

Twenty-first International Conference
"MODERN PROBLEMS OF REMOTE SENSING OF THE EARTH FROM SPACE"

Comparative analysis of the effectiveness of
modern remote sensing methods for assessing
vegetation with traditional methods.
Their accuracy on the example of the selected site



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Modern methods of remote sensing

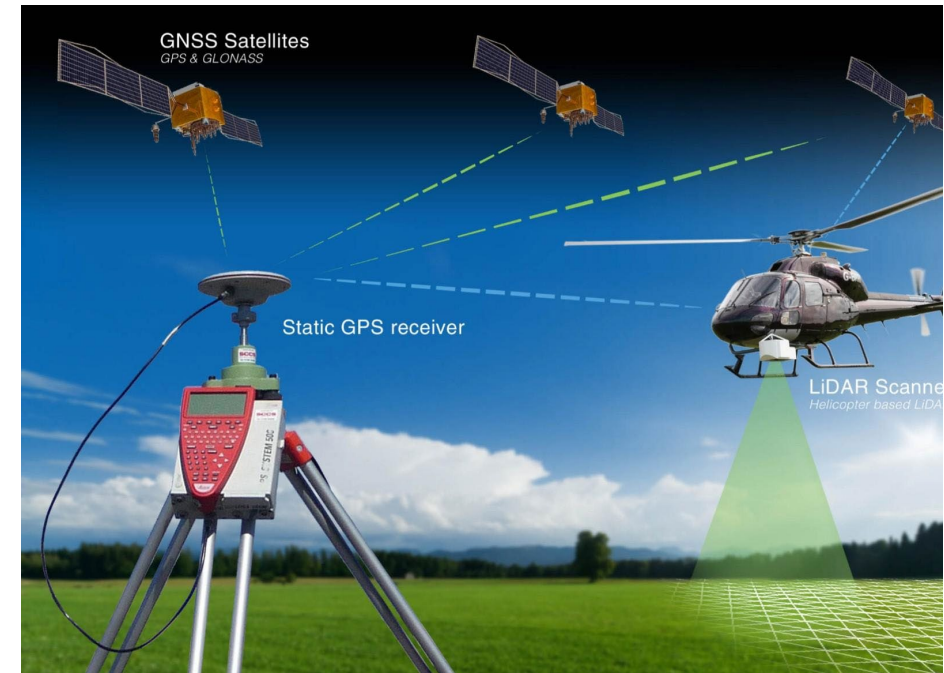
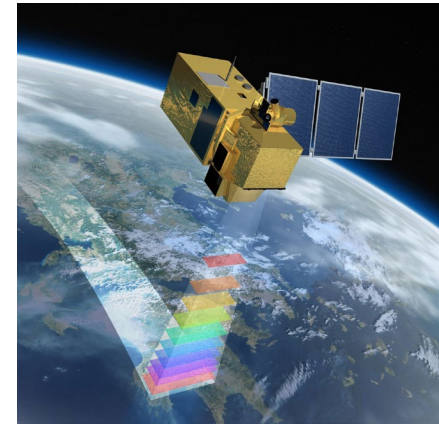
Satellite sensing

Lidar sensing

Radar Sensing (SAR)

Thermal sensing

Aircraft platforms and unmanned aerial vehicles (UAVs)



