Carpatian Basin 30ky BP GIS data set

C. Willmes

Abstract

To provide paleoenvironmental data for a GIS and geostatistic based Species Distribution Modelling (SDM) application, this comprehensive GIS data set was created. The data set consists of DEM based topography, and of paleoclimate layers, that were used as environmental predictor variables for SDM application.

1   Context

For modelling species distributions, environmental predictors are correlated (through various statistical, GIS, or machine learning methods) to model probabilities of occurrence from known at unknown locations.

The GIS datasets delivering the environmental predictor variables consists of two main environmental domains. 1. Topography based predictor variables, and 2. Climate based predictor variables.

The topography based variables are derived, by using the GRASS GIS *r.slope.aspect* tool Shapiro and Waupotitsch (2015) from the SRTM DEM Jarvis et al. (2008). The paleoclimate predictors are computed by applying a spatio-temporal interpolation Willmes et al. (2017) to create temperature and precipitation data for the 30ky bp time sclice. The interpolated precipitation and temperature data is then used as input for the R dismo packages Hijmans and Elith (2016) *biovars* function, to compute 19 bioclimatic predictor variables.

The dataset is assigned with a DOI, and can be cited as follows in scholarly works, that use this dataset in their publications:

> C. Willmes (2017): Carpatian Basin 30ka BP GIS data set. CRC806-Database, doi: 10.5880/SFB806.37

2   Metadata

The basic descriptive metadata of the dataset is given in this section.

2.1   Basic Metadata

Title	LGM paleoenvironment of Europe - Map
Author(s)	C. Willmes
Year	2017
License	CC-BY
Topic	Environment
Keywords	MIS 3, 30ky BP, Paleoclimate, Paleoenvironment
Publisher	CRC806-Database
DOI	10.5880/SFB806.37

2.2   Spatial Metadata

Type	BoundingBox
Place	Carpatian Basin
BoundingBox (SW, NE)	41 13, 52 28
Region	Europe

The spatial data is located in South-Western Europe, or the Balkans region. The spatial area is delimited by a bounding box in longitude/latitude notation for the southwestern and northeastern corners.

2.3   Temporal Metadata

Type	Interval
Name	Late MIS 3
Interval	31000, 30000

For temporal indexing the dates are given in years before present (yBP).

3   Data sources

Dataset	Source	Notes
SRTM DEM	Jarvis et al. (2008)	The topographic data
Paleoclimate data	Willmes et al. (2017)	The climate data

