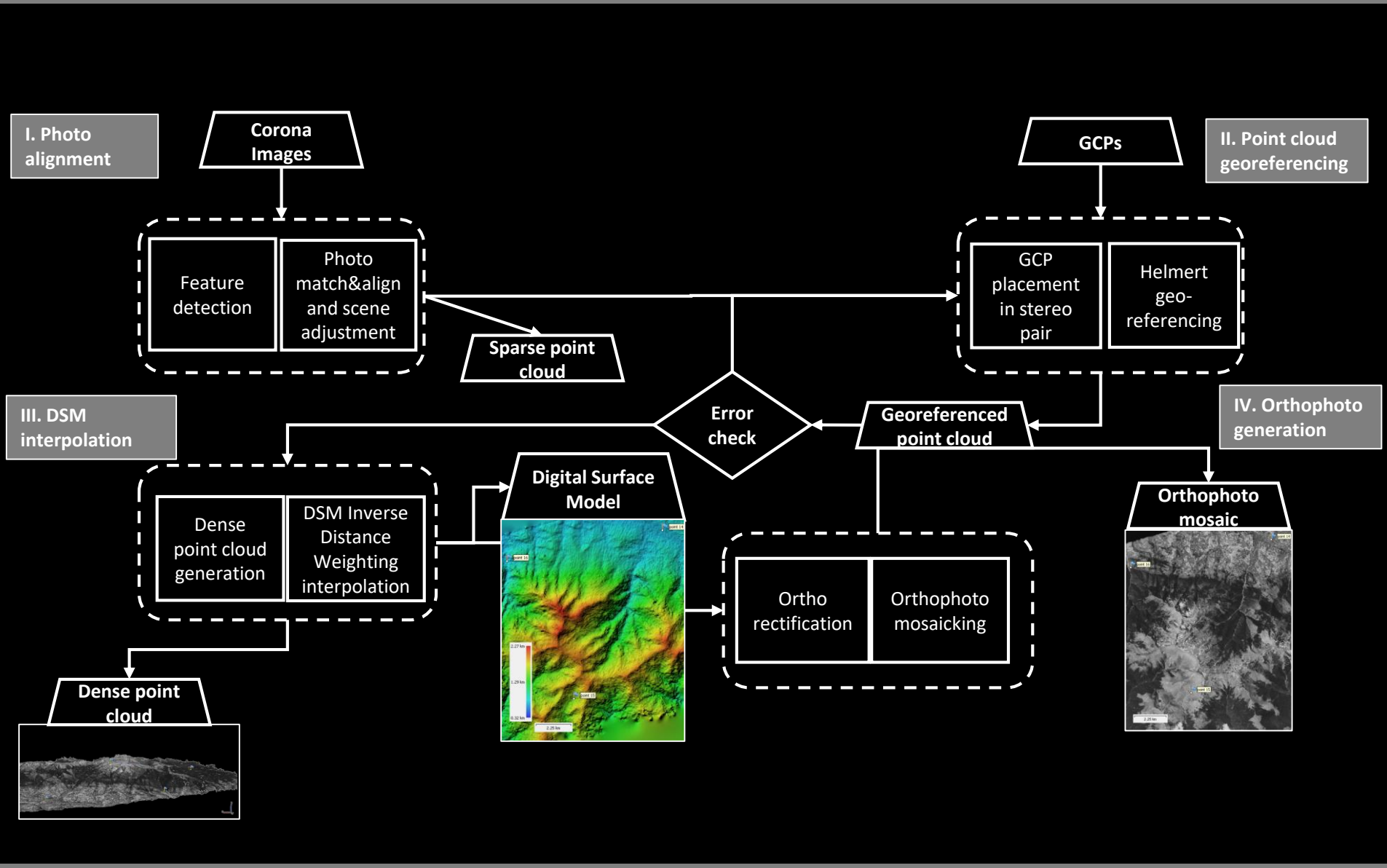
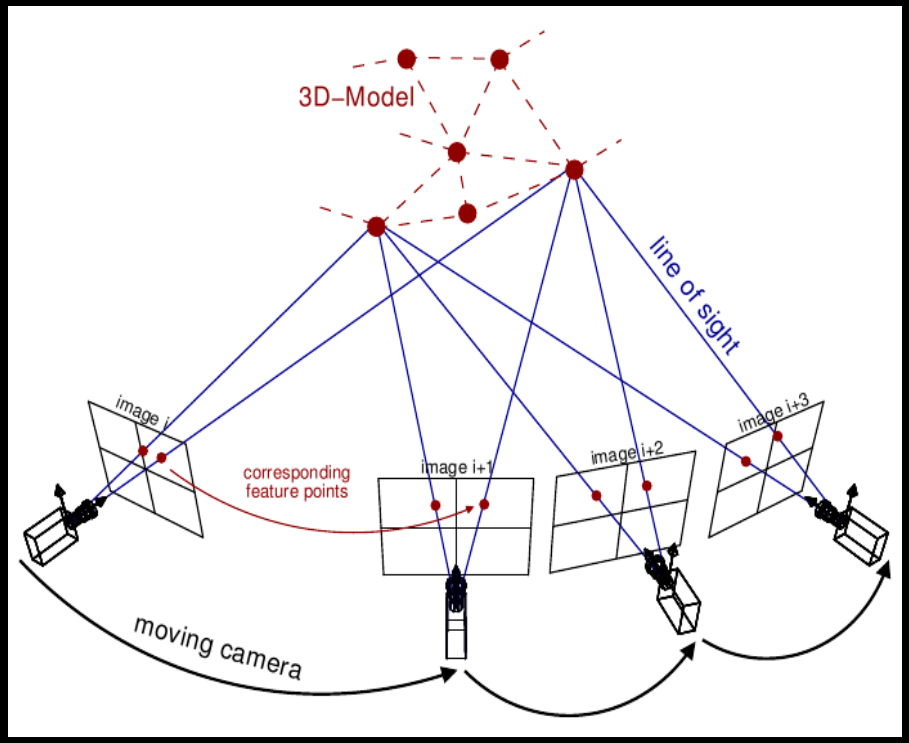
Corona imagery

