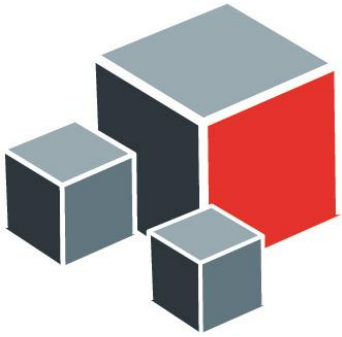




Istraživanje je provedeno uz potporu Hrvatske zaklade za znanost

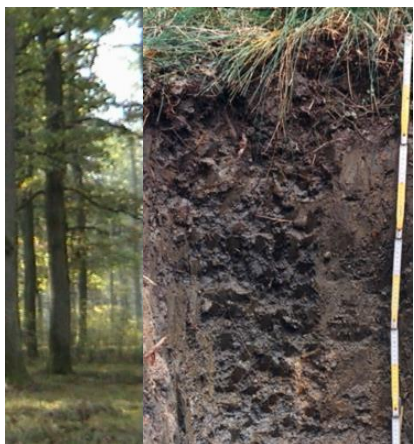
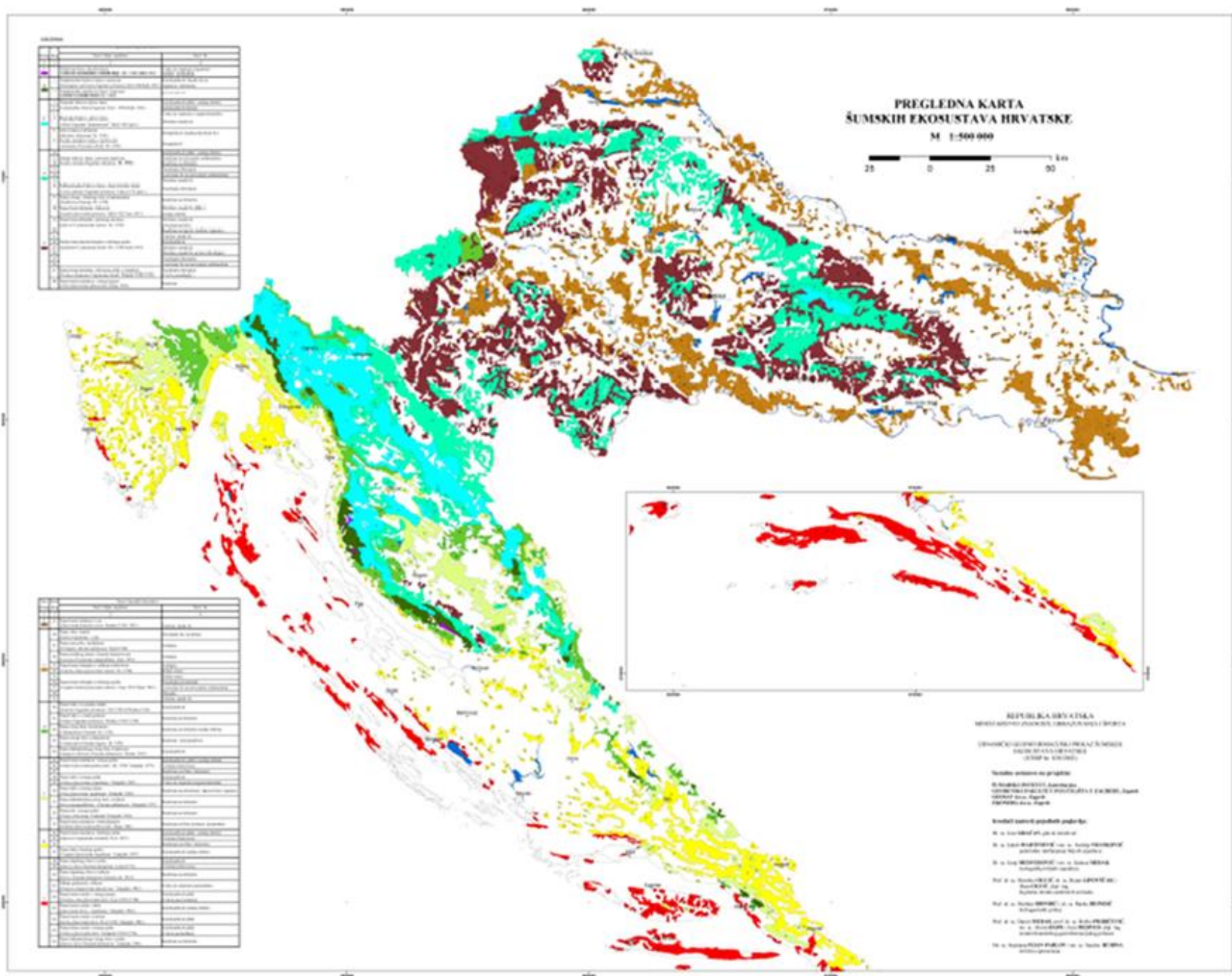
Primjena programskog sučelja R u daljinskim istraživanjima i prostorno-vremenskoj analizi dinamike šumskih ekosustava u Hrvatskoj

Ivan Pilaš¹, Damir Medak², Ivan Medved¹, Jasna Medak²

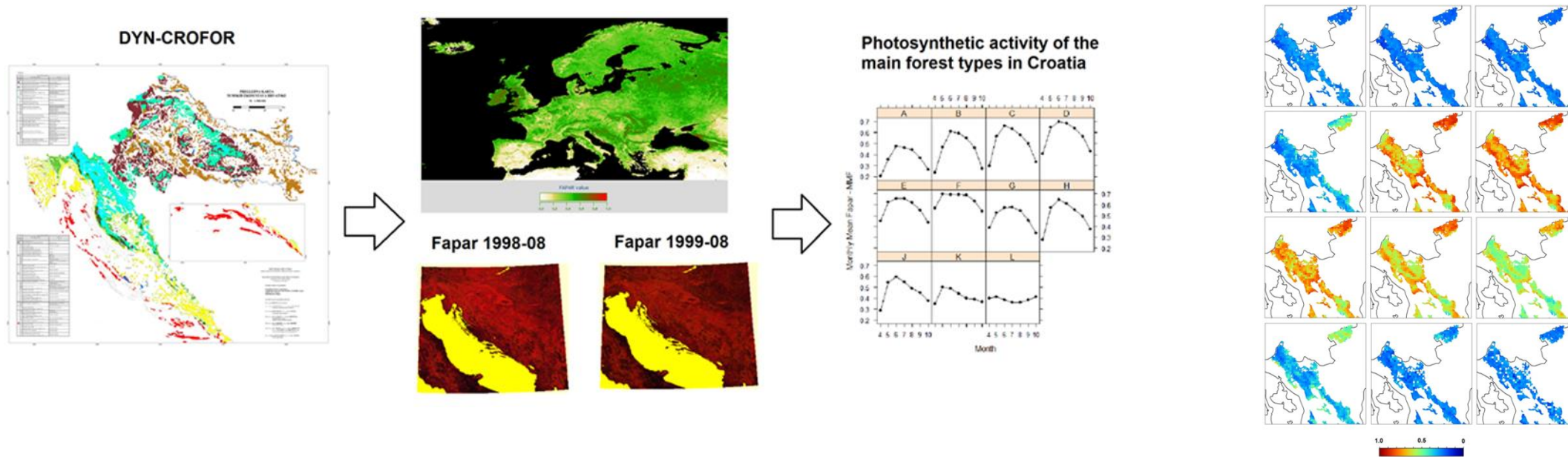
1. Hrvatski šumarski institut
2. Geodetski fakultet u Zagrebu

Kartiranje šuma?

- Šume su staništa u kojima su stabla dominantan oblik vegetacije
- Šume se razvijaju i diferenciraju s obzirom na prevladavajuću kombinaciju ekoloških (pedogenetskih) čimbenika:
 - Klima (temperatura, oborine...)
 - Reljef (hidrološki procesi, erozija...)
 - Geološka podloga, matični supstrat
 - Biogeokemijski ciklus (tlo-vegetacija)
 - Vrijeme (antropogeni utjecaj, klimatske promjene...)
- Razlikovanje STRUKTURE i FUNKCIJE šumskog pokrova!



Integracija strukture i funkcije šumskog pokrova



STATIČKI SLOJEVI

(PROSTORNE ANALIZE)

- QGIS
- GRASS
- SAGA
- I dr.



DINAMIČKI SLOJEVI

(PROSTORNO-VREMENSKE ANALIZE)

- Java
- Python
- R



STATISTIČKA OBRADA

(DATA MINING,
STATISTICAL LEARNING)

- R



DINAMIČKI PRIKAZ U WEB OKRUŽENJU

- SQL & PHP
- SQL & R



- R predstavlja integrirano programsko sučelje otvorenog koda „open source“ za upravljanje podacima, proračune i grafičku interpretaciju rezultata (<https://cran.r-project.org/>)
- Razvoj R-a započeo je 1992. godine u Bell laboratorijima, prva stabilna verzija izrađena 2000. godine
- Primjena R (Cran task view - analitika okoliša, ekonometrija, genetika, biometrija, socijalna analitika i dr.).