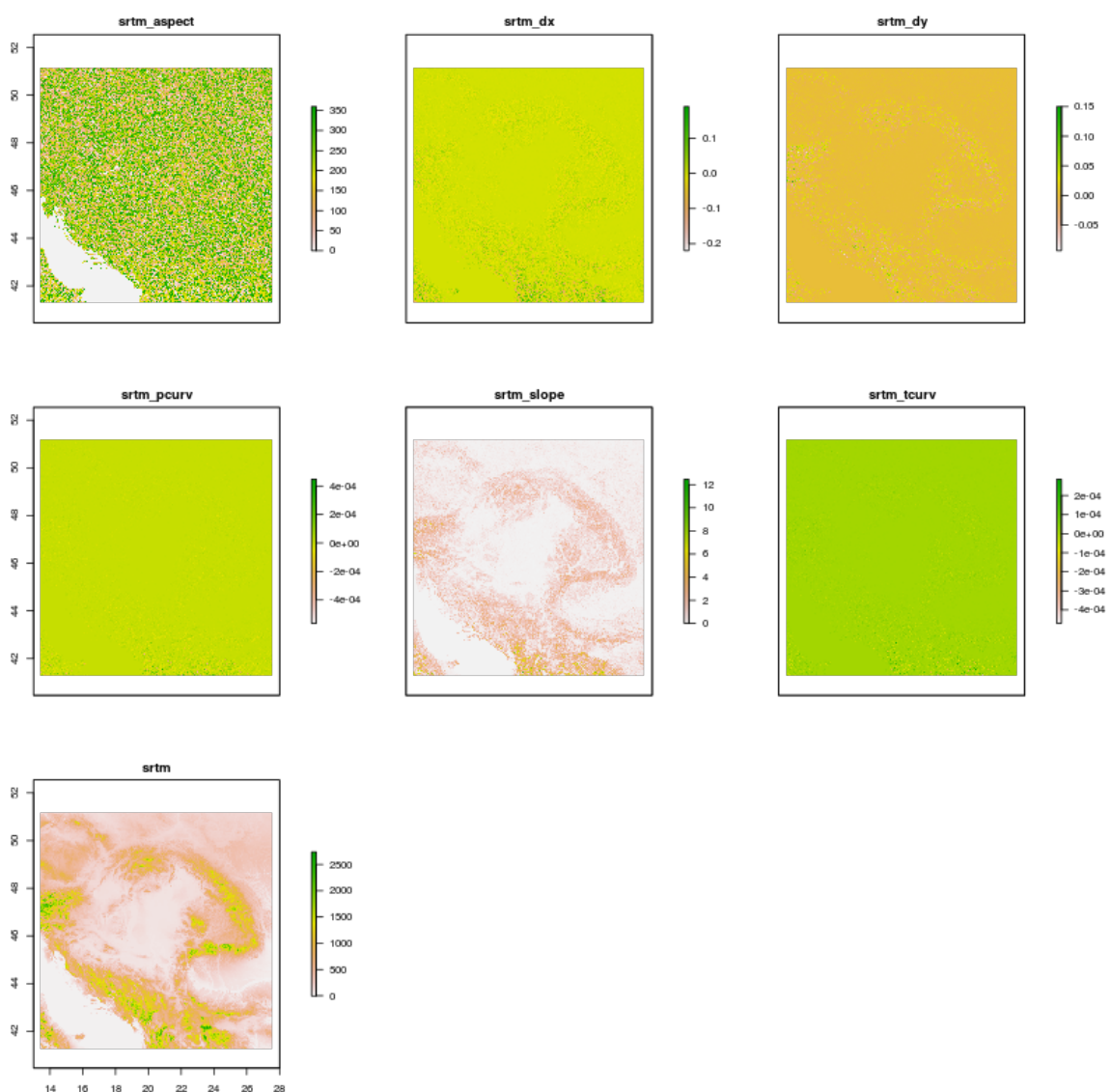# 4   Maps and Visualisations

Figure 1: DEM and derived topography based predictor layers.

A set of 6 predictor varibales (slope, aspect, curvatures and partial derivatives), are computed from the SRTM DEM data using the GRASS GIS r.slope.aspect tool Shapiro and Waupotitsch (2015).
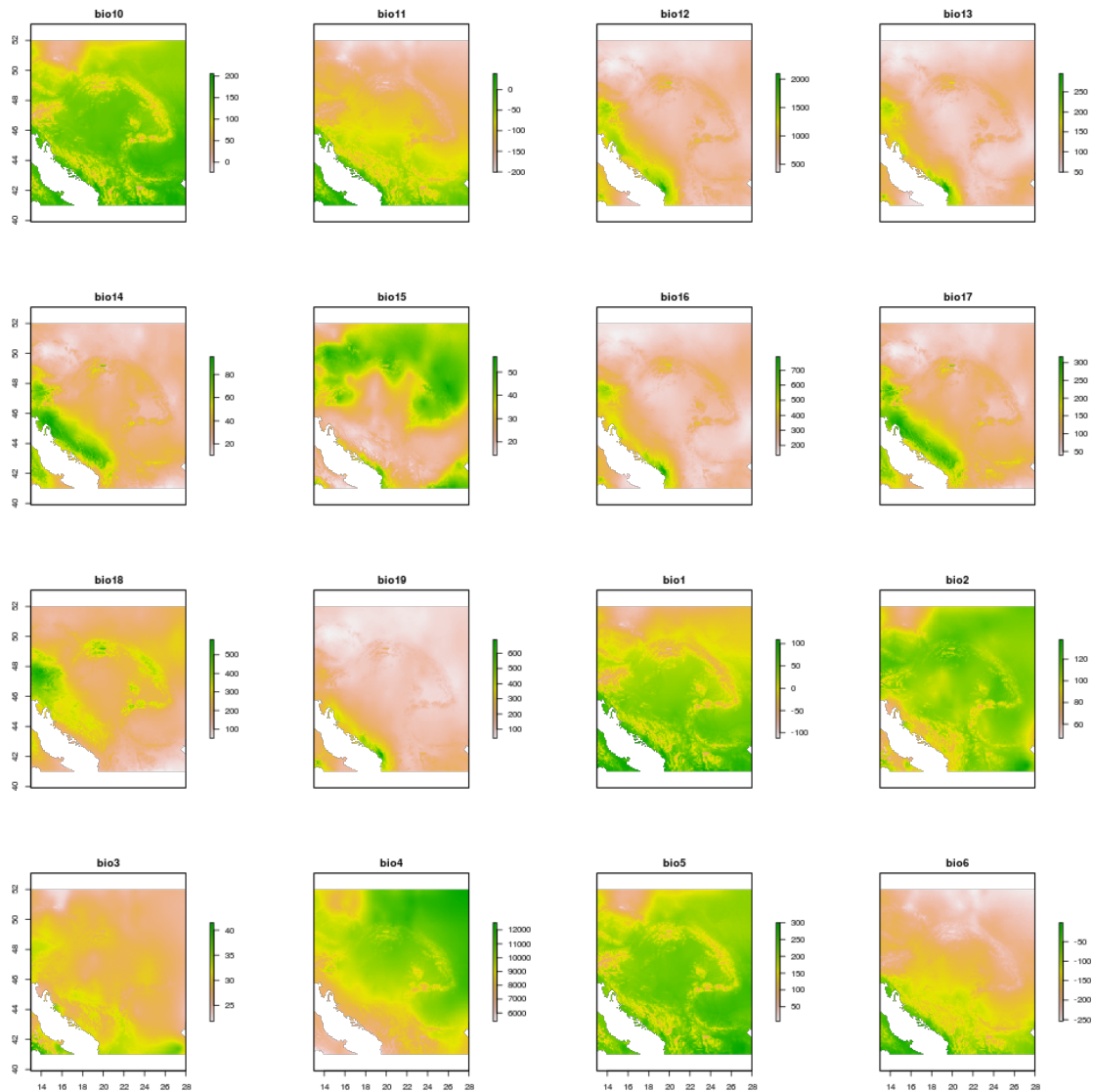
Figure 2: From paleoclimate data derived biclimatic variables predictor layers.