Traditional methods of vegetation assessment

Ground surveys

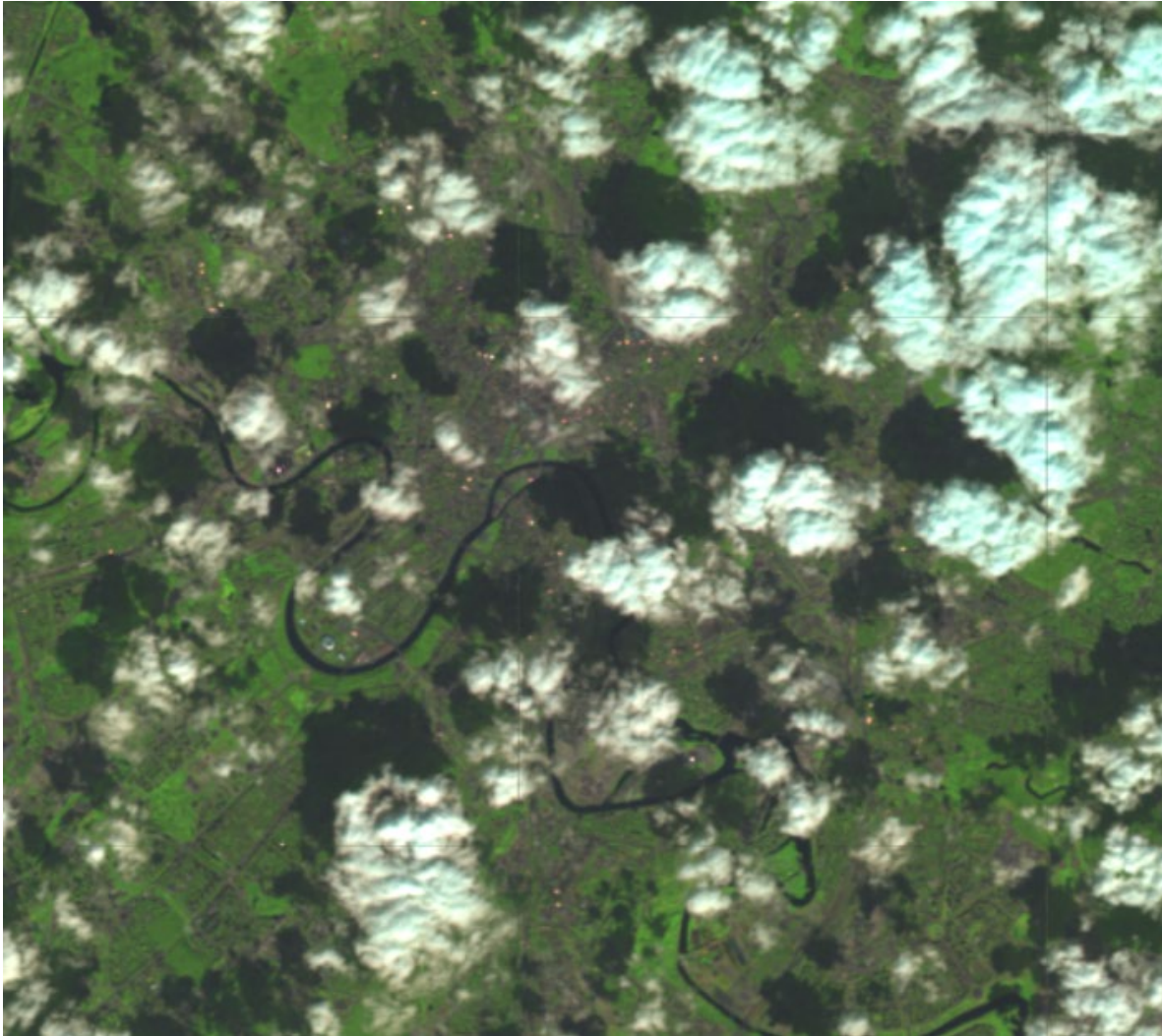
Botanical research

Photos and shooting from eye height

Audit methods

Vegetation density assessment





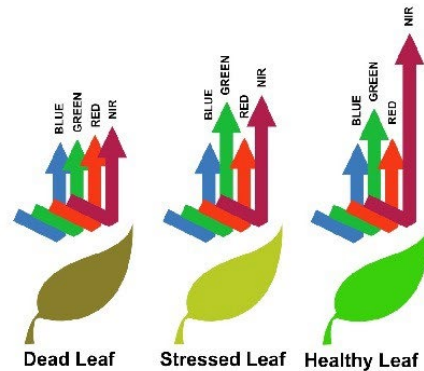
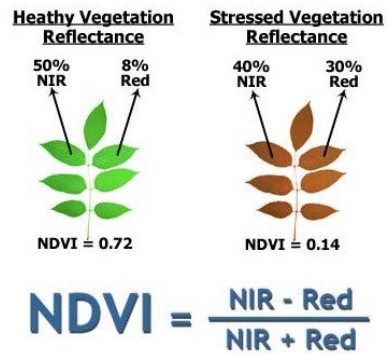
Limitations of modern methods