CRAN Task View: Analysis of Spatial Data

- Classes for spatial data – SpatialPointsDataFrame, SpatialPixelsDataFrame, SpatialLinesDataFrame, SpatialPolygonsDataFrame
- Najčešće korišteni paketi:
 - sp (unos, manipulacija, iznos prostornih podataka)
 - rgdal (povezivanje s GDAL-om, transformacije i reprojiciranje)
 - raster (rasterske prostorno-vremenske analize, RasterStack i RasterBrick klase)
 - rts (raster time series analysis – analize rasterskih vremenskih nizova, RasterStackBrickTS klasa)
 - gstat (geostatistika)
 - spatial (kriging & point pattern analysis)

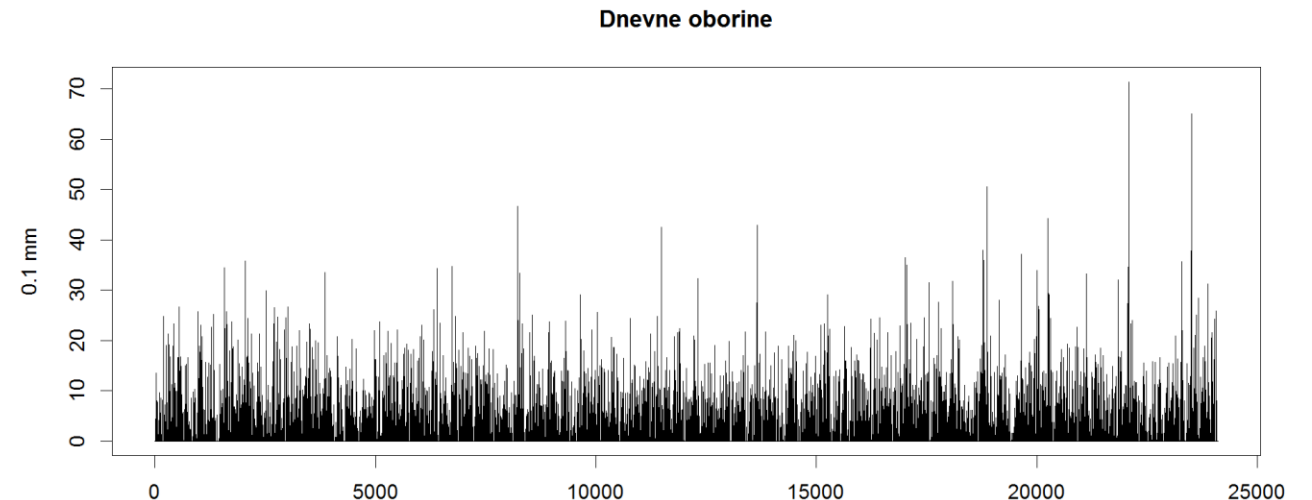
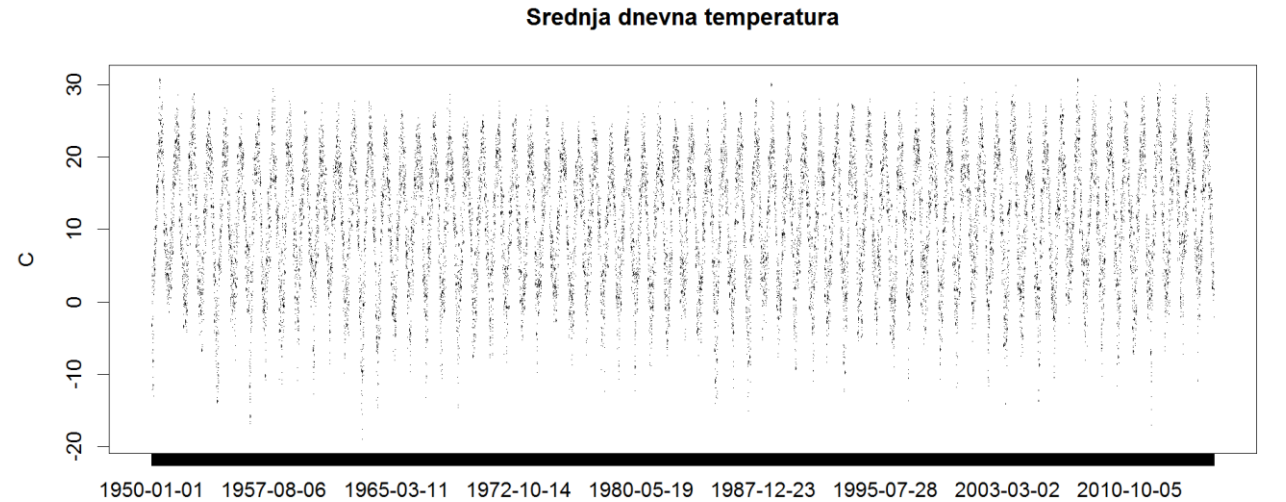
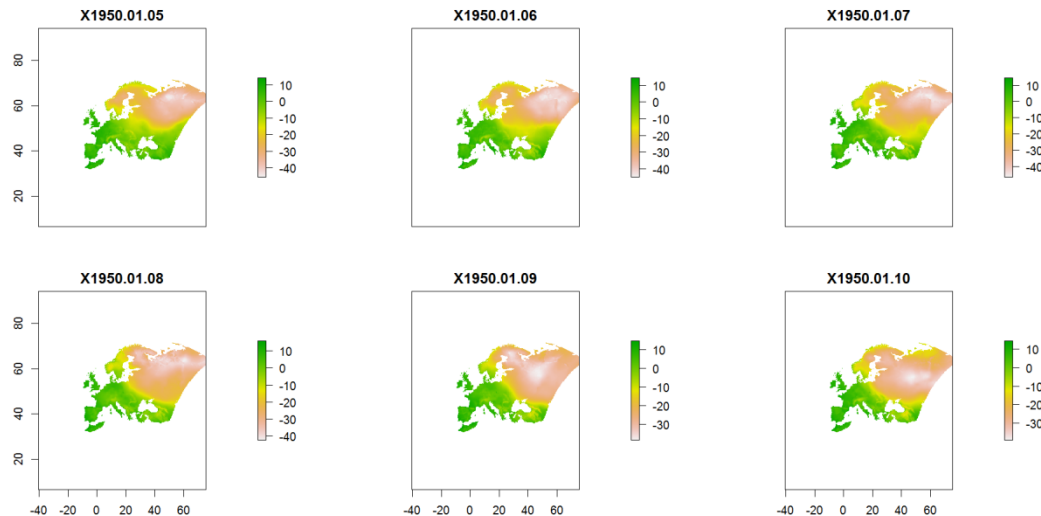
E-OBS “gridded dataset” 1950-2015

Dnevne oborine, srednja, minimalna i maksimalna dnevna temperatura u 65 godišnjem razdoblju

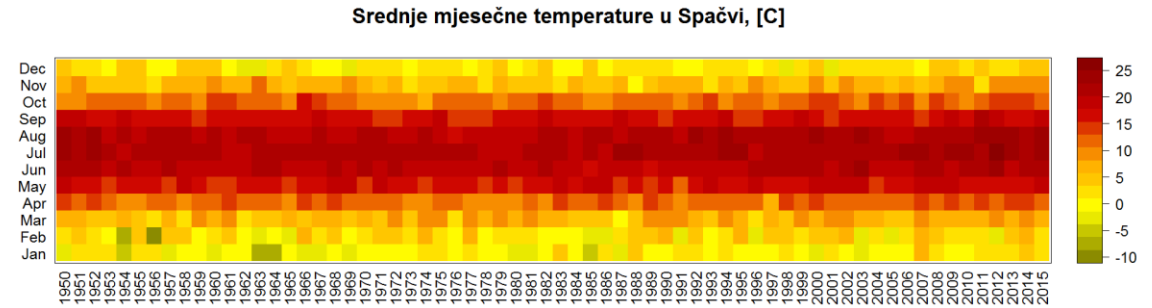
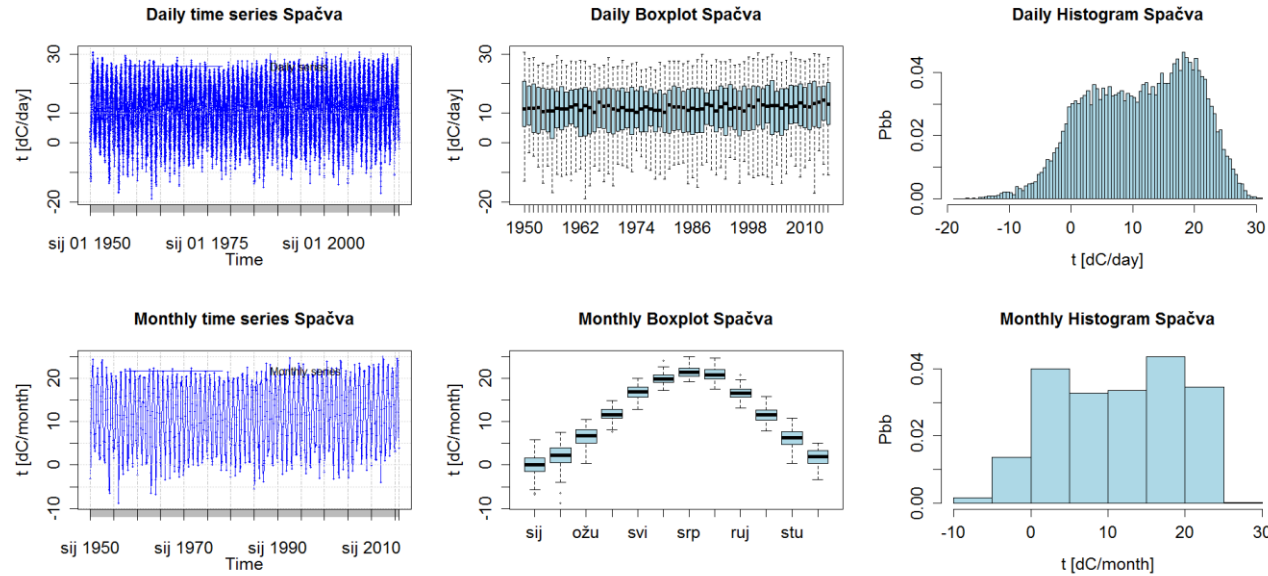


