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# Linkage between dust cycle and loess of the Last Glacial Maximum in Europe

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Table S1: Loess mass accumulation rates; encompassing all particle sizes (MAR) or only particles with less than 10 µm diameter (MAR10). Reconstructed from fieldwork samples dated to the LGM or to a period encompassing the LGM. Proportion of particles smaller than 10 µm in diameter (Frac10). MAR ranges itemized by their limits. For sites with more than one reconstructed MAR each rate is shown separately. Missing value (0.00); country codes (CC) conform with ISO 3166.

| Site | CC | Lat °N | Lon °E | MAR $g\,m^{-2}\,yr^{-1}$ | MAR10 $g\,m^{-2}\,yr^{-1}$ | Frac10 |
|---|---|---|---|---|---|---|
| Achenheim [1] | FR | 48.35 | 7.38 | 331.00 | 82.75 | 0.25 |
| Achenheim [2] | FR | 48.35 | 7.38 | 257.00 | 0.00 | 0 |
| Albertirsa [3] | HU | 47.26 | 19.64 | 386.00 | 96.50 | 0.25 |
| Albertirsa [2] | HU | 47.26 | 19.64 | 841.00 | 0.00 | 0 |
| Albertirsa [4] | HU | 47.26 | 19.64 | 587.00 | 134.00 | 0.23 |
| Am Bingert Wiesbaden [2] | DE | 50.12 | 8.28 | 361.00 | 0.00 | 0 |
| Arapovychi (Arapovichi) [5] | UA | 51.95 | 33.31 | 666.00 | 166.50 | 0.25 |
| Basaharc [4] | HU | 47.80 | 18.84 | 348.00 | 79.00 | 0.23 |
| Batajnica [4] | RS | 44.92 | 20.32 | 329.00 | 75.00 | 0.23 |
| Böckingen [2] | DE | 49.13 | 9.18 | 3300.00 | 0.00 | 0 |
| Bodrogkeresztúr 1 [4] | HU | 48.13 | 21.40 | 381.00 | 87.00 | 0.23 |
| Bönnigheim A [2] | DE | 49.04 | 9.14 | 131.00 | 0.00 | 0 |
| Bönnigheim B [6] | DE | 49.04 | 9.14 | 242.00 | 60.50 | 0.25 |
| Bönnigheim B [2] | DE | 49.04 | 9.14 | 283.00 | 0.00 | 0 |
| Bönnigheim B [2] | DE | 49.04 | 9.14 | 1500.00 | 0.00 | 0 |
| Bryansk [5] | RU | 53.15 | 34.06 | 394.00 | 98.50 | 0.25 |
| Crvenka [4] | RS | 45.66 | 19.48 | 197.00 | 45.00 | 0.23 |
| Csorgókút 1 [4] | HU | 48.13 | 21.40 | 284.00 | 65.00 | 0.23 |
| Csorgókút 2 [4] | HU | 48.13 | 21.40 | 453.00 | 103.00 | 0.23 |
| Debrecen (Alföldi brickyard) [4] | HU | 47.53 | 21.57 | 237.00 | 54.00 | 0.23 |
| Dolní Vestonice [6] | CZ | 48.89 | 16.66 | 758.00 | 189.50 | 0.25 |
| Dolní Věstonice [2] | CZ | 48.89 | 16.66 | 754.00 | 0.00 | 0 |
| Dolní Věstonice [2] | CZ | 48.89 | 16.66 | 1100.00 | 0.00 | 0 |
| Dunaszekcső[4] | HU | 46.07 | 18.75 | 707.00 | 161.00 | 0.23 |
| Dunaújváros [4] | HU | 46.97 | 18.94 | 1238.00 | 282.00 | 0.23 |
| Dybawka [7] | PL | 49.79 | 22.69 | 1195.00 | 0.00 | 0 |
| Erdut [4] | HR | 45.53 | 19.06 | 215.00 | 49.00 | 0.23 |
| Gololobovo [8] | RU | 55.05 | 38.57 | 272.00 | 68.00 | 0.25 |
| Gorokhov [5] | UA | 50.31 | 24.50 | 435.00 | 108.75 | 0.25 |
| Grubgraben Kammern Niederösterreich [2] | AT | 48.50 | 15.80 | 2100.00 | 0.00 | 0 |
| Gunderding Oberösterreich [2] | AT | 48.26 | 13.23 | 10340.00 | 0.00 | 0 |
| Halytsch (Halyc) [9] | UA | 49.10 | 24.80 | 226.00 | 56.50 | 0.25 |
| Harmignies [10] | BE | 50.41 | 4.02 | 412.00 | 103.00 | 0.25 |
| Harmignies [2] | BE | 50.41 | 4.02 | 1467.00 | 0.00 | 0 |
| Harmignies [2] | BE | 50.41 | 4.02 | 3135.00 | 0.00 | 0 |
| Irig [4] | RS | 45.08 | 19.87 | 192.00 | 44.00 | 0.23 |
| Katymár [7] | HU | 46.02 | 19.20 | 1005 | 0.00 | 0 |
| Katymár [4] | HU | 46.02 | 19.20 | 632.00 | 144.00 | 0.23 |
| Kesselt [11] | BE | 50.84 | 5.60 | 446.00 | 111.50 | 0.25 |

