<u>Maps of North-Western Europe during the Late Weichselian</u>

<u>Data:</u>
SRTM30_Plus, version 6.0
(available for non-profit use from the Scripps Institution of Oceanography, University of California San Diego at: ftp://topex.ucsd.edu/pub/srtm30_plus/ ; Becker et al. 2009; cf. Sandwell / Smith 2009; the tiles of this version measure 40° latitude x 50° longitude with a precision of *c*. 900 m [30 x 30 arc-seconds] and include bathymetric data; for further information and references read the Readme.V6.0 and References_SRTM30_Plus text files provided at the homepage mentioned above)
used tiles: W20N90 and E20N90
The projected data comprises the sector between 10° western and 25° eastern longitude and 45-60° northern latitude.

<u>Program:</u>
Global Mapper v8.01

<u>Map projection:</u>
Datum: WGS 84.
Geographic Projection (Latitude/ Longitude)

<u>Applied greyscale shader:</u>

altitude	R	G	B	shade	chroma	brightness
-250 m	148	148	148	160	0	139
-5 m	248	248	248	160	0	233
50 m	228	228	228	160	0	215
300 m	148	148	148	160	0	139
6000 m	28	28	28	160	0	26

<u>Applied shader:</u>

altitude	R	G	B	shade	chroma	brightness
-240 m	15	35	185	155	204	94
-120 m	217	255	217	80	240	222
-4 m	185	255	185	80	240	207
-3 m	128	255	128	80	240	180
50 m	0	255	65	90	240	120
100 m	11	255	11	80	240	125
250 m	133	255	11	60	240	125
500 m	255	255	0	40	240	120
750 m	193	193	72	40	119	125
1000 m	120	100	40	30	122	75
1500 m	128	65	0	20	240	60
2000 m	65	0	0	0	240	30
2490 m	255	255	255	160	0	240

<u>Vertical options in Global Mapper v8.01:</u>
Hill shading enabled
Light direction – Altitude: 0; Azimuth: 45
Ambient lighting – 0.75
Vertical exaggeration – 8.1

<u>Graphical revision:</u>
The map was exported as GeoTIFF and some perturbations such as large open mining fields were graphically removed in Adobe Photoshop. Further disturbances occur especially in the bathymetric data and, presumably, result from Holocene undulation movements of sea sediments and sediment fans from the Lateglacial to Holocene river mouths (e.g. Bourillet et al. 2003; Lericolais / Auffret / Bourillet 2003; Busschers et al. 2007). These disturbances were equally removed in Adobe Photoshop on the sea areas.

Finally, the map was stretched in a length-width proportion of 2:3 resulting in an approximate mixture of equal-length and equal-area projection of Europe. Note that if the maps are read into GIS programs they will return into the original SRTM-format with cylindric projection.

<u>Map size & format:</u>
All maps measure 24.7 x 14.27 cm (greyscale) / 20.0 x 11.56 cm (RGB) with 200dpi and are saved in .jpg-format (download version).
Higher quality .tif-formats can be forwarded on demand. Please, send requests to Sonja B. Grimm (information at the end of this document).