The bioclimatic variables computed using the dismo R package, are defined as follows:

bio1 = Annual Mean Temperature

bio2 = Mean Diurnal Range (Mean of monthly (max temp - min temp))

bio3 = Isothermality (BIO2/BIO7) (* 100)BIO4 = Temperature Seasonality (standard deviation *100)

bio5 = Max Temperature of Warmest Month

bio6 = Min Temperature of Coldest Month

bio7 = Temperature Annual Range (BIO5-BIO6)

bio8 = Mean Temperature of Wettest Quarter

bio9 = Mean Temperature of Driest Quarter

bio10 = Mean Temperature of Warmest Quarter

bio11 = Mean Temperature of Coldest Quarter

bio12 = Annual Precipitation

bio13 = Precipitation of Wettest Month

bio14 = Precipitation of Driest Month

bio15 = Precipitation Seasonality (Coefficient of Variation)

bio16 = Precipitation of Wettest Quarter

bio17 = Precipitation of Driest Quarter

bio18 = Precipitation of Warmest Quarter

bio19 = Precipitation of Coldest Quarter

5 Data resources

5.1 File resources

The map was published in two data formats, as PDF and a PNG image file.

File	Format	Size
bio_ts30.zip	Zip Archive of 19 bioclimatic variable rasters	125 MB
DEM.zip	Zip Archive of SRTM DEM and 6 derived topography predictor variable rasters	23 MB

5.2 Web resources

DOI	10.5880/SFB806.37
Carpatian Basin DEM (SRTM)	http://crc806db.uni-koeln.de/layer/show/438/
Carpatian Basin Aspect of DEM (SRTM)	http://crc806db.uni-koeln.de/layer/show/439/
Carpatian Basin Slope of DEM (SRTM)	http://crc806db.uni-koeln.de/layer/show/440/
Annual Mean Temperature (bio1)	http://crc806db.uni-koeln.de/layer/show/441/
Mean Diurnal Range (bio2)	http://crc806db.uni-koeln.de/layer/show/442/
Isothermality (bio3)	http://crc806db.uni-koeln.de/layer/show/443/
Temperature Seasonality (bio4)	http://crc806db.uni-koeln.de/layer/show/444/
Max Temperature of Warmest Month (bio5)	http://crc806db.uni-koeln.de/layer/show/445/
Min Temperature of Coldest Month (bio6)	http://crc806db.uni-koeln.de/layer/show/446/
Temperature Annual Range (bio7)	http://crc806db.uni-koeln.de/layer/show/447/
Mean Temperature of Wettest Quarter (bio8)	http://crc806db.uni-koeln.de/layer/show/448/
Mean Temperature of Driest Quarter (bio9)	http://crc806db.uni-koeln.de/layer/show/449/
Mean Temp. of Warmest Quarter (bio10)	http://crc806db.uni-koeln.de/layer/show/450/
Mean Temperature of Coldest Quarter (bio11)	http://crc806db.uni-koeln.de/layer/show/451/
Annual Precipitation (bio12)	http://crc806db.uni-koeln.de/layer/show/452/
Precipitation of Wettest Month (bio13)	http://crc806db.uni-koeln.de/layer/show/453/
Precipitation of Driest Month (bio14)	http://crc806db.uni-koeln.de/layer/show/454/
Precipitation Seasonality (bio15)	http://crc806db.uni-koeln.de/layer/show/455/
Precipitation of Wettest Quarter (bio16)	http://crc806db.uni-koeln.de/layer/show/456/
Precipitation of Driest Quarter (bio17)	http://crc806db.uni-koeln.de/layer/show/457/
Precipitation of Warmest Quarter (bio18)	http://crc806db.uni-koeln.de/layer/show/458/
Precipitation of Coldest Quarter (bio19)	http://crc806db.uni-koeln.de/layer/show/459/

Acknowledgements

References

Hijmans, R. J. and Elith, J. (2016). Species distribution modeling with R. *dismo R package version 1.1-4.*

Jarvis, A., Reuter, H. I., Nelson, A., and Guevara, E. (2008). Hole-filled seamless SRTM data V4, International Centre for tropical Agriculture (CIAT).

Shapiro, M. and Waupotitsch, O. (2015). Grass gis r.slope.aspect tool.

Willmes, C., Hölzchen, E., Sommer, C., and Rodriguez, J. (2017). Spatio-temporal interpolation of paleoclimate data based on δ18o climate variability observations (in prep.). *Quarternary International.*