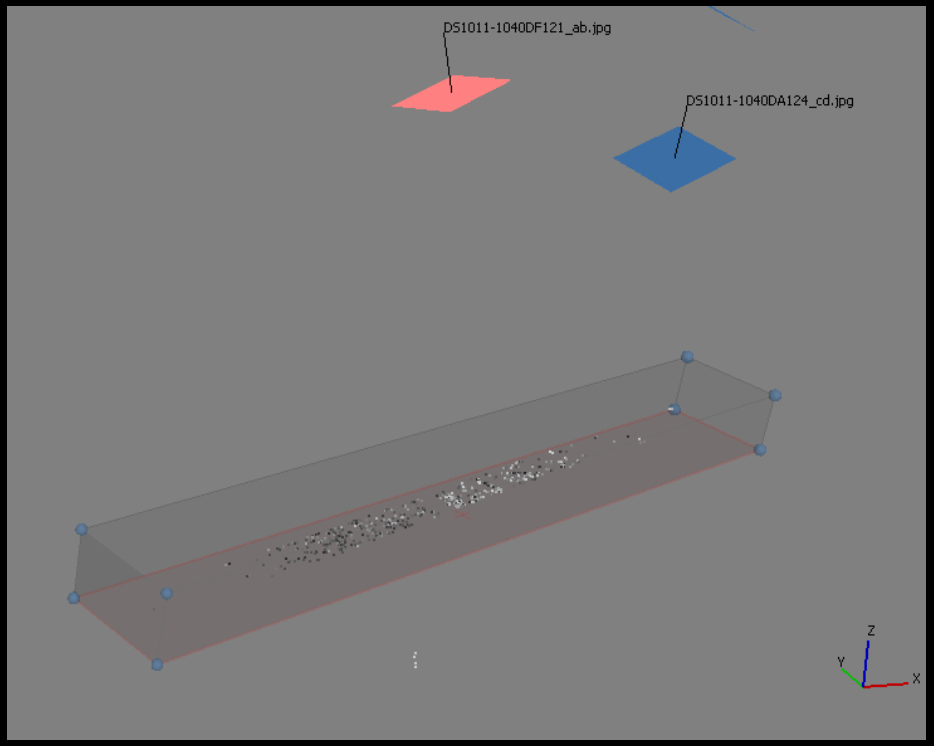


Corona orthorectification workflow



I. Photo Alignment





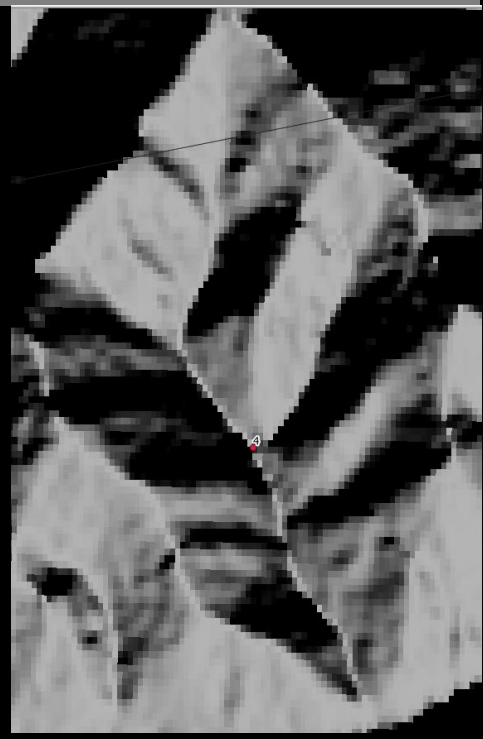
Align Cameras using Structure from Motion algorithm