European Climate Assessment & Dataset

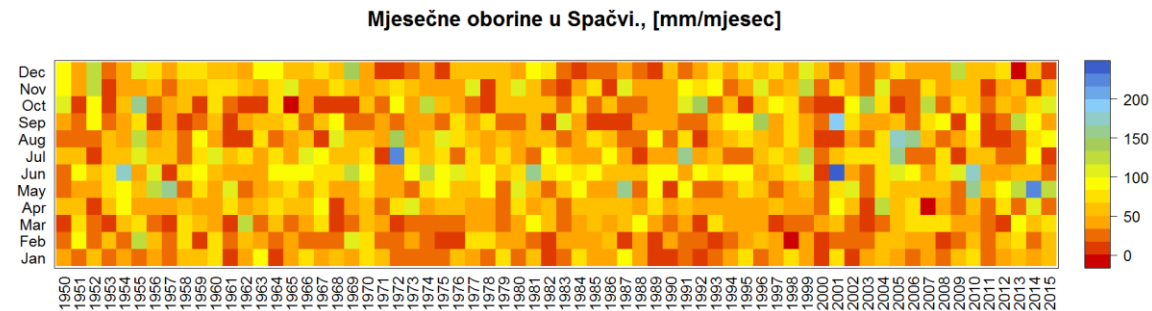
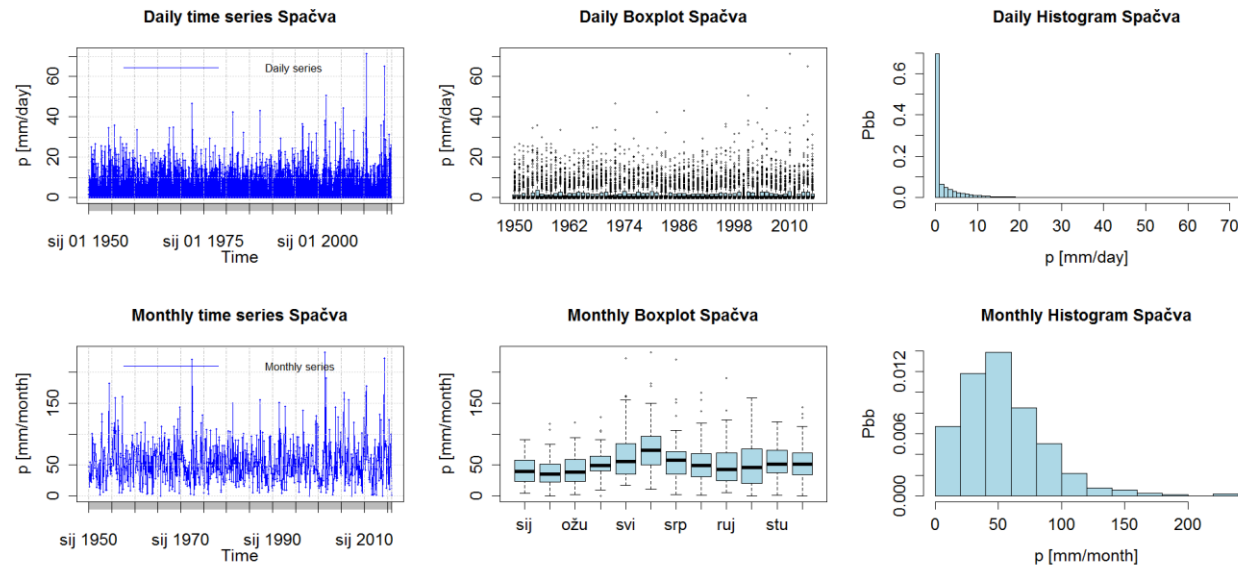
“RasterStack” 24106 prostornih rasterskih klimatskih slojevau dnevnoj rezoluciji



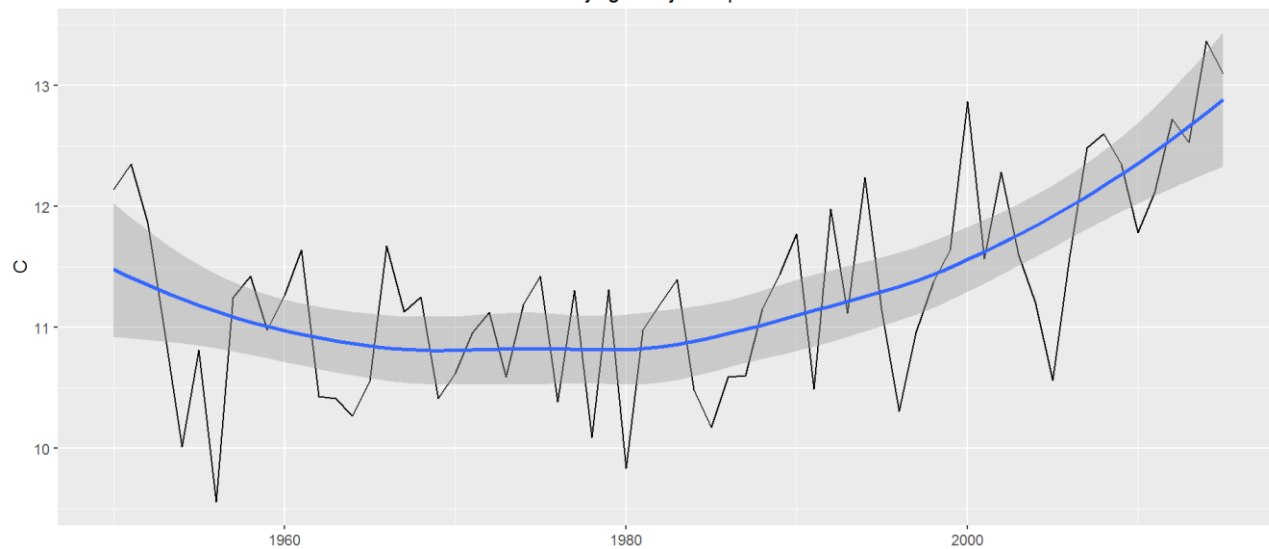
Temperature statistika



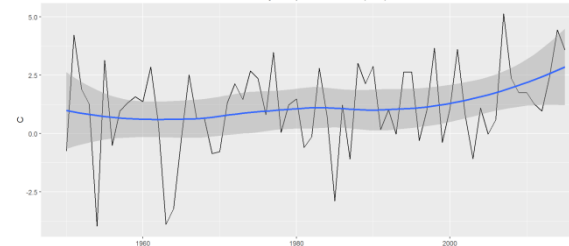
Oborine statistika



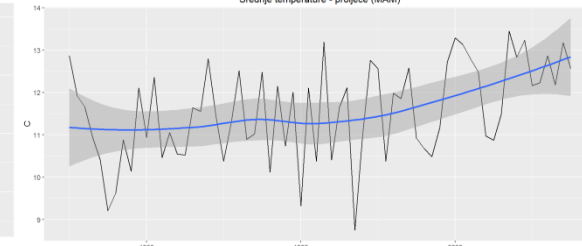
Srednja godišnja temperatura



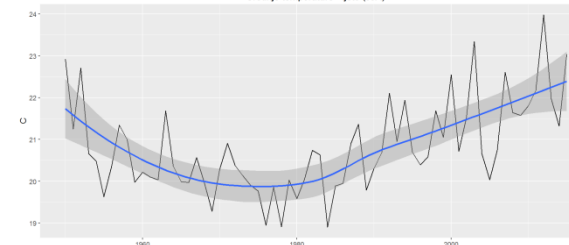
Srednje temperature - zima (DJF)



