LGM paleoenvironment of Europe - Map

D. Becker, J. Verheul, M. Zickel, C. Willmes

Abstract

The here documented GIS map and dataset contains a collection of Last Glacial Maximum (LGM, 21k yBP) paleoenvironmental data. It is the first result of a project that aims to acquire, produce and publish GIS datasets from non-GIS based sources such as analogous maps, textual informations or figures of scientific publications for prehistoric time slices. In combination with modelling results and already available GIS-datasets related to the mentioned time frame, it should enable other researchers and members from other projects to use the maps in their work, properly cited and referenced. The map shows LGM land ice sheets, paleo-stream networks and inland water in Europe, a sea-level adapted (-120m) coast line and a Köppen-Geiger climate classification derived from climate model data.

1 Context

The LGM Paleoenvironment GIS Map shows LGM land ice sheets, paleo-stream networks and inland water in europe, a sea-level adapted (-120m) coast line and a Köppen-Geiger climate classification derived from climate model data. The underlying digital elevation model is the General Bathymetric Chart of the Oceans 2014 (GEBCO 2014) in 30 arc-second resolution General Bathymetric Chart of the Oceans (2014). The LGM sea level adapted coast line (-120m) was derived from the GEBCO 2009 elevation model. The global Köppen-Geiger climate classification for the LGM was computed by Willmes et al. (2014b).

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

> D. Becker, J. Verheul, M. Zickel, C. Willmes (2015): LGM paleoenvironment of Europe - Map. CRC806-Database, doi: 10.5880/SFB806.15.

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)	D. Becker, J. Verheul, M. Zickel, C. Willmes
Year	2015
License	CC-BY
Topic	Environment
Keywords	LGM, Paleoclimate, Paleoenvironment
Publisher	CRC806-Database
DOI	10.5880/SFB806.15

2.2 Spatial Metadata

Type	BoundingBox
Place	European part of the CRC 806 area
BoundingBox (SW, NE)	-10.0 30.0, 68.05 80.0
Region	Europe

The data is located in the CRC 806 area. The working area involves Northern Africa, Europe and Western Eurasia. The area is delimited by a bounding box in longitude/latitude notation for the southwestern and northeastern corners.

2.3 Temporal Metadata

Type	Interval
Name	Last Glacial Maximum (LGM)
Interval	26500, 19000

For temporal indexing the dates are given in years before present (yBP). The listed interval (26.5ka to 19.0ka) is sourced from Clark et al. (2009).

3 Data sources

The GEBCO 2014 DEM was used as the basemap to illustrate the water bodies that weren't digitized by hand, to derive the LGM land mass and coast line and to derive a hillshade to reproduce the relief in the map. The Köppen-Geiger climate classification is a representation of the climatic situation during the LGM in Europe. The dataset was produced by Willmes et al. (2015). The inland water data is compiled from various sources and shows the main rivers of europe, smaller glacial lakes and the LGM shapes of the Caspian Sea and the Aral Sea. Lastly the glaciation extents illustrate the ice sheets over northern Europe, the Alps and the Zagros Mountains.

Dataset	Source	Notes
Gebco 2014	General Bathymetric Chart of the Oceans (2014)	The topographic data
Koeppen-Geiger LGM	Willmes et al. (2014a)	The climate classification data
Quarternary Glaciations	Ehlers et al. (2011)	The glaciation extents
NaturalEarthData	(Kelso and Patterson, 2010)	Graticules
LGM major inland waters of Europe - GIS dataset	Verheul et al. (2015)	Streams and inland waterbodies for the LGM