<u>Map information and references:</u>
General information
Four sets of maps are available: two sets in greyscale and two in RGB. For each colour model there is one set of maps with water courses indicated and one without.
Within the sets there are six maps. The time slices are given according to the Greenland eventstratigraphy (Björck et al. 1998).
Data for modern coastlines as well as national borders (only on some maps) was taken and used with minor alterations from shapefiles of national administrative borders made freely available for academic and non-commercial use by Global Administrative Areas at http://www.gadm.org/country.
Though well aware that the various glaciers occur at various altitudes a specific (mean) altitude was chosen for the Alpine glacier because putting the contemporary altitude of each glacier onto the map would have meant an unnecessary large data processing for the purpose of an overview map. Perhaps, shapefiles of the moraines of the various glacier advances will become available and processable in GIS programs in the future. Of course, the use of such detailed data is preferable then. However, on the present maps margin lines of all ice sheets were graphically smoothed if necessary in order to make a graphic rather than a precise impression of an ice sheet become possible.
Furthermore, with the regression of the massive ice sheets isostatic uplift became another important factor in shaping Northern Europe (Kiden / Denys / Johnston 2002; Reicherter / Kaiser / Stackebrandt 2005; Shennan et al. 2006). Due to the geomorphological relief in the most intensively affected areas, the land-water distribution would not alter significantly in comparison to the maps presented here and in areas further away the impact of this process decreased and would only result in slight differences in the shading. Nevertheless, if more accurate maps were planned these movements should be taken into account.
Equally, the river channels on the water-set of maps are given as schematic approximations partially due to seasonal changes and the changes of river system regime within the time slices but also due to the partial lack of reliable data.
For the hydrological system in the western North Sea basin during the Late Weichselian see Fitch / Thomson / Gaffney 2005; Ward / Larcombe / Lillie 2006; Gaffney / Thomson / Fitch 2007; cf. Praeg 2003.
Ice channels and water gaps on the North European Plain are given according to **Wolstedt 1956**. These broad glacial valleys were formed by meltwater streams alongside the margins of the Scandinavian ice sheet. Thus, in GS-2a the ice sheet were already regressed into Scandinavia and significant meltwater streams could no longer be expected from these on the North European Plain. Furthermore, by this time most rivers flowed presumably in their modern valleys. However, until today these broad valleys are used as preferred traffic routes and often remained wet areas. Therefore, these valleys are shown on all maps of the Late Weichselian and are indicated in a lighter blue as not necessarily “active” water courses except for the LGM maps.

NW-Eu 10W-25E 45-60N -000m 0:
Time slice: GH (2000 A.D.)
Alpine glacier margins are plotted at 2,490 m asl according to **IUGG (CCS) – UNEP – UNESCO 2005**.

NW-Eu 10W-25E 45-60N -060m 1:
Time slice: GS-1
Sea level change is set according to **Weaver et al. 2003**.
Irish Sea mainly after **A. Brooks** (University of Dublin, Dublin, Submerged Landscapes Archaeological Networks: http://www.naturalscience.tcd.ie/SL_palaegeog.php; accessed: 25-10-2006) – which is further supported by results from J. Kelley (University of Maine, Orono) & A. Cooper (Ulster University, Londonderry / still in prep.; http://news.ulster.ac.uk/releases/2004/1300.html, accessed: 25-10-2006); cf. Edwards / Brooks 2008; Clark et al. 2012.
The Baltic Ice Lake limits are according to **Björck 1995**.

Glacier data for Scandinavia come from **Lundqvist / Wohlfarth 2001** and **Boulton et al. 2001**. The glacier data for the Alps are interpolated after **Ivy-Ochs et al. 2006**. The British glacier data are according to **Clark et al. 2004**.
The Channel river is according to **Bourillet et al. 2003**; **Lericolais / Auffret / Bourillet 2003**; **Gupta et al. 2007**, cf. Gibbard 1988; Antoine et al. 2003; Ménot et al. 2006; Busschers et al. 2007; Hijma et al. 2012.
The northern river channel is according to **Konradi 2000** and Streif 2004.

NW-Eu 10W-25E 45-60N -070m 2:
Time slice: GI-1c-a
Sea level change is set according to **Weaver et al. 2003**.
Irish Sea mainly after **A. Brooks** (University of Dublin, Dublin, Submerged Landscapes Archaeological Networks: http://www.naturalscience.tcd.ie/SL_palaegeog.php; accessed: 25-10-2006) – which is further supported by results from J. Kelley (University of Maine, Orono) & A. Cooper (Ulster University, Londonderry / still in prep.; http://news.ulster.ac.uk/releases/2004/1300.html, accessed: 25-10-2006); cf. Clark et al. 2012.
The Baltic Ice Lake limits are according to **Björck 1995**.
Glacier data for Scandinavia come from **Lundqvist / Wohlfarth 2001** and **Boulton et al. 2001**. The glacier data for the Alps are interpolated after **Ivy-Ochs et al. 2006**. The British glacier data are interpolated from the data for the LGM and Younger Dryas given in **Clark et al. 2004** by analogy with the rate of regression of the Scandinavian ice shield (see above).
The Channel river is according to **Bourillet et al. 2003**; **Lericolais / Auffret / Bourillet 2003**; **Gupta et al. 2007**, cf. Gibbard 1988; Antoine et al. 2003; Ménot et al. 2006; Busschers et al. 2007; Hijma et al. 2012.
The northern rivers channel is according to **Konradi 2000** and Streif 2004.