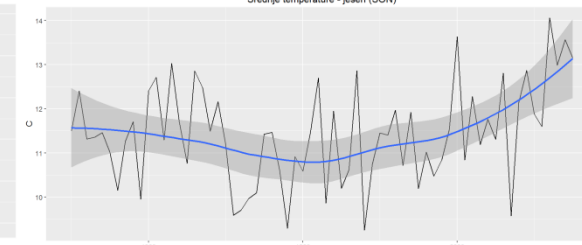
Srednje temperature - proljeće (MAM)



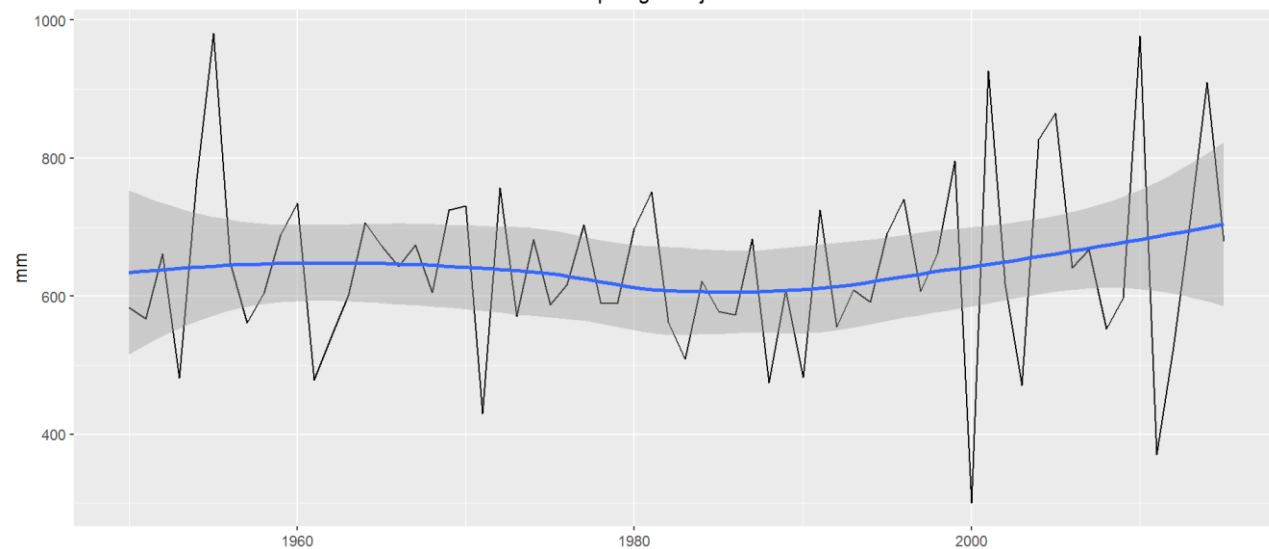
Srednje temperature - ljeto (JJA)



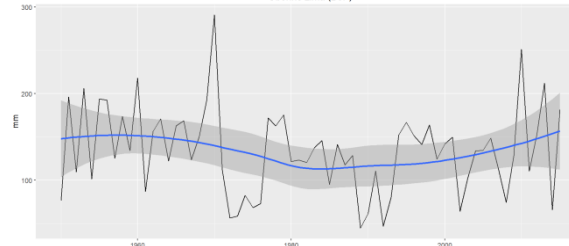
Srednje temperature - jesen (SON)



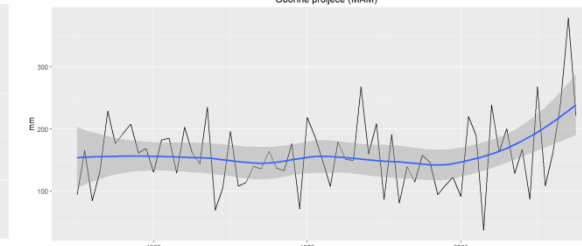
Ukupne godišnje oborine



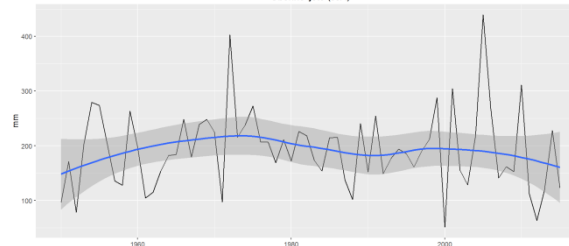
Oborine zima (DJF)



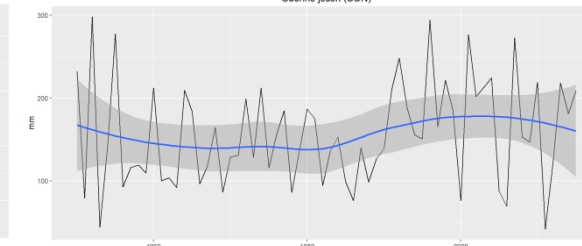
Oborine proljeće (MAM)



Oborine ljeto (JJA)



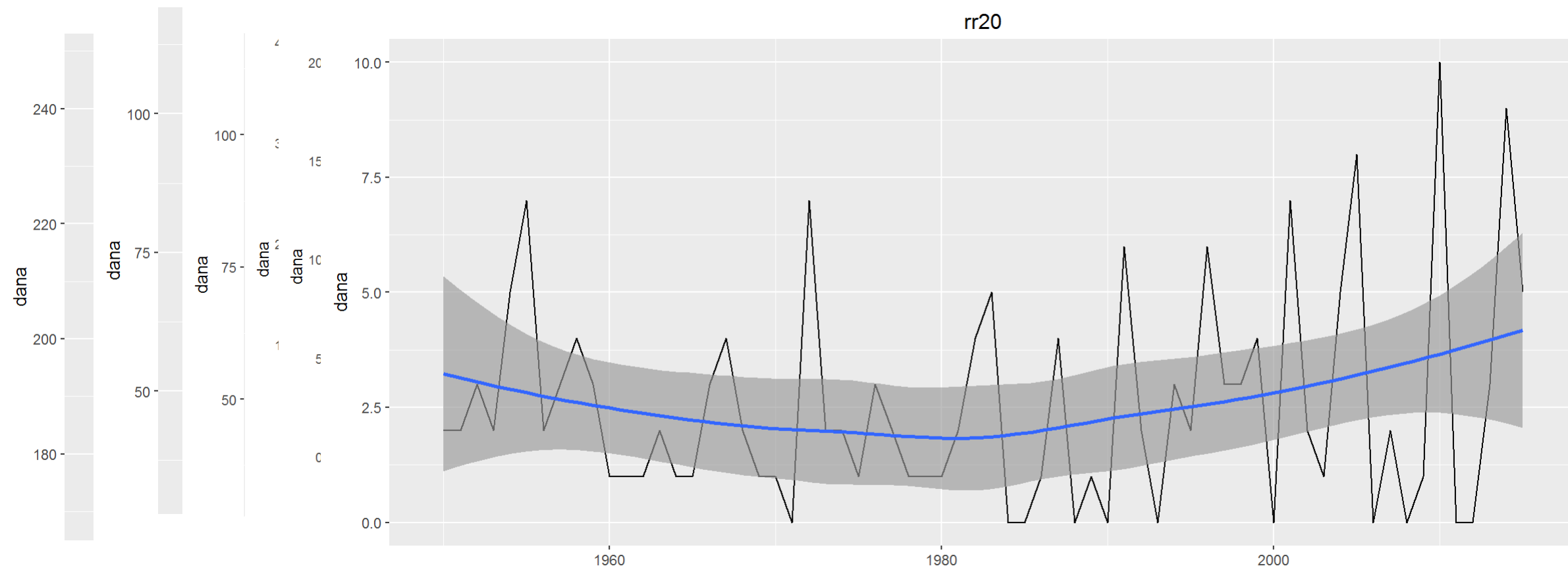
Oborine jesen (SON)