II. Point cloud georeferencing

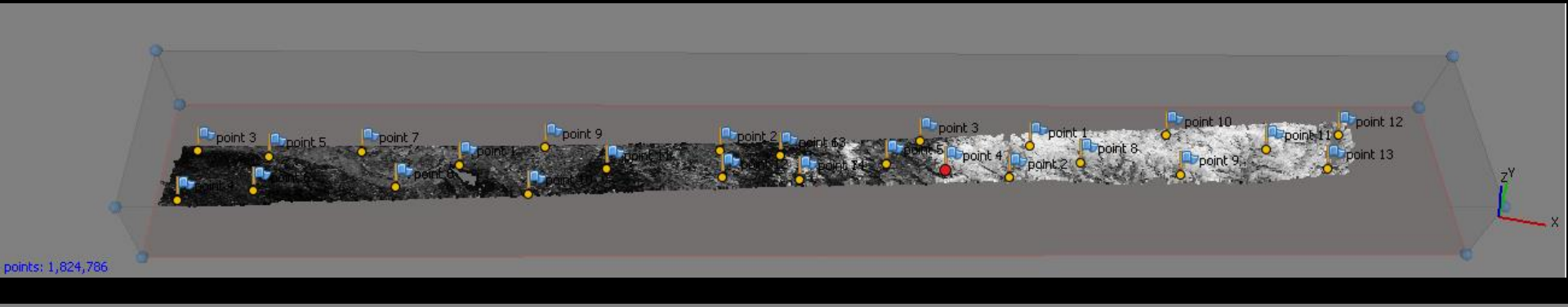
Afterward Camera

Forward Camera

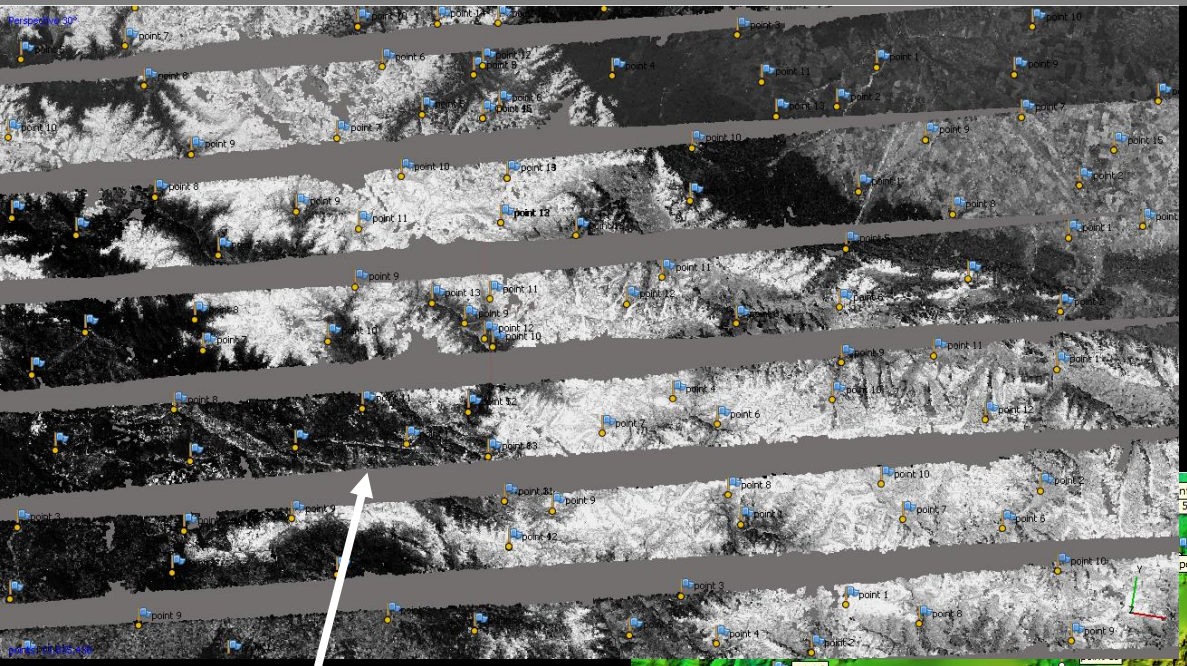
High-res Image (x,y)