4 Maps and Visualisations

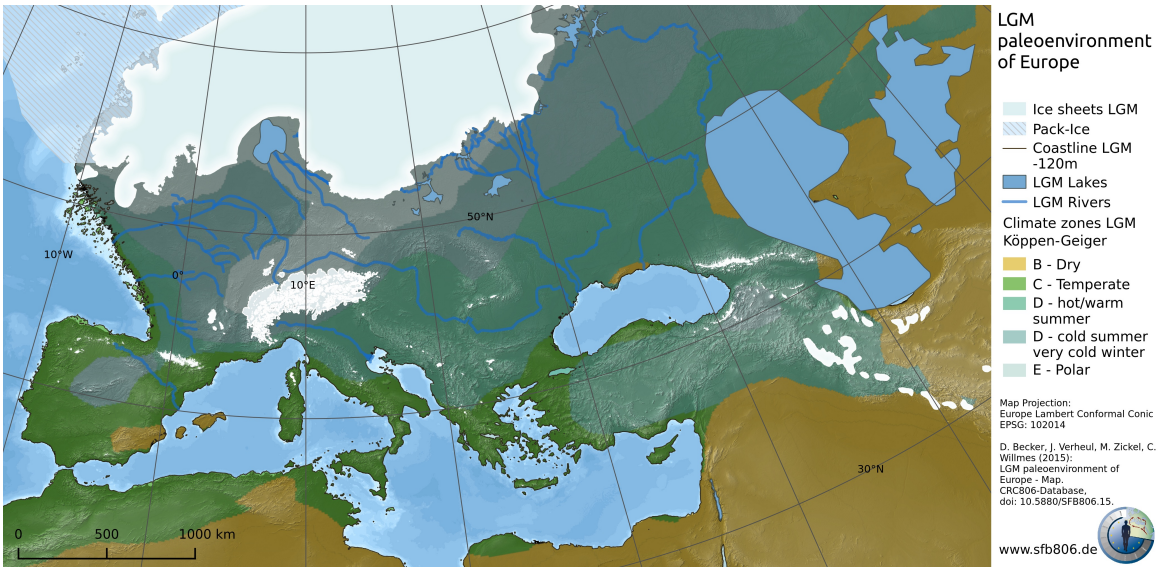

Figure 1: LGM paleoenvironment of Europe.

The mapping was conducted with QGIS 2.12. GEBCO 2014 was used for the basemap and a derived hillshade for the relief. The coloring of the Köppen-Geiger climate zones, as well as the rivers and the lakes, was chosen to have a "natural" appearance. Only the main climate zones of the Köppen-Geiger classification (B, C, D, E) are depicted, with a further distinction in the D climates between hot summer (a), warm summer (b) and cold summer (c), very cold winter (d).

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
LGM_Europe_Map.png	PNG image file containing the map	3,8 MB
LGM_Europe_Map.pdf	PDF file containing the map	2 MB

5.2 Web resources

DOI	10.5880/SFB806.15

Acknowledgements

This research was conducted within the frame of the DFG funded Collaborative Research Centre 806 (www.sfb806.de).

References

Clark, P., Dyke, A., Shakun, J., Carlson, A., Clark, J., Wohlfarth, B., Mitrovica, J., Hostetler, S., and McCabe, M. (2009). The Last Glacial Maximum. *Science*, 325(5941):710–714.

Ehlers, J., Gibbard, P. L., and Hughes, P. D. (2011). *Quaternary Glaciations - Extent and Chronology A Closer Look*, volume 15 of *Developments in Quaternary Sciences*. Elsevier.

General Bathymetric Chart of the Oceans (2014). GEBCO 2014 Grid - Gridded bathymetry data. http://www.gebco.net/data_and_products/gridded_bathymetry_data/, accessed: 2015-10-22.

Kelso, N. V. and Patterson, T. (2010). Introducing Natural Earth Data - NATURALEARTHDATA.COM. *Geographia Technica*, pages 82–89.

Verheul, J., Zickel, M., Becker, D., and Willmes, C. (2015). LGM major inland waters of Europe - GIS dataset. CRC806-Database, DOI: http://dx.doi.org/10.5880/SFB806.14.

Willmes, C., Becker, D., Brocks, S., Hütt, C., and Bareth, G. (2014a). Köppen-Geiger classification of MPI-ESM-P LGM simulation. CRC806-Database, DOI: http://dx.doi.org/10.5880/SFB806.2.

Willmes, C., Brocks, S., Becker, D., Hütt, C., and Bareth, G. (2015). High resolution Köppen-Geiger classifications of paleoclimate simulations. *Transactions in GIS*, ?(?):xx – xx.

Willmes, C., Kürner, D., and Bareth, G. (2014b). Building Research Data Management Infrastructure using Open Source Software. *Transactions in GIS*, 18:496 – 509.