Indeksi klimatskih ekstrema

Broj dana s mrazom

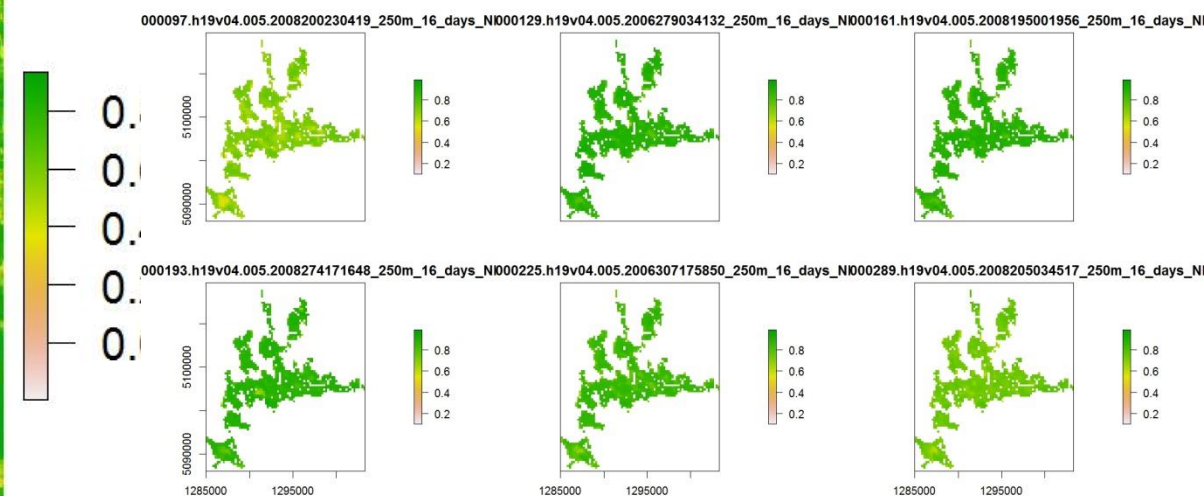
rr20



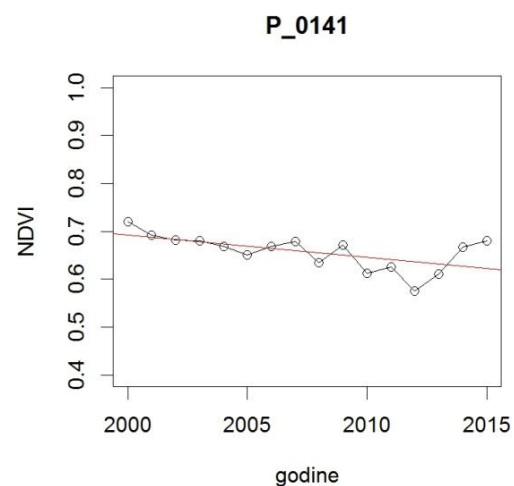
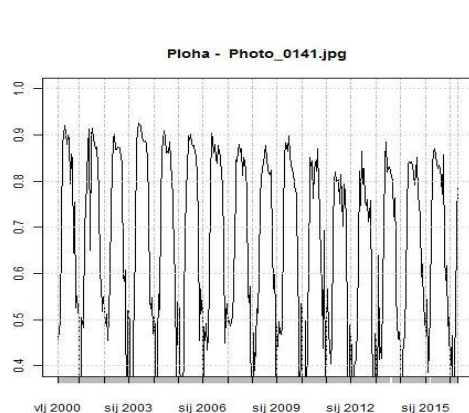
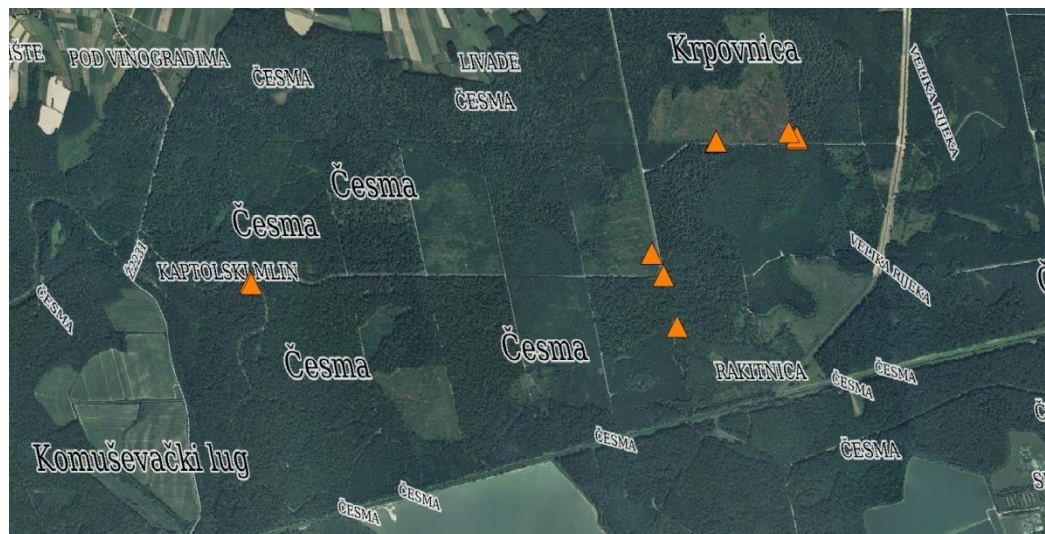


MODIS

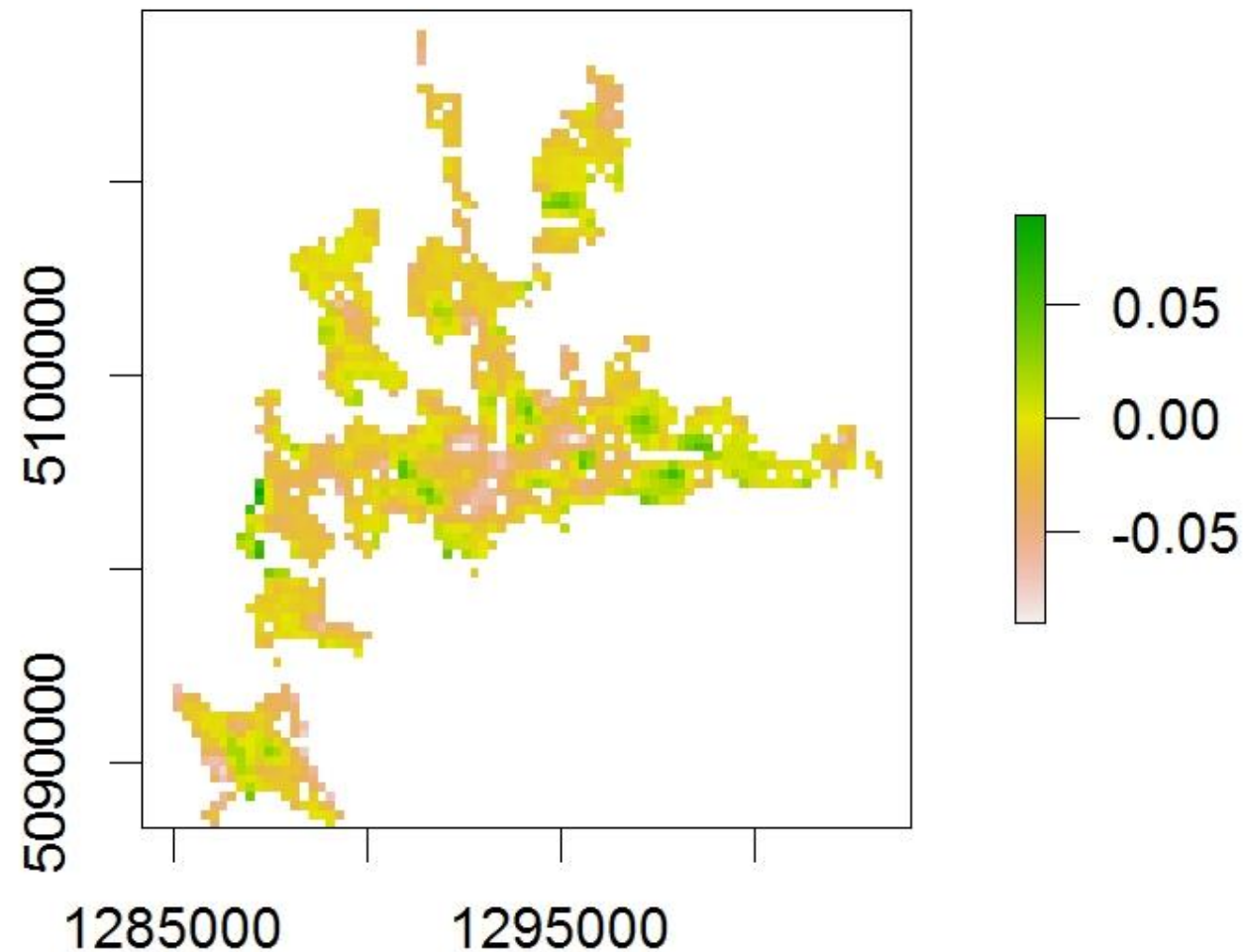
Moderate Resolution Imaging Spectroradiometer



NDVI trendovi na lokacijama (to



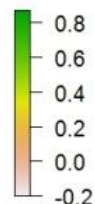
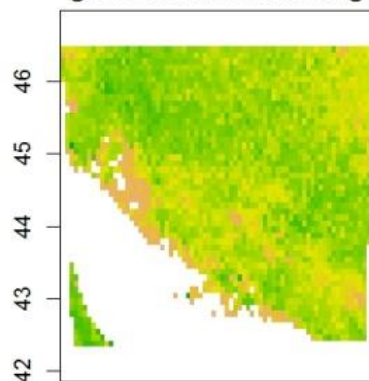
Promjene NDVI u šumi Česma



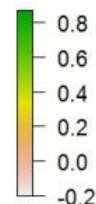
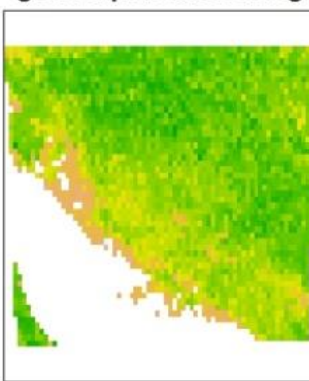
Global Inventory Modeling and Mapping Studies (NOAA AVHRR GIMMS NDVI , 1982-2013)



