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A homogeneous Database at Mediterranean basin scale and Machine Learning analysis to understand the potential representativeness variables

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4th Open Science Meeting 2019
Transforming Land Systems for People and Nature
April 24 – 26, 2019 · Bern, Switzerland



DIVERCROP : Land system dynamics in the Mediterranean basin across scales as relevant indicator for species diversity and local food systems

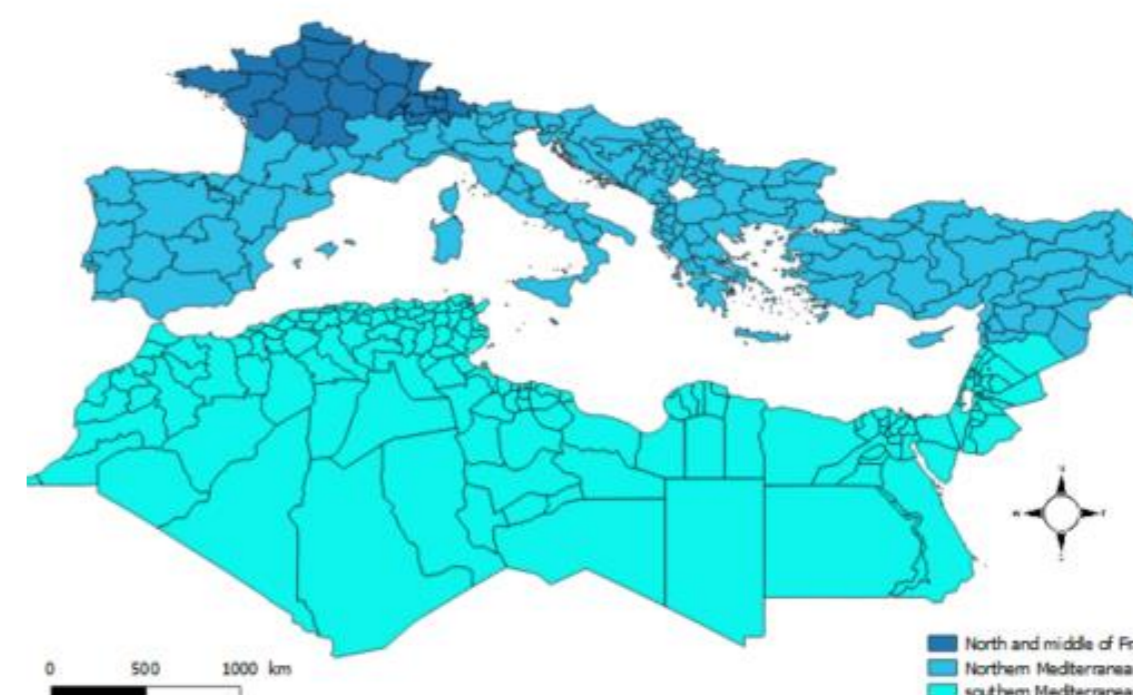
<http://divercropblog.wordpress.com/>

ID 263

1 Research question : Which are the variables best representative for the crops production in Mediterranean? (wheat case study)



2



3 The mediterranean homogeneous spatial database

LAND COVER / LAND USE

CCI - ESA (Louvain) – 300 m résolution (2005) – raster images
natural vegetation, Tree cover
Scrubland, Urban areas
Bare areas, Water bodies

MAPSPAM MODEL - 42 CROPS

(2005) – Raster images
Area, production, yield, crop suitability, irrigation, rainfield
Pixels 5 min ~ 8- 10 Km resolution

POPULATION (URBAN, RURAL)

LANDCAN Database (2005, 2015), Hyde Database

PROTECTED AREAS

World Database on Protected Areas (vector)