NW-Eu 10W-25E 45-60N -090m 3:
Time slice: GI-1e-d
Sea level change is according to **Weaver et al. 2003**.
Irish Sea mainly after **A. Brooks** (University of Dublin, Dublin, Submerged Landscapes Archaeological Networks: http://www.naturalscience.tcd.ie/SL_palaegeog.php; accessed: 25-10-2006) – which is further supported by results from J. Kelley (University of Maine, Orono) & A. Cooper (Ulster University, Londonderry / still in prep.; http://news.ulster.ac.uk/releases/2004/1300.html, accessed: 25-10-2006); cf. Clark et al. 2012.
The Baltic Ice Lake limits are according to **Björck 1995**.
Glacier data for Scandinavia come from **Lundqvist / Wohlfarth 2001** and **Boulton et al. 2001**. The glacier data for the Alps are interpolated after **Ivy-Ochs et al. 2006**. The British glacier data are interpolated from the data for the LGM and Younger Dryas given in **Clark et al. 2004** by analogy with the rate of regression of the Scandinavian ice shield (see above).
The Channel river is according to **Bourillet et al. 2003**; **Lericolais / Auffret / Bourillet 2003**; **Gupta et al. 2007**, cf. Gibbard 1988; Antoine et al. 2003; Ménot et al. 2006; Busschers et al. 2007; Hijma et al. 2012.
The northern river channel is according to **Konradi 2000** and Streif 2004.

NW-Eu 10W-25E 45-60N -105m 4:
Time slice: GS-2a
Sea level change is according to **Weaver et al. 2003**.
Irish Sea mainly after **A. Brooks** (University of Dublin, Dublin, Submerged Landscapes Archaeological Networks: http://www.naturalscience.tcd.ie/SL_palaegeog.php; accessed: 25-10-2006) – which is further supported by results from J. Kelley (University of Maine, Orono) & A. Cooper (Ulster University, Londonderry / still in prep.; http://news.ulster.ac.uk/releases/2004/1300.html, accessed: 25-10-2006); cf. Clark et al. 2012.
According to Björck 1995 there are no data for this period available on the Baltic Ice Lake(s); cf. Clark et al. 2012.
Glacier data for Scandinavia come from **Lundqvist / Wohlfarth 2001** and **Boulton et al. 2001**. The glacier data for the Alps are interpolated after **Ivy-Ochs et al. 2006**. The British glacier data are interpolated from the data for the LGM and Younger Dryas given in **Clark et al. 2004** by analogy with the rate of regression of the Scandinavian ice shield (see above); cf. Clark et al. 2012.
The Channel river is according to **Bourillet et al. 2003**; **Lericolais / Auffret / Bourillet 2003**; **Gupta et al. 2007**, cf. Gibbard 1988; Antoine et al. 2003; Ménot et al. 2006; Busschers et al. 2007; Hijma et al. 2012.
The northern river channel is according to **Konradi 2000** and Streif 2004.

NW-Eu 10W-25E 45-60N -120m 5:
Time slice: GS-3 (Last Glacial Maximum)
Sea level change is according to **Peltier 2005**. Meanwhile, the sea level can be set more precisely to -123 m (Hanebuth / Stattegger / Bojanowski 2009).
Glacier data is according to **Ivy-Ochs et al. 2006** (Alps; at 1,010 m asl); **Clark et al. 2004** (GB); **Boulton et al. 2001** (Scandinavia). The coalescence of the British and Scandinavian ice sheets in the North Sea basin is according to **Carr et al. 2006** (Cape Shore episode) and Sejrup et al. 2009; cf. Clark et al. 2012.
The Channel river is according to **Bourillet et al. 2003**; **Lericolais / Auffret / Bourillet 2003**; **Gupta et al. 2007**, cf. Gibbard 1988; Antoine et al. 2003; Ménot et al. 2006; Busschers et al. 2007; Hijma et al. 2012.

How to cite the maps in publications:
If you want to use these maps within a publication, please cite them as “compiled by Grimm YYYY after [references marked bold in text above for the map used]”. Since these maps would not exist without these ground data, please also acknowledge these basic works of the cited authors by citing their references!
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A previous version of these maps are available for download at:
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