High costs, limited resolution, weather exposure

Limitations of traditional methods

Time-consuming, may be limited to the area of examination and require time

Methodology of analysis



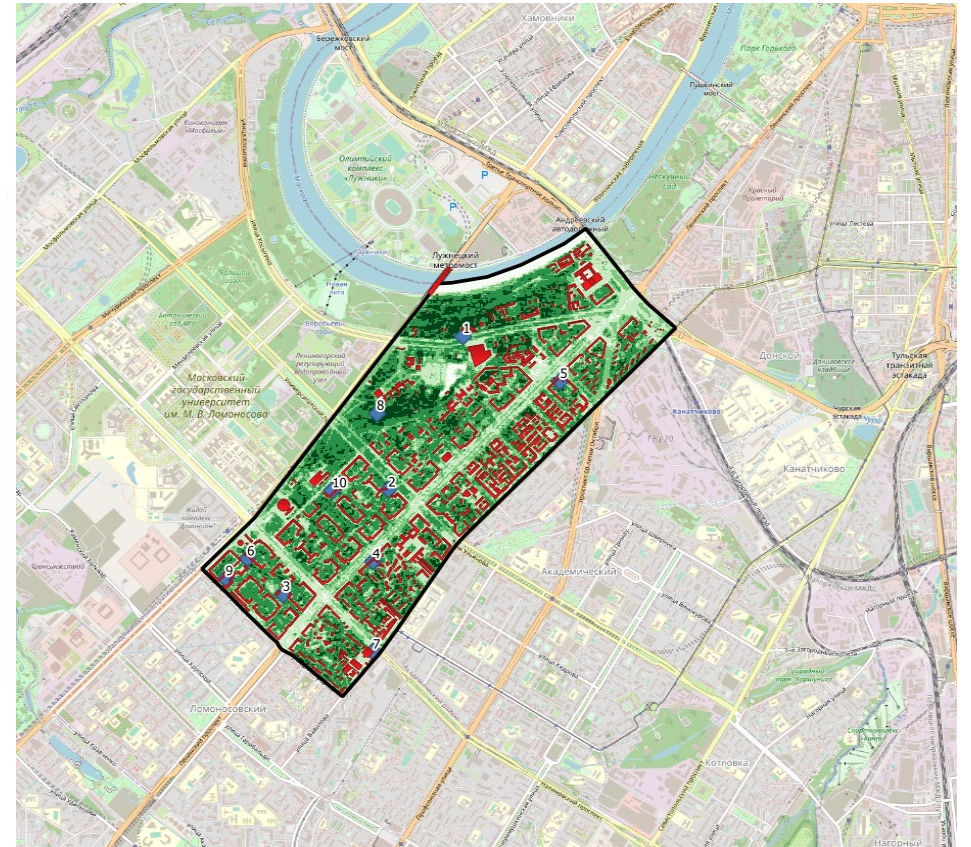
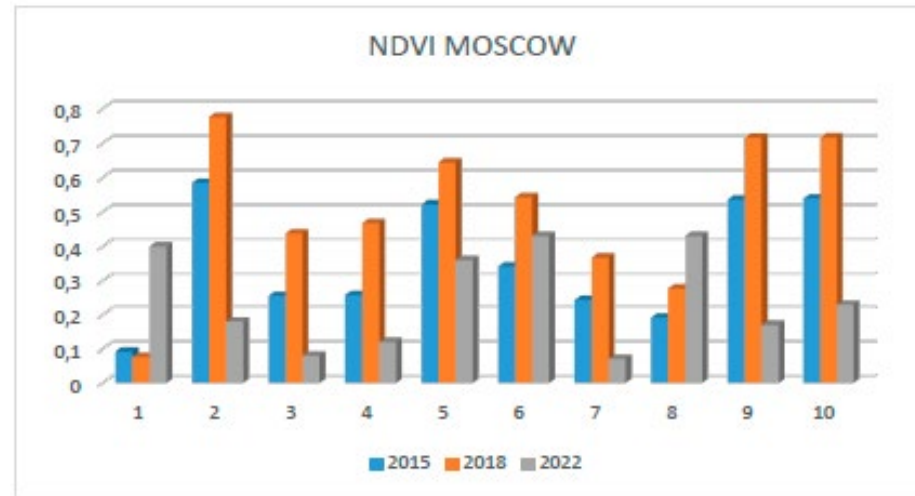
NDVI is an index that estimates the amount of green vegetation. The index normalizes the scattering of green leaves in the near infrared range with the absorption of chlorophyll in red wavelengths. The range of NDVI values is from -1 to 1. Negative NDVI values (values approaching -1) correspond to water. Values close to zero (from -0.1 to 0.1) usually correspond to barren areas of rocks, sand or snow. Low positive values represent shrubs and pastures (from 0.2 to 0.4), and high values indicate temperate and tropical moist forests (values approaching 1).