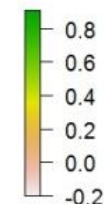
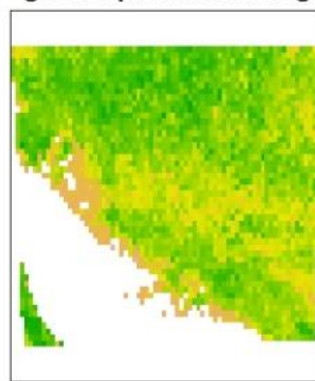
geo82mar15b.n07.VI3g



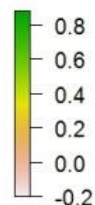
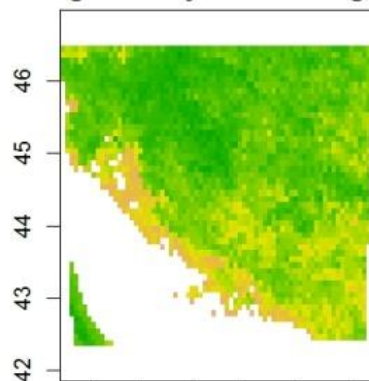
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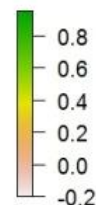
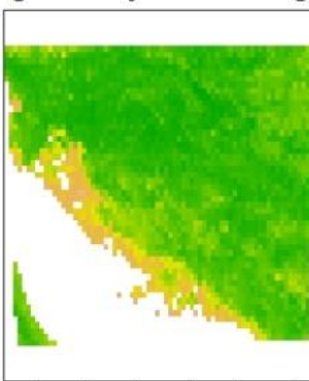
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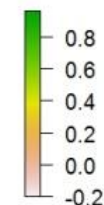
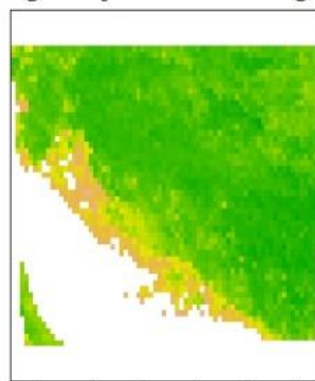
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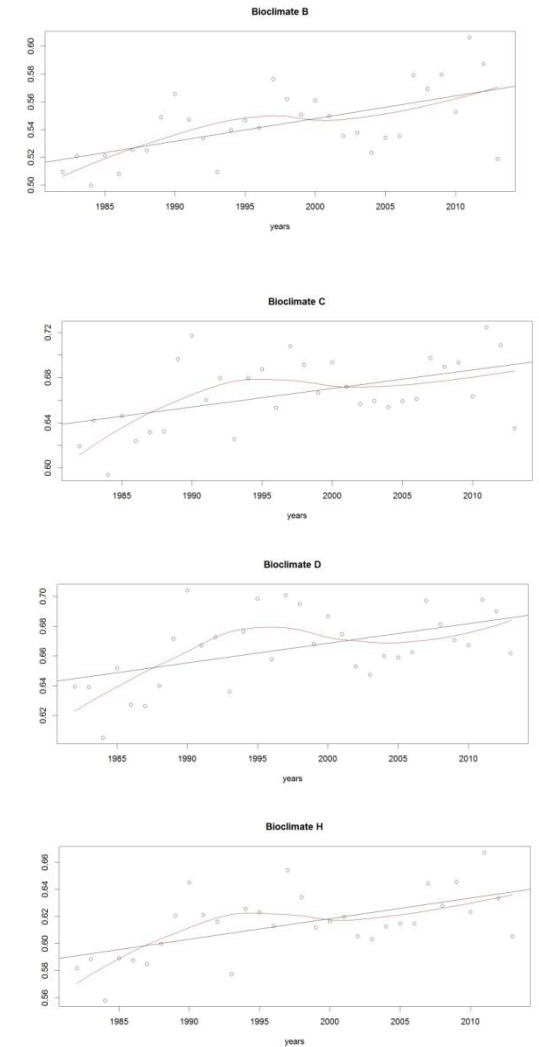
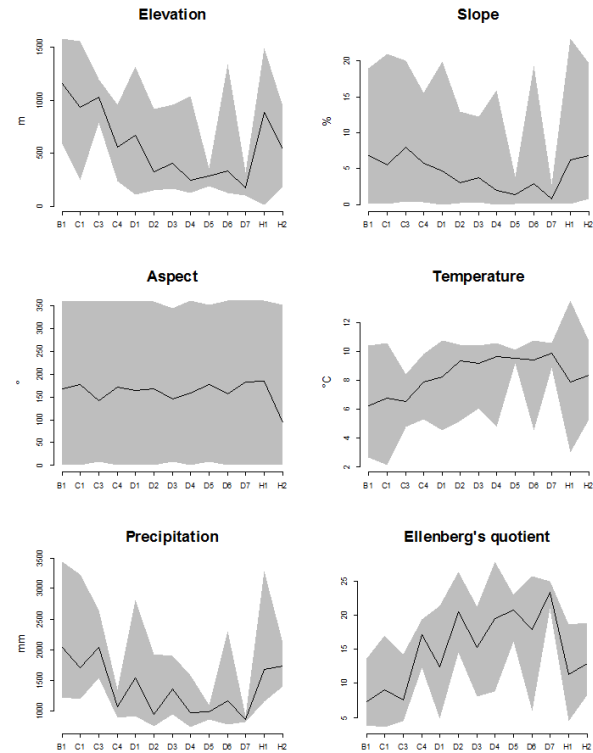
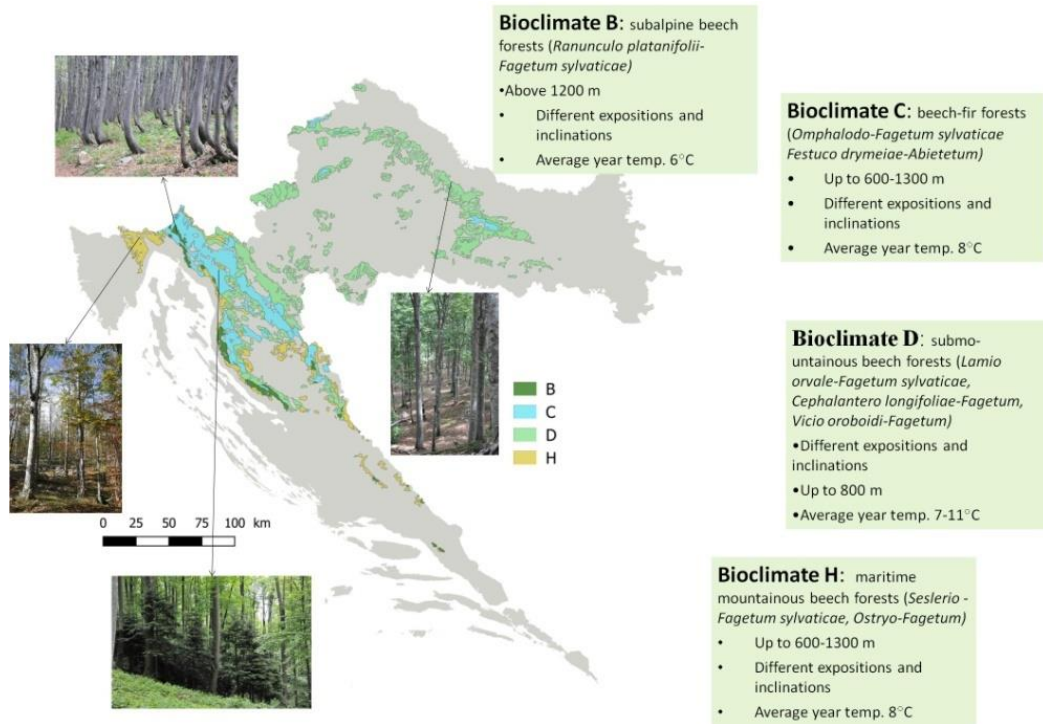
geo82may15b.n07.VI3g