SRTM (z)

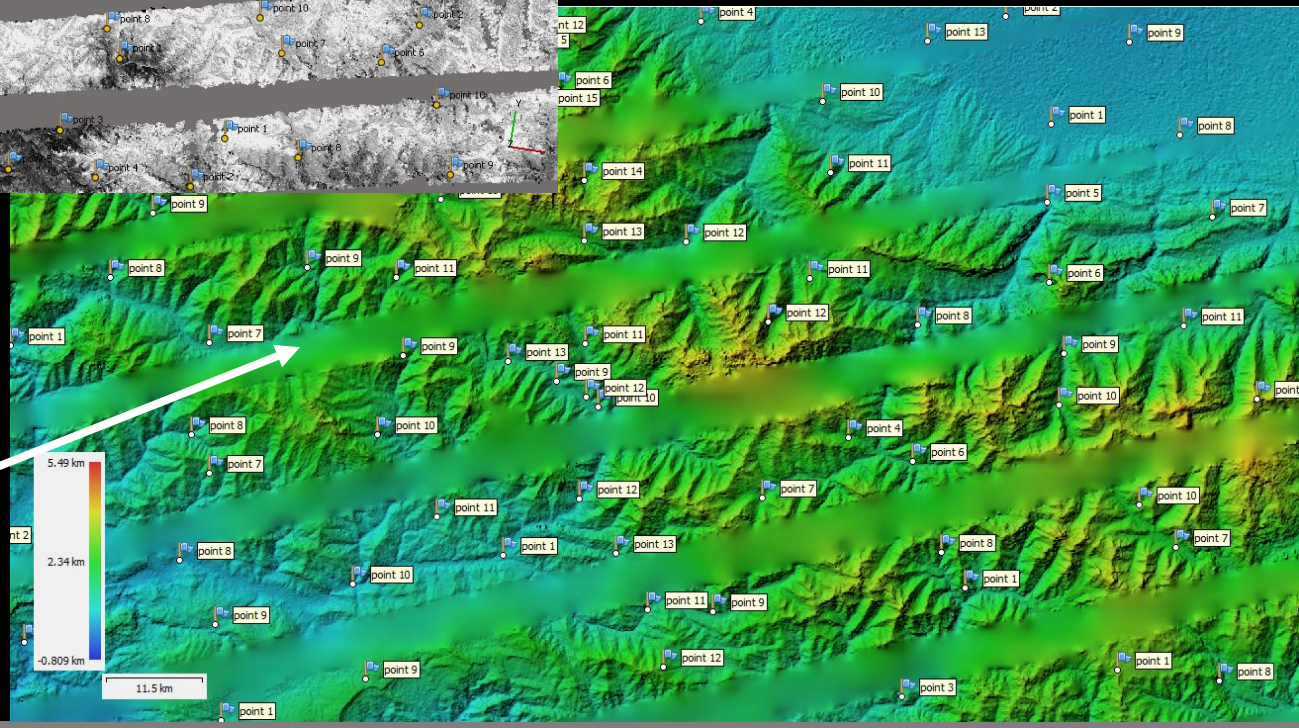


III. DSM interpolation

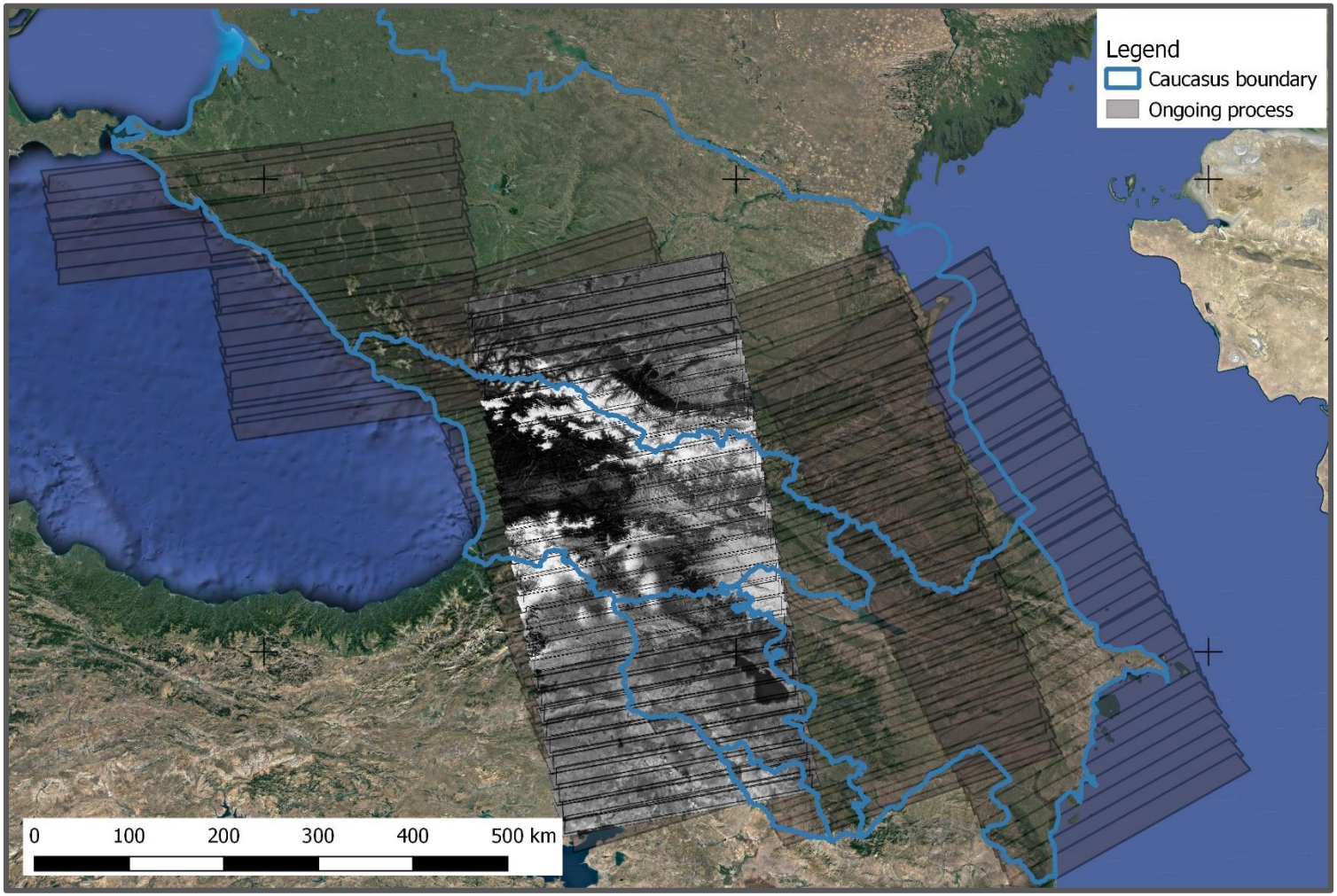


Dense Point Clouds joined from neighboring Corona stereo stripes

Some missions are “stereo medium”, and we have to fill holes in stereo-coverage between stripes using SRTM