NDVI analysis by selected points

Data on NDVI values were obtained at ten selected points

For the analysis, the Gagarinsky district in Moscow and spectral images of the Sentinel 2 satellite for three years, the month of August, were taken, since at this time of year there is a high vegetation index and minimal cloud cover in the atmosphere

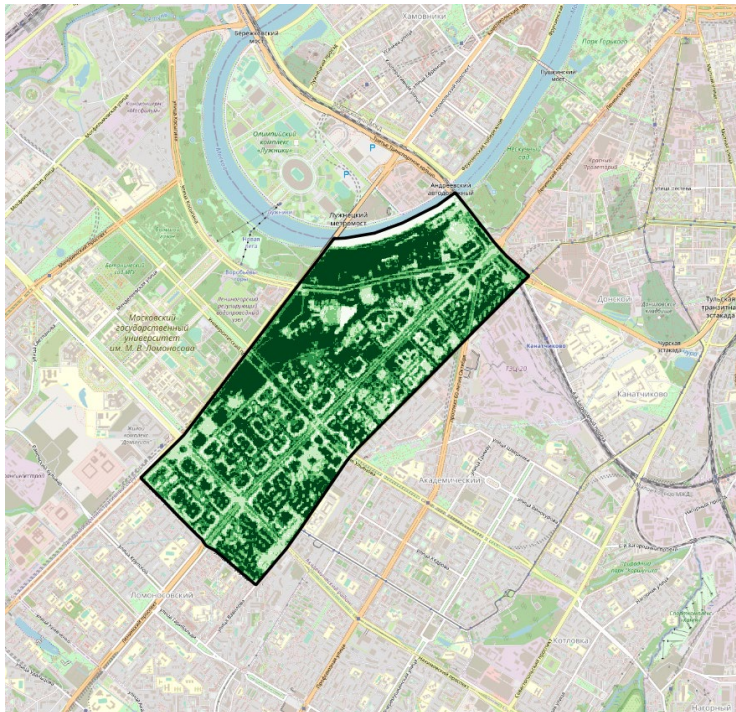
| | 2015 | 2018 | 2022 |
|----|----------|-------------|------|
| 1 | 0,09161 | 0,076086953 | 0,4 |
| 2 | 0,584829 | 0,775479317 | 0,18 |
| 3 | 0,255276 | 0,437164336 | 0,08 |
| 4 | 0,257697 | 0,467149973 | 0,12 |
| 5 | 0,521901 | 0,643399477 | 0,36 |
| 6 | 0,341021 | 0,542397678 | 0,43 |
| 7 | 0,243482 | 0,366880149 | 0,07 |
| 8 | 0,191686 | 0,277145028 | 0,43 |
| 9 | 0,535643 | 0,715440571 | 0,17 |
| 10 | 0,53934 | 0,716304898 | 0,23 |