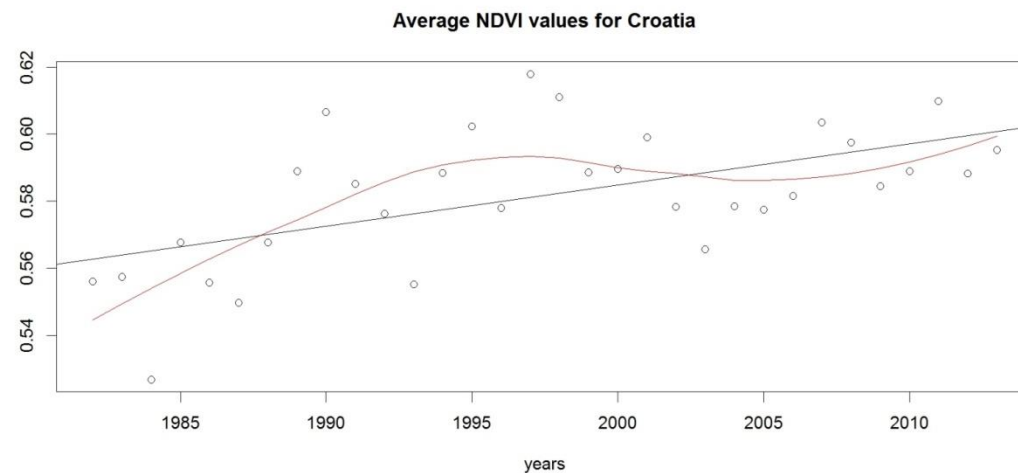
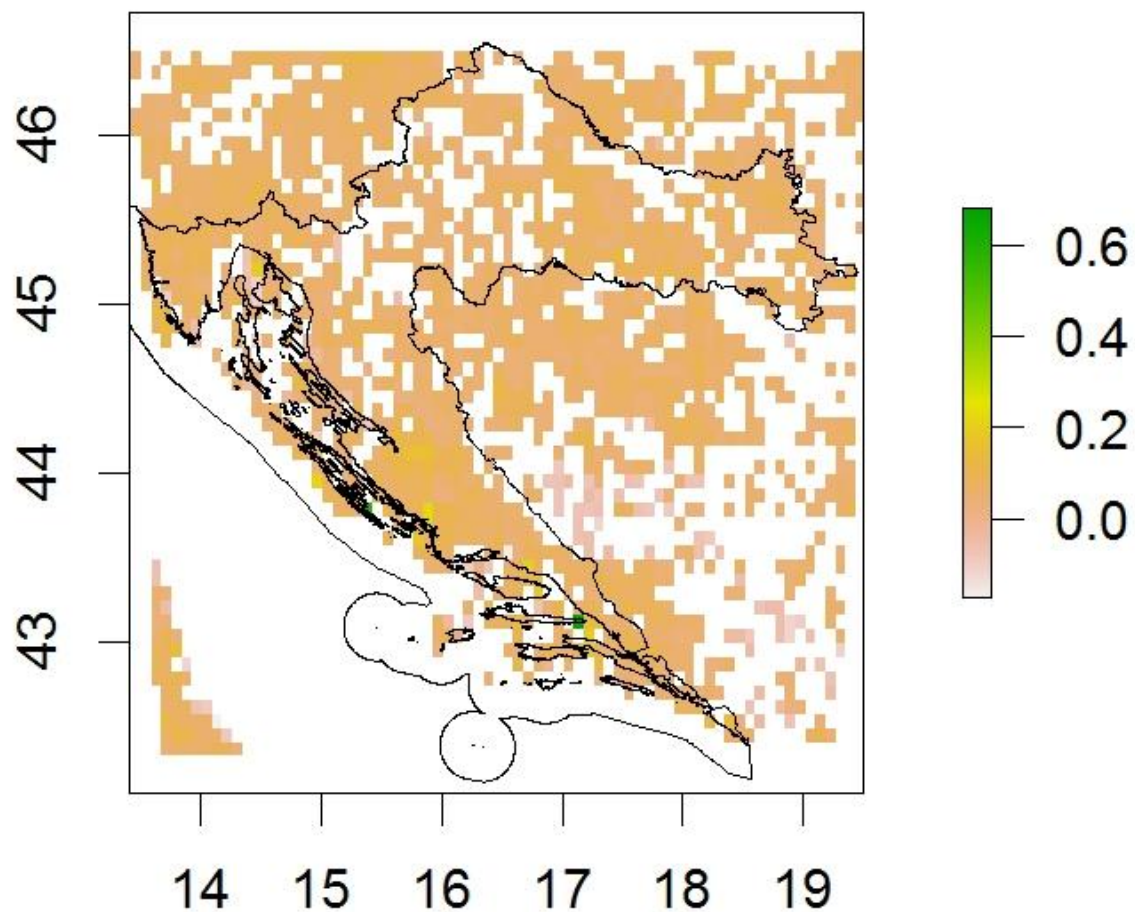
geo82jun15a.n07.VI3g