*Table continues*

Table S1: *continued*

| Site | CC | Lat °N | Lon °E | MAR g m$^{-2}$ yr$^{-1}$ | MAR10 g m$^{-2}$ yr$^{-1}$ | Frac10 |
|---|---|---|---|---|---|---|
| Kesselt [2] | BE | 50.84 | 5.60 | 825.00 | 0.00 | 0 |
| Kesselt [2] | BE | 50.84 | 5.60 | 330.00 | 0.00 | 0 |
| Korostelevo (Korostylievo) [12] | RU | 51.84 | 42.42 | 181.00 | 45.25 | 0.25 |
| Lakitelek 1 [4] | HU | 46.88 | 20.02 | 254.00 | 58.00 | 0.23 |
| Látókép [4] | HU | 47.56 | 21.49 | 212.00 | 48.00 | 0.23 |
| Likhvin (Chekalin) [8] | RU | 54.10 | 36.27 | 272.00 | 68.00 | 0.25 |
| Madaras [4] | HU | 46.04 | 19.29 | 375.00 | 86.00 | 0.23 |
| Mende [13] | HU | 47.42 | 19.45 | 456.00 | 114.00 | 0.25 |
| Mende [2] | HU | 47.42 | 19.45 | 519.00 | 0.00 | 0 |
| Mende [4] | HU | 47.42 | 19.45 | 761.00 | 173.00 | 0.23 |
| Mezyn (Mezin) [5] | UA | 52.20 | 33.30 | 788.00 | 197.00 | 0.25 |
| Molodova V [14] | UA | 48.50 | 26.89 | 369.00 | 92.25 | 0.25 |
| Mosorin [7] | RS | 45.26 | 20.28 | 545.00 | 0.00 | 0 |
| Mošorin [4] | RS | 45.26 | 20.28 | 395.00 | 90.00 | 0.23 |
| Nussloch [15] | DE | 49.35 | 8.72 | 2114.00 | 528.50 | 0.25 |
| Nussloch [2] | DE | 49.35 | 8.72 | 1213.00 | 0.00 | 0 |
| Nussloch [2] | DE | 49.35 | 8.72 | 6129.00 | 0.00 | 0 |
| Otkaznoe (Otkaznoye) [16] | RU | 44.32 | 43.85 | 336.00 | 117.60 | 0.35 |
| Paks [13] | HU | 46.64 | 18.88 | 1325.00 | 331.25 | 0.25 |
| Paks [2] | HU | 46.64 | 18.88 | 2662.00 | 0.00 | 0 |
| Paks [4] | HU | 46.64 | 18.88 | 1422.00 | 324.00 | 0.23 |
| Patkóbánya Kopasz Hill Tokaj [17] | HU | 48.22 | 20.45 | 395.00 | 98.75 | 0.25 |
| Petrovaradin [4] | RS | 45.27 | 19.87 | 174.00 | 40.00 | 0.23 |
| Prymors'ke (Primorskoje) [18] | UA | 45.94 | 30.20 | 654.00 | 163.50 | 0.25 |
| Pyrogove [7] | UA | 50.36 | 30.53 | 1659.00 | 0.00 | 0 |
| Radymno [7] | PL | 49.96 | 22.81 | 538.00 | 0.00 | 0 |
| Remicourt [2] | BE | 50.67 | 5.40 | 560.00 | 140.00 | 0.25 |
| Remicourt [2] | BE | 50.67 | 5.40 | 453.00 | 0.00 | 0 |
| Rocourt [19] | BE | 50.68 | 5.54 | 257.00 | 64.25 | 0.25 |
| Rocourt [2] | BE | 50.68 | 5.54 | 93.00 | 0.00 | 0 |
| Ruma [4] | RS | 45.01 | 19.85 | 192.00 | 44.00 | 0.23 |
| Sables d'Or les Pins [2] | FR | 48.65 | -2.39 | 354.00 | 0.00 | 0 |
| Ságvár [4] | HU | 46.83 | 18.09 | 176.00 | 40.00 | 0.23 |
| Sanzhijka [7] | UA | 46.23 | 30.61 | 808.00 | 0.00 | 0 |
| Schwalbenberg [2] | DE | 50.57 | 7.24 | 560.00 | 140.00 | 0.25 |
| St.-Pierre-les-Elbeuf [20] | FR | 49.60 | 1.23 | 242.00 | 60.50 | 0.25 |
| St.-Romain-de-Colbosc [19] | FR | 49.54 | 0.36 | 687.00 | 171.75 | 0.25 |
| Stari Bezradychy [7] | UA | 50.18 | 30.55 | 440.00 | 0.00 | 0 |
| Stari Slankamen [4] | RS | 45.13 | 20.27 | 168.00 | 38.00 | 0.23 |
| Stillfried Gänserndorf Niederösterreich [2] | AT | 48.42 | 16.84 | 229.00 | 0.00 | 0 |
| Strelitsa [21] | RU | 51.60 | 38.90 | 290.00 | 72.50 | 0.25 |
| Surduk [4] | RS | 45.07 | 20.33 | 434.00 | 99.00 | 0.23 |
| Susek [4] | RS | 45.22 | 19.53 | 150.00 | 34.00 | 0.23 |
| Süttő[22] | HU | 47.74 | 18.45 | 1009.00 | 0.00 | 0 |