Comparison of NDVI values in Moscow, Russia. Sentinel 2 satellite images

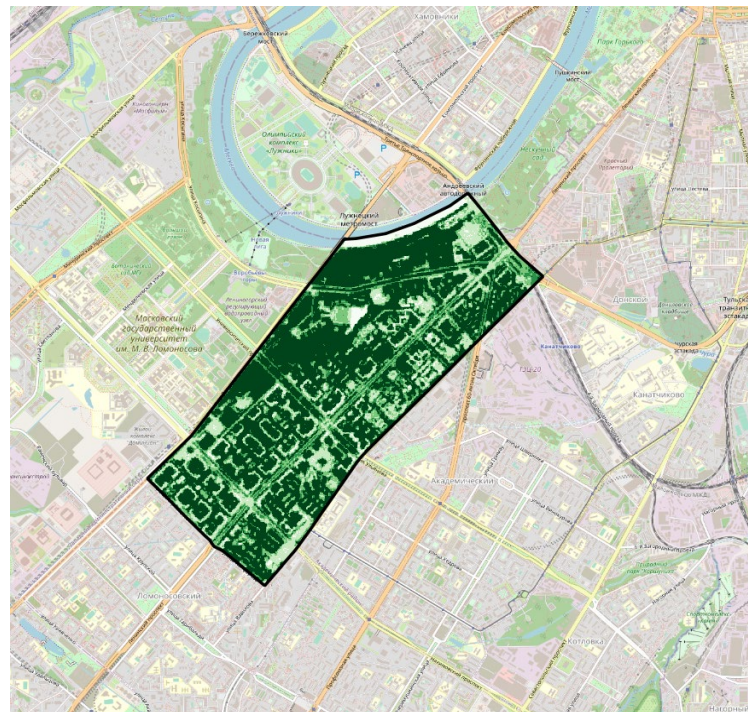


2015/08



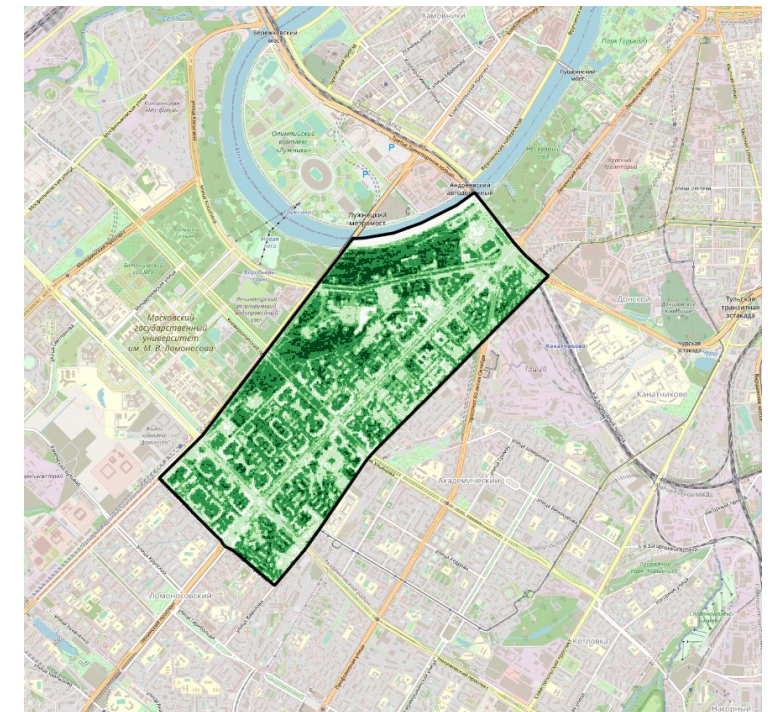
1398347m2

2018/08



3997236m2

2022/08

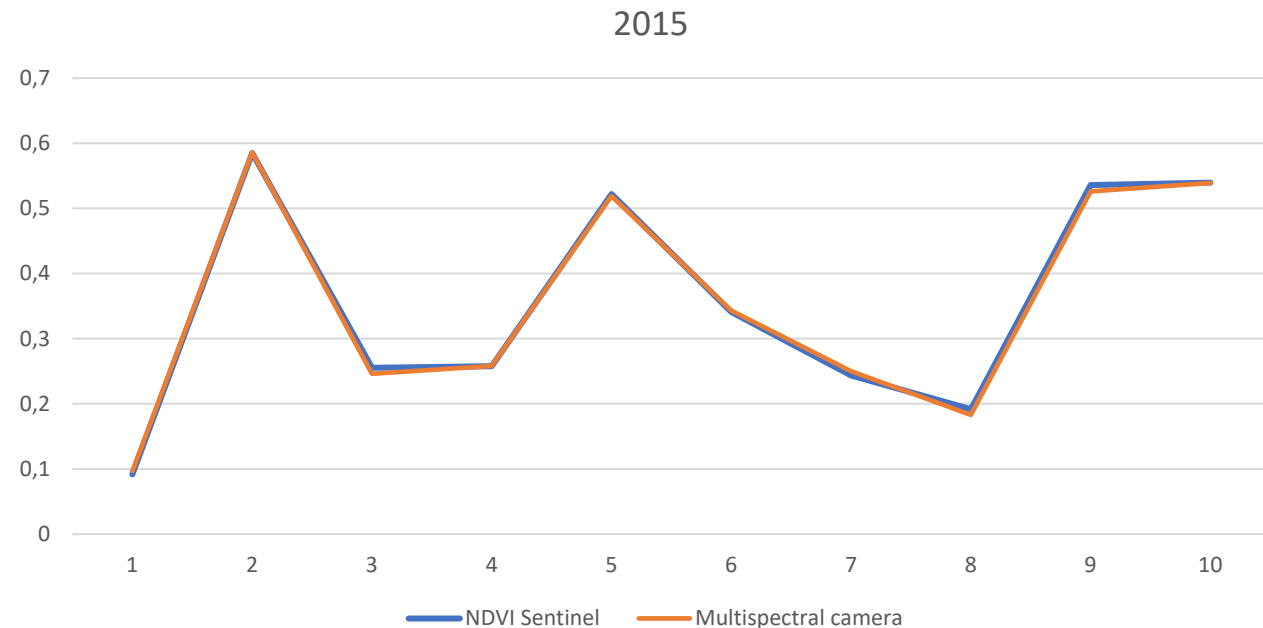


856224m2

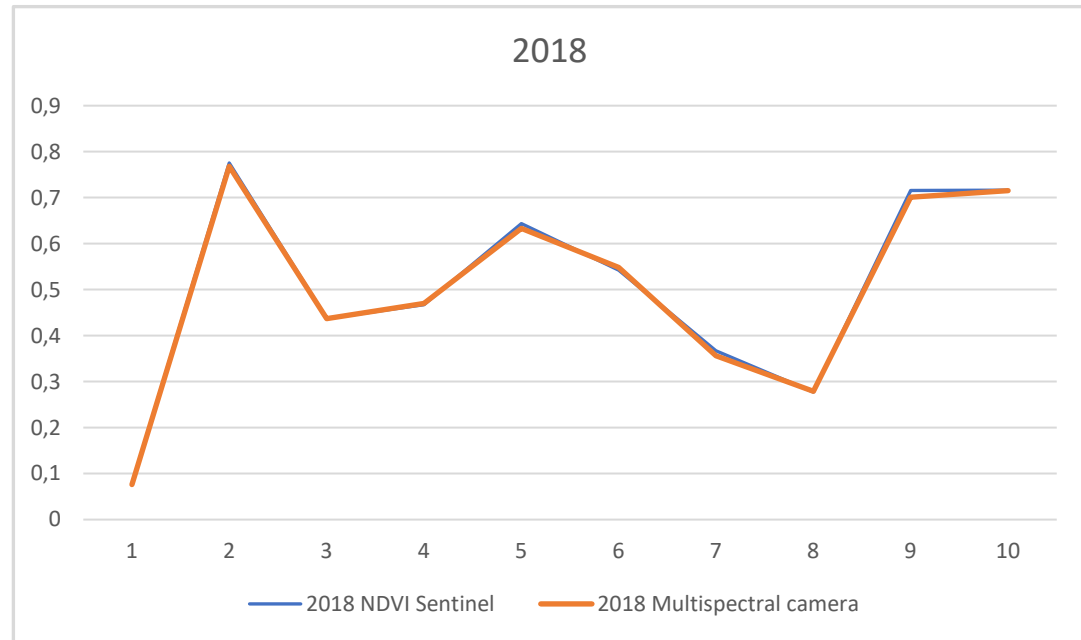
Vegetation area in Gagarin district

Comparison of data from the Sentinel satellite with a multispectral camera, measurements of which were made at selected points from a short distance, open database Russian Federal Service for Hydrometeorology and Environmental Monitoring