NDVI trendovi bukovih šuma u Hrvatskoj

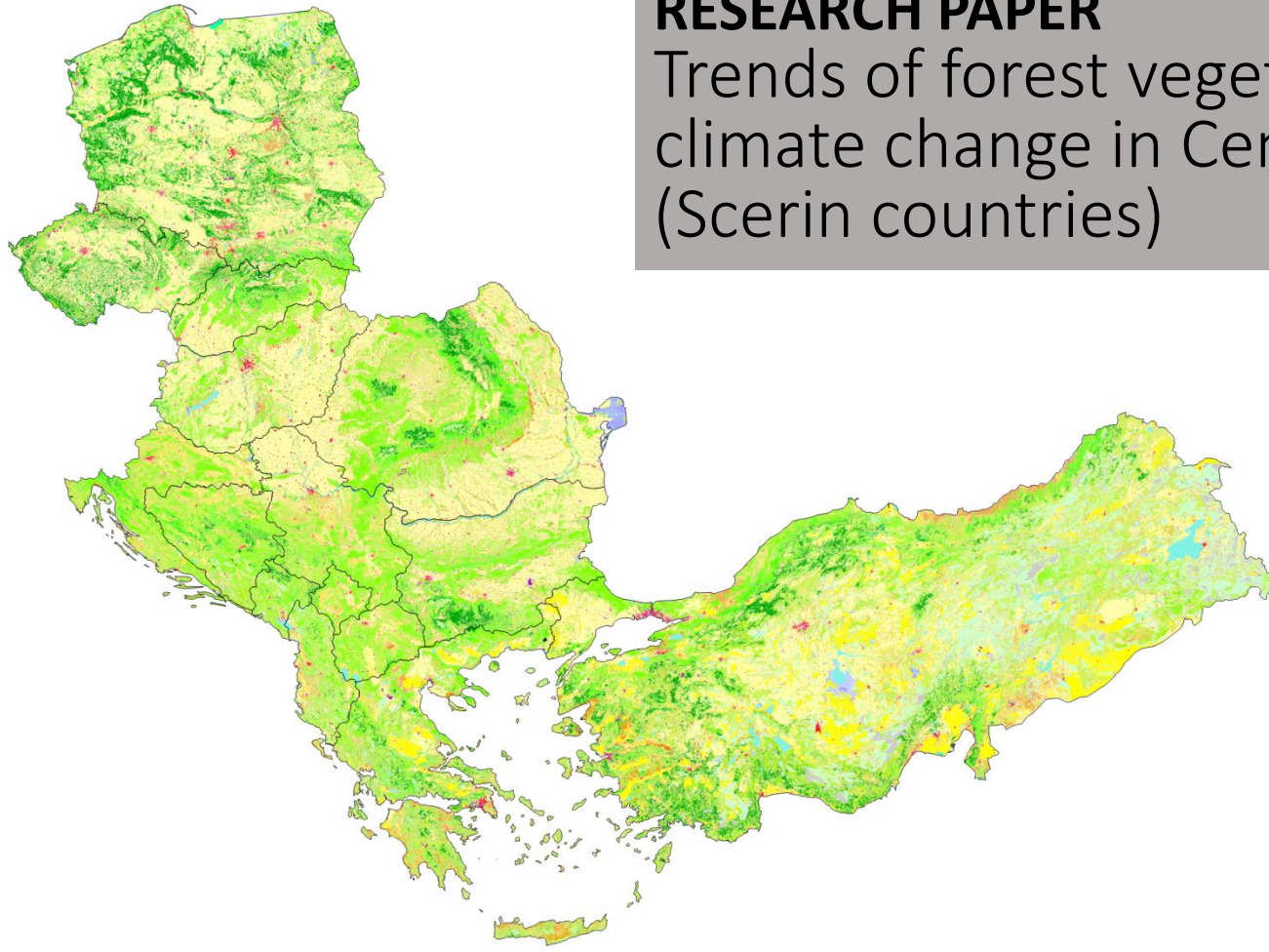


Značajne promjene NDVI-a u Hrvatskoj

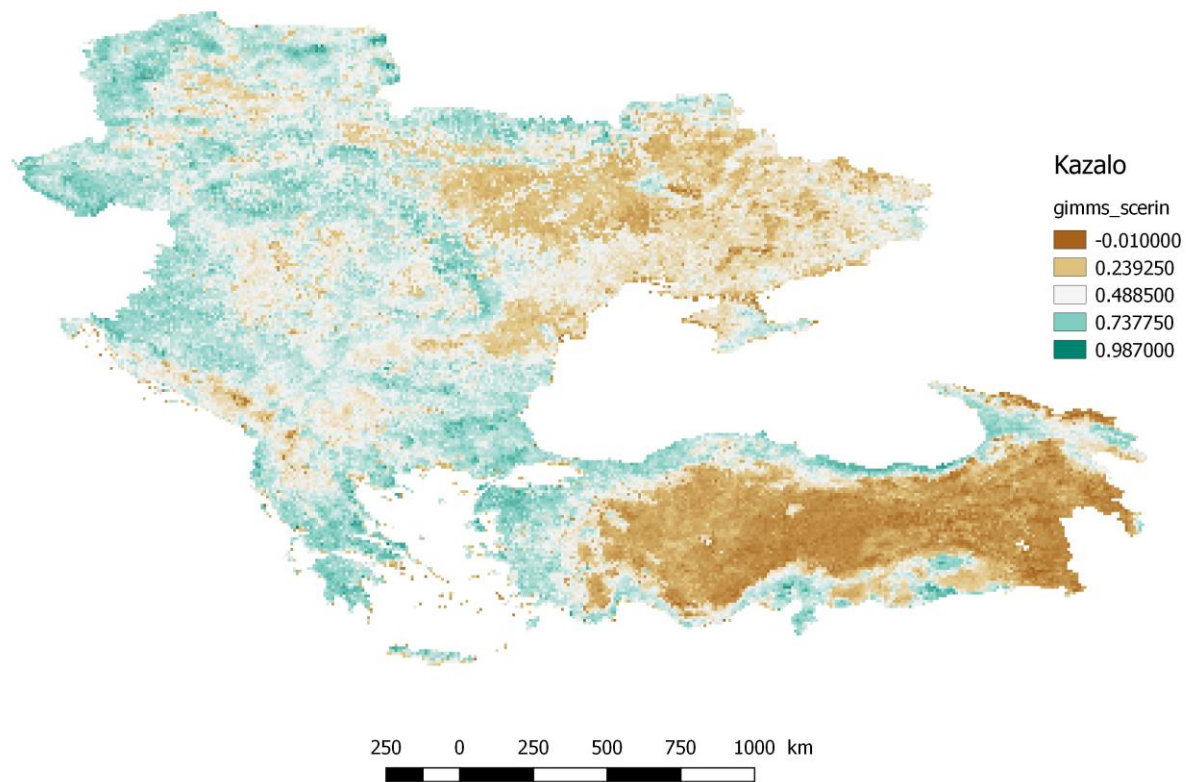


RESEARCH PAPER

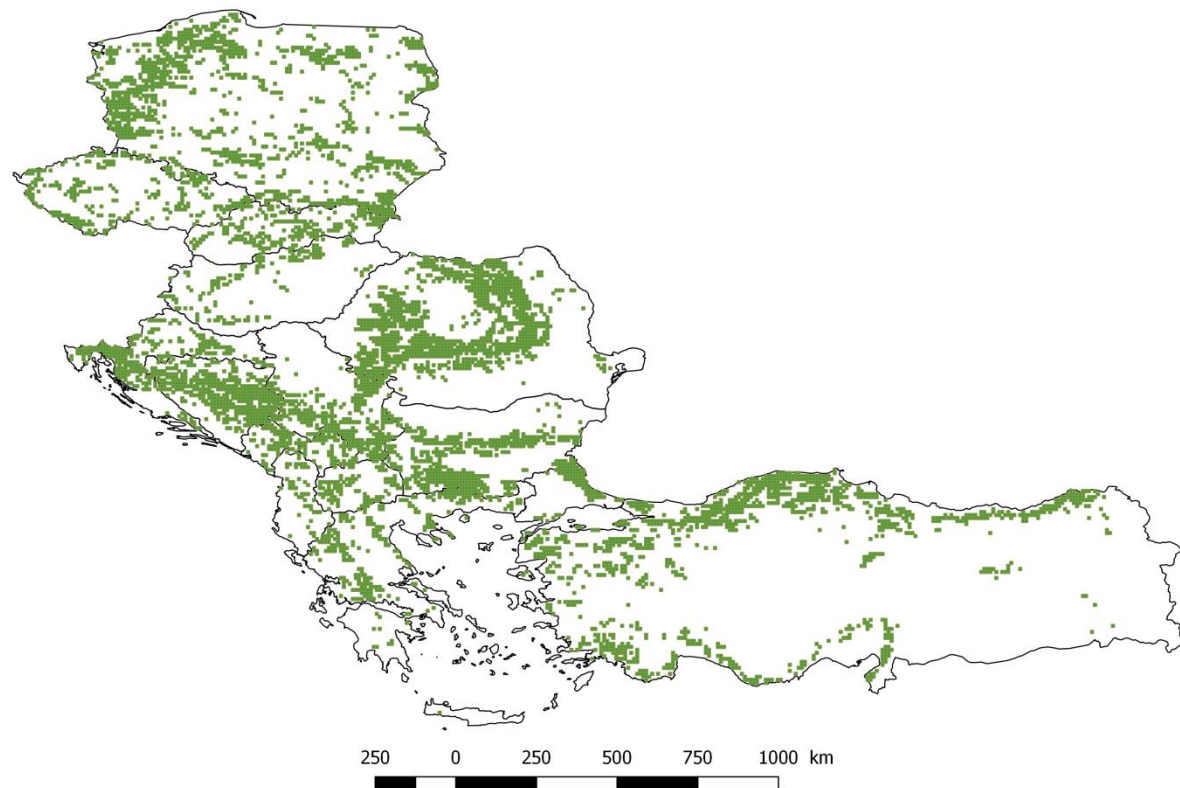
Trends of forest vegetation activity and observed
climate change in Central-South Eeastern Europe
(Scerin countries)



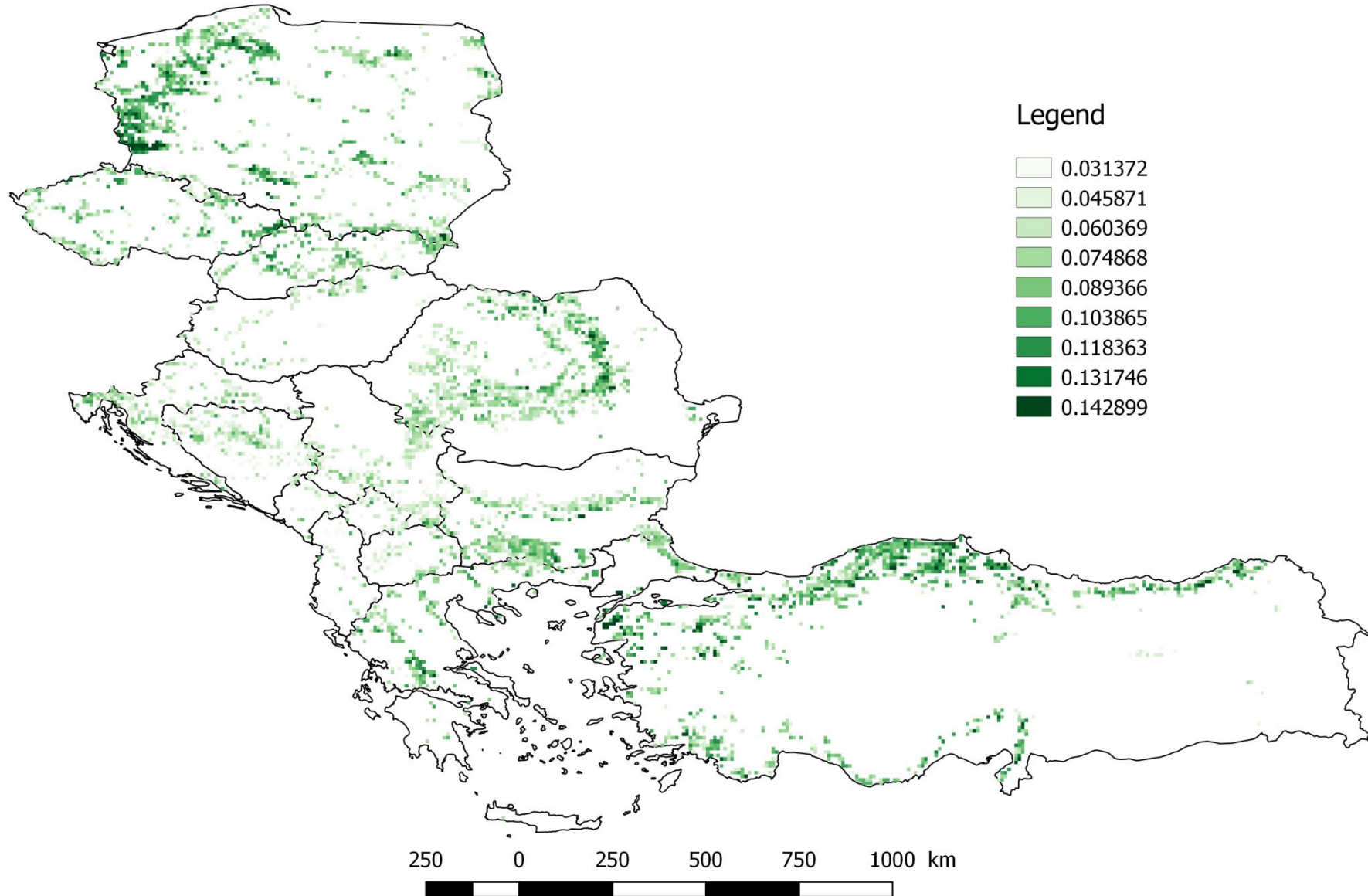
AVHRR GIMMS NDVI



CLC 50% FOREST - AVHRR GIMMS MASK FILE



AREAS OF SIGNIFICANT NDVI CHANGE



Hvala na pažnji!