SOILS TYPES & QUALITY

Harmonized world soil database

GROUND

DTM: Global 30 Arc-Second Elevation (GTOPO30) USGS (slope) – raster image

LIVESTOCK

Gridded Livestock of the world

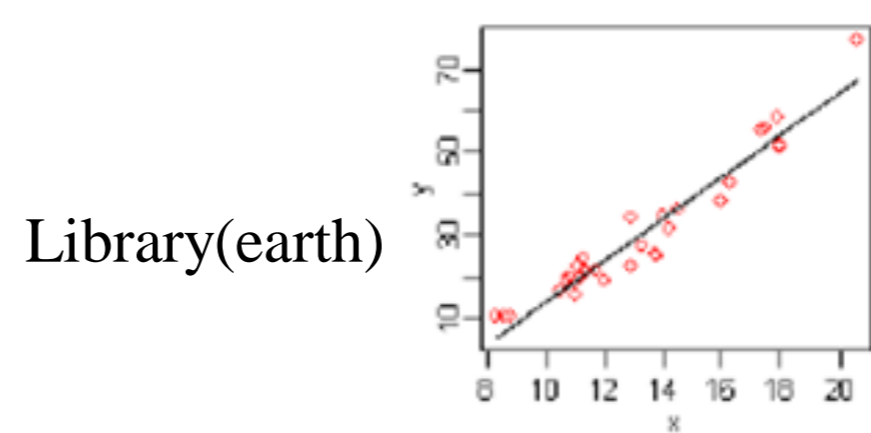


Peter Horstbol Møller

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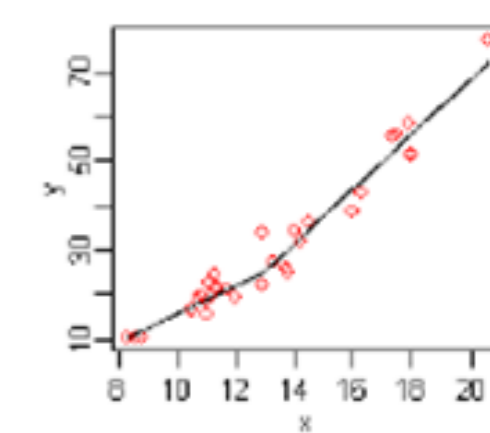
Methodology & Tools

Multivariate adaptive regression splines



Normal Regression

$$y' = -37 + 5.1x$$



MARS

$$y' = 25 + 6.1 \max(0, x-13) - 3.1 \max(0, 13-x)$$

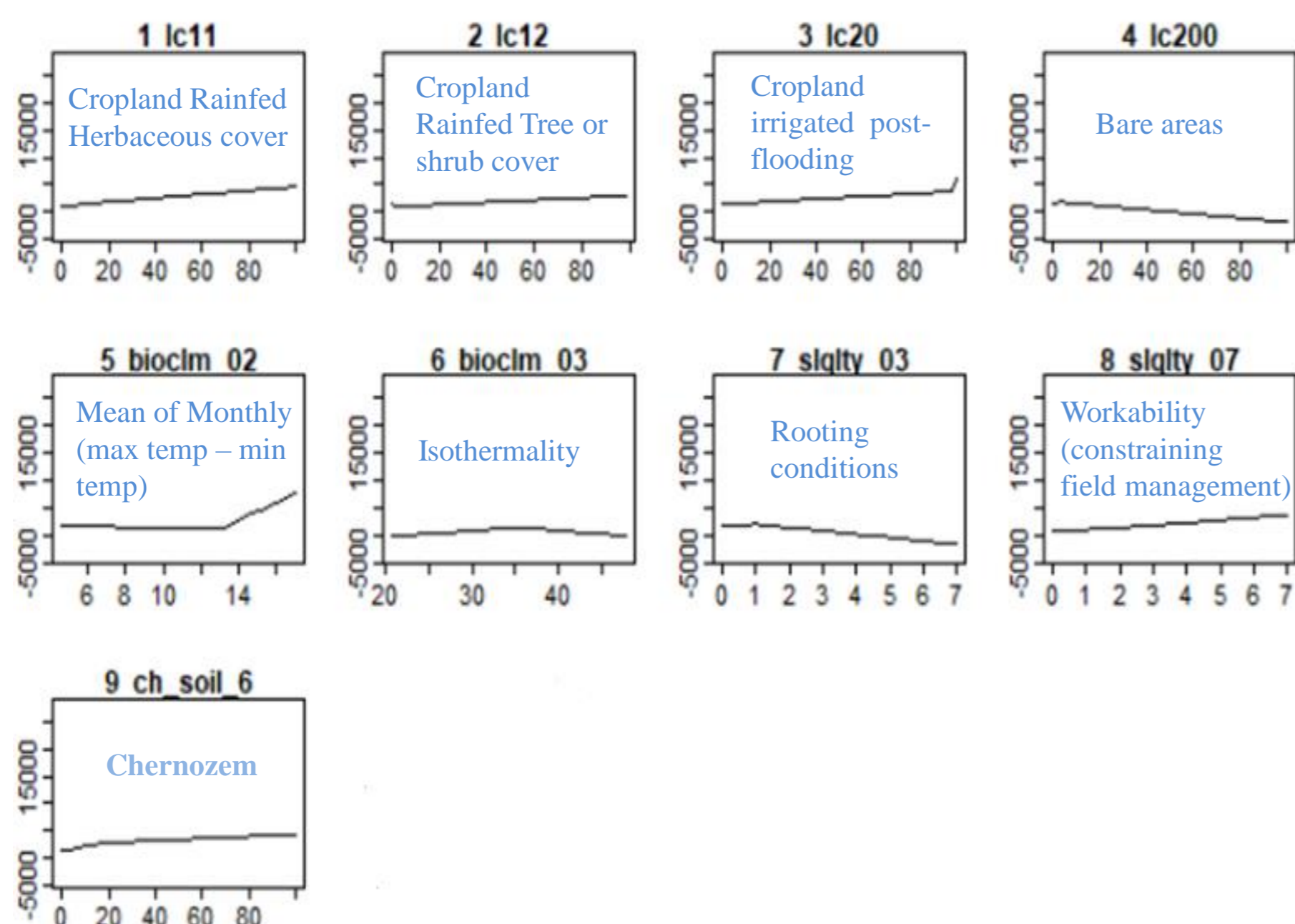
- A) Join all informations in a dataframe
- B) Choose dépendent variables (42 crops)
- C) Choose Independent variables (other variables, urban, population, livestock, altitude, soils ..)
- D) Launch model with function Earth with R

```
mod1_nord <- earth(x=nx, y=ny[,1]) # y = dependantes x non dependantes
```