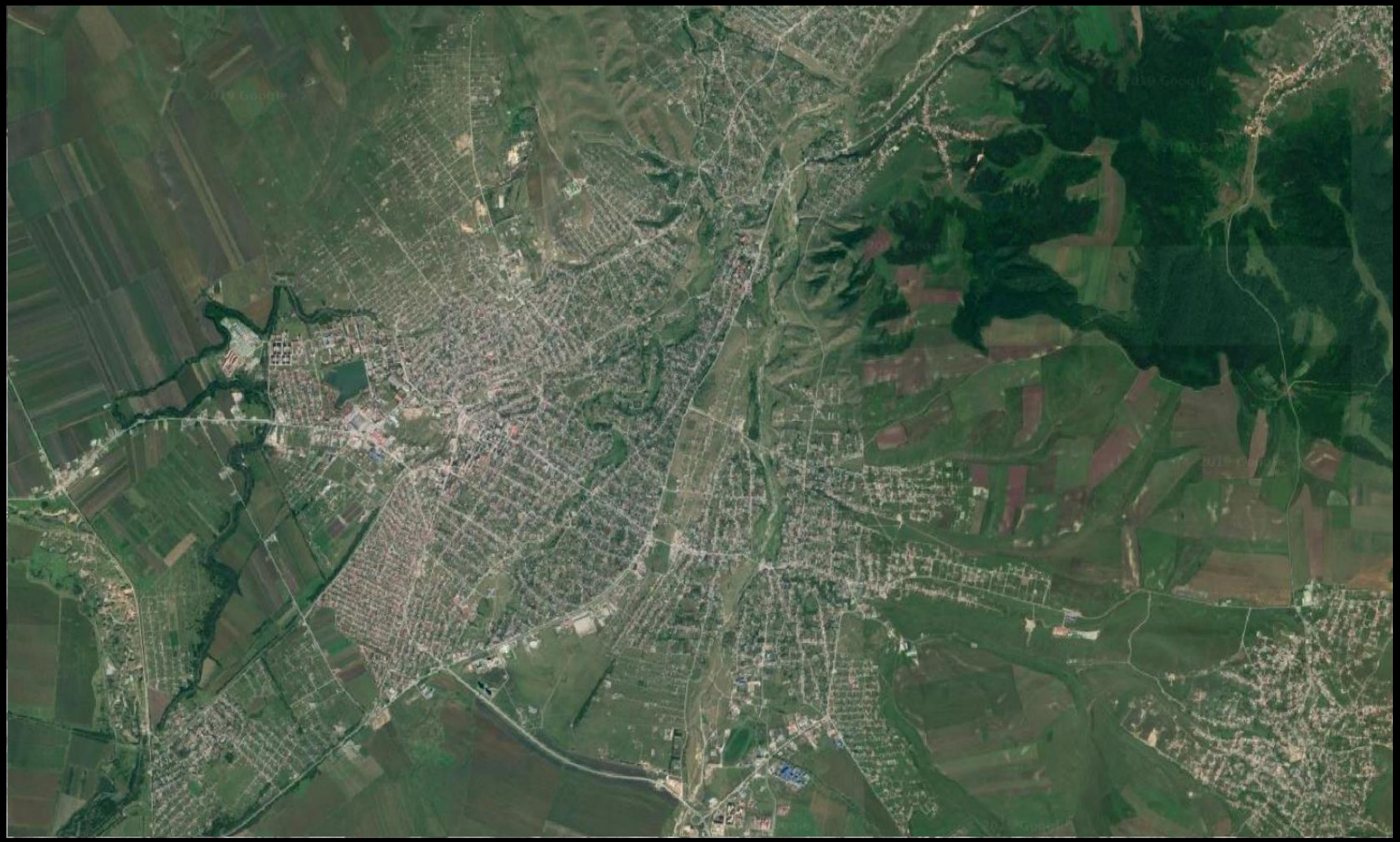
Corona imagery



Results

Results

Results



Results

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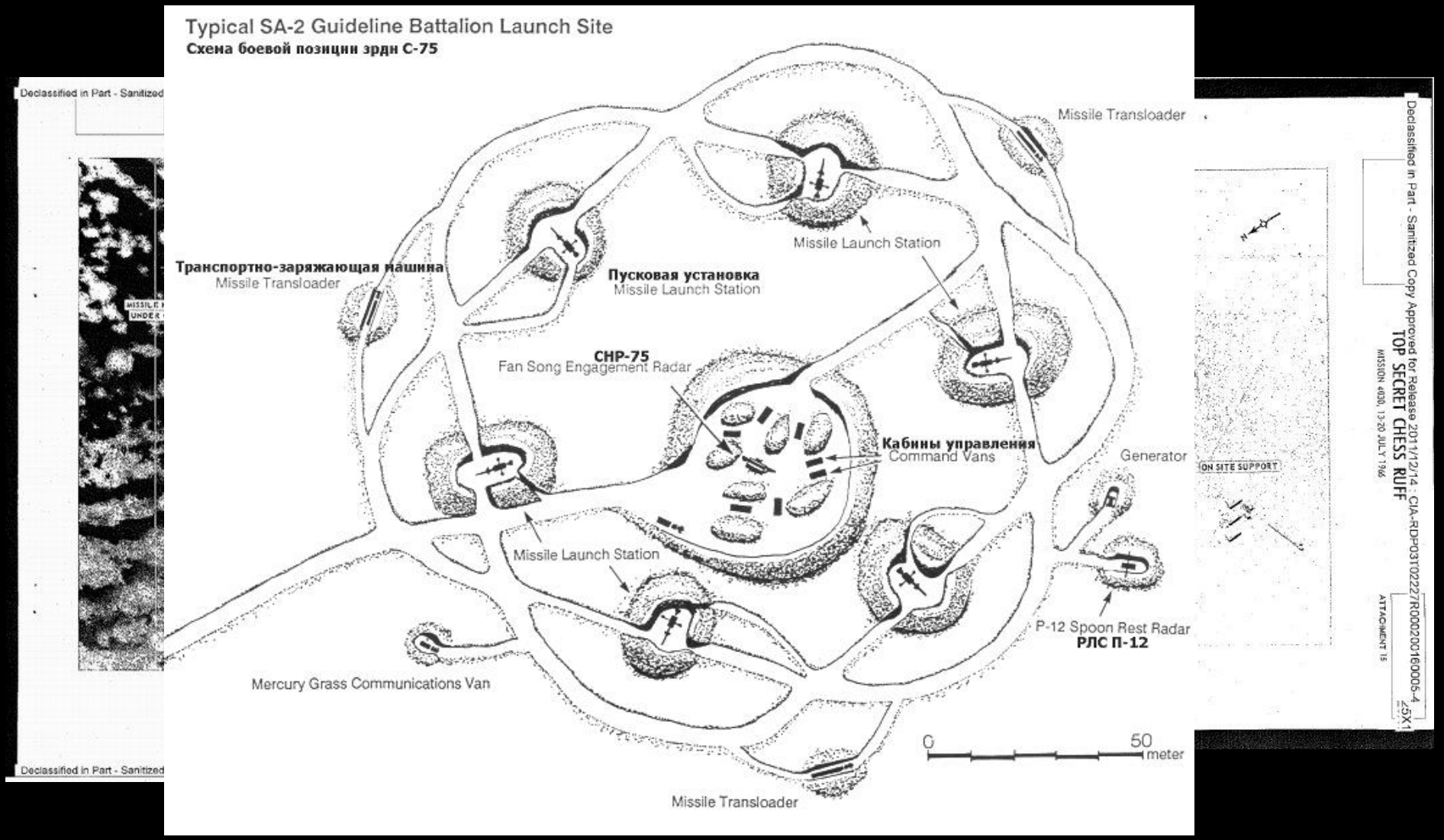
Typical SA-2 Guideline Battalion Launch Site
Схема боевой позиции эрдн С-75
Declassified in Part - Sanitized
Транспортно-заряжающая машина
Missile Transloader
Пусковая установка
Missile Launch Station
СНР-75
Fan Song Engagement Radar
Кабины управления
Command Vans
Missile Launch Station
Missile Transloader
Missile Launch Station
Generator
P-12 Spoon Rest Radar
РЛС П-12
Mercury Grass Communications Van
0
50
meter
Missile Transloader
Declassified in Part - Sanitized Copy Approved for Release 2011/12/14 : CIA-RDP03T02227R000200160005-4
TOP SECRET CHESS RUFF
ON SITE SUPPORT
ATTACHMENT 15

Conclusions

- Little conversion among land cover classes in the Caucasus
  - Some agricultural abandonment and re-cultivation
  - Forest cover generally increasing but local deforestation

Conclusions

- Degradation more common
  - We mapped grassland degradation based on annual sums of soil endmember fractions
  - Approach works for both MODIS and Landsat data
  - Short-term degradation (5-yr) far more common than long-term degradation

Conclusions

- Corona imagery
  - We developed approach to georectifiy Corona imagery for large areas using structure-from-motion software
  - Allows to analyze land cover change since the 1960s
  - Fascinating era: height of the cold war

THANK YOU!!!