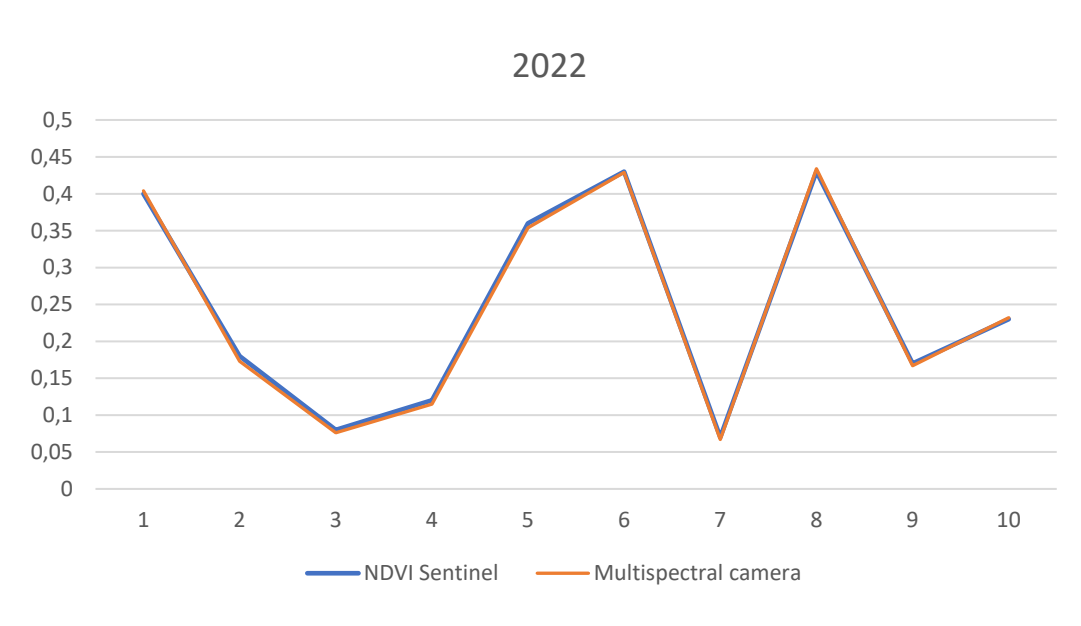
| 2015 | | |
|------|---------------|----------------------|
| | NDVI Sentinel | Multispectral camera |
| 1 | 0,09161 | 0,097 |
| 2 | 0,584829 | 0,586 |
| 3 | 0,255276 | 0,246 |
| 4 | 0,257697 | 0,258 |
| 5 | 0,521901 | 0,519 |
| 6 | 0,341021 | 0,343 |
| 7 | 0,243482 | 0,25 |
| 8 | 0,191686 | 0,183 |
| 9 | 0,535643 | 0,526 |
| 10 | 0,53934 | 0,539 |



| 2018 | | |
|------|---------------|----------------------|
| | NDVI Sentinel | Multispectral camera |
| 1 | 0,07608695 | 0,076 |
| 2 | 0,77547932 | 0,768 |
| 3 | 0,43716434 | 0,437 |
| 4 | 0,46714997 | 0,47 |
| 5 | 0,64339948 | 0,633 |
| 6 | 0,54239768 | 0,548 |
| 7 | 0,36688015 | 0,356 |
| 8 | 0,27714503 | 0,279 |
| 9 | 0,71544057 | 0,701 |
| 10 | 0,7163049 | 0,715 |



| 2022 | | |
|------|---------------|----------------------|
| | NDVI Sentinel | Multispectral camera |
| 1 | 0,4 | 0,404 |
| 2 | 0,18 | 0,173 |
| 3 | 0,08 | 0,076 |
| 4 | 0,12 | 0,115 |
| 5 | 0,36 | 0,354 |
| 6 | 0,43 | 0,429 |
| 7 | 0,07 | 0,067 |
| 8 | 0,43 | 0,434 |
| 9 | 0,17 | 0,167 |
| 10 | 0,23 | 0,232 |



Conclusion and prospects

The resulting deviation in the difference between NDVI images and data obtained from a multispectral camera averaged 0,004. This small value highlights the consistency between the two methods of vegetation assessment. However, it is important to note that the accuracy of such measurements may depend on several factors, such as weather conditions at the time of shooting, time of day, lighting angle, resolution of the equipment used and the type of surface. Therefore, when interpreting the results, it is necessary to take into account the context of the survey and the established conditions in order to correctly assess the accuracy and applicability of the data obtained in specific conditions.

Thanks for your attention