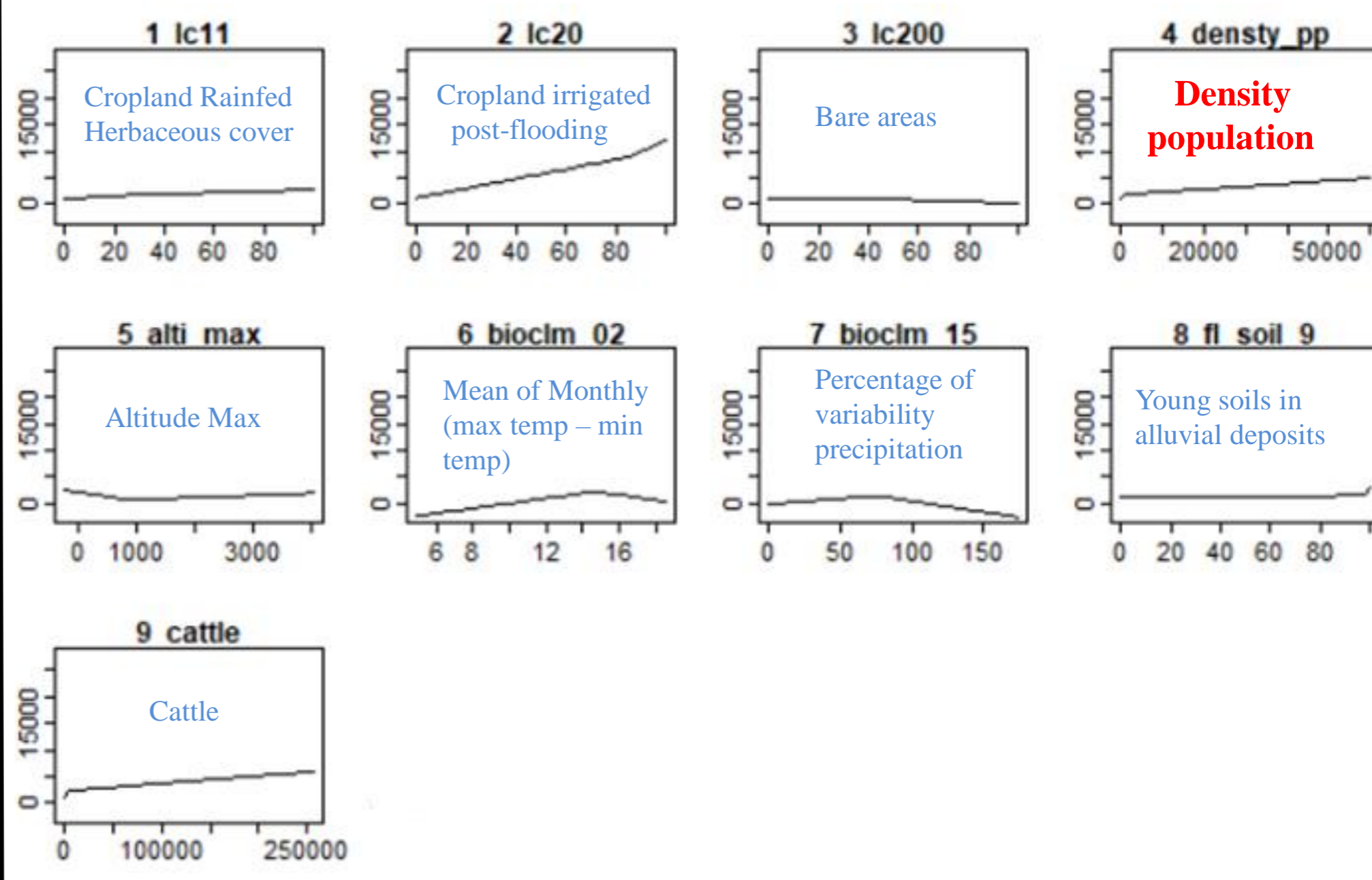
5

Results on wheat production

NORTHERN MEDITERRANEAN



SOUTHERN MEDITERRANEAN



One example of counterintuitive result :

➔ Population is a good incentive in the south of the basin (wheat may be a production close to the city) contrary to the north, where there is no effect (production areas and cities are not in the same location)

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Régression multivariée par spline adaptative. (2018, décembre 3). Wikipédia, http://fr.wikipedia.org/w/index.php?title=R%C3%A9gression_multivari%C3%A9e_par_spline_adaptative&oldid=154474849.

Assessment of wheat yield gap in the Mediterranean (Mustafa Pala et al, 2011), ICARDA, geoagro.icarda.org (Assessment_of_wheat.pdf)