*Table continues*

Table S1: *continued*

| Site | CC | Lat °N | Lon °E | MAR g m$^{-2}$ yr$^{-1}$ | MAR10 g m$^{-2}$ yr$^{-1}$ | Frac10 |
|---|---|---|---|---|---|---|
| Süttő[4] | HU | 47.74 | 18.45 | 584.00 | 133.00 | 0.23 |
| Szeged-Öthalom I [4] | HU | 46.28 | 20.10 | 332.00 | 76.00 | 0.23 |
| Tápiósüly [4] | HU | 47.45 | 19.52 | 504.00 | 115.00 | 0.23 |
| Titel [7] | RS | 45.23 | 20.30 | 591.00 | 0.00 | 0 |
| Titel [4] | RS | 45.23 | 20.30 | 510.00 | 116.00 | 0.23 |
| Tokaj (Kereszt Hill II) [4] | HU | 48.13 | 21.40 | 222.00 | 51.00 | 0.23 |
| Tokaj (Patkó-quarry) [4] | HU | 48.12 | 21.40 | 332.00 | 76.00 | 0.23 |
| Tokaj Kopasz Hill Patkó-bánya [17] | HU | 48.22 | 20.45 | 395.00 | 98.75 | 0.25 |
| Tönchesberg Tönches-Berg Kruft [23] | DE | 50.35 | 7.35 | 779.00 | 194.75 | 0.25 |
| Tönchesberg Tönches-Berg Kruft [2] | DE | 50.35 | 7.35 | 1249.00 | 0.00 | 0 |
| Trindorf Oftering [2] | AT | 48.24 | 14.14 | 2970.00 | 0.00 | 0 |
| Üveghuta-2 borehole [4] | HU | 46.20 | 18.61 | 338.00 | 77.00 | 0.23 |
| Volgodonsk [24] | RU | 47.56 | 41.99 | 245.00 | 98.00 | 0.4 |
| Vyazivok [25] | UA | 49.33 | 32.98 | 202.00 | 50.50 | 0.25 |
| Willendorf II Niederösterreich [2] | AT | 47.79 | 16.05 | 372.00 | 0.00 | 0 |
| Willendorf II Niederösterreich [2] | AT | 47.79 | 16.05 | 886.00 | 0.00 | 0 |
| Zmajevac [4] | HR | 45.81 | 18.82 | 437.00 | 100.00 | 0.23 |

Table S2: Palaeoclimate Modelling Intercomparison Project Phase 3 (PMIP3) setup for global LGM simulations (first column) and its adapted implementation that upgrades the WRF-Chem to the WRF-Chem-LGM. Default values listed for comparison to the right of the slash (second column).

| | PMIP3-LGM [26] | WRF-Chem-LGM / WRF-Chem |
|---|---|---|
| Earth's orbit: | | |
| Eccentricity | 0.018994 | 0.018994 / 0.014 |
| Obliquity | 22.949° | 22.949° / 23.5° |
| Gas concentrations: | | |
| $CO_2$ $(10^{-6})$ | 185 | 185 / 379 |
| $CH_4$ $(10^{-9})$ | 350 | 350 / 1774 |
| $N_2O$ $(10^{-9})$ | 200 | 200 / 319 |
| CFCs, misc. $(10^{-12})$ | 0 | 0 / 169, 251, 538 |
| Mineral dust | Computed or CMIP5-PI [27] | Shao et al. [28] |
| Land-sea mask | 1° PMIP3-LGM [26] | 1° PMIP3-LGM-based |
| Orography | Offsets added (1° PMIP3-LGM) | Offsets added (1° PMIP3-LGM-based) |
| Ice sheets | 1° PMIP3-LGM | 2° CLIMAP-LGM [29]-based |
| Land use | Same as in CMIP5-PI | 2° CLIMAP-LGM-based |
| Vegetation cover | Same as in CMIP5-PI | Deduced from 2° CLIMAP-LGM and WRF geo-data [30] |
| Soil types | Not specified | Present-day WRF geo-data, EIS adapted |
| Erodibility | Not specified | Deduced [31] from 1° PMIP3-LGM topography and 2° CLIMAP-LGM bare soil |
| Sea surface temperatures | Not specified | MPI-LGM [32–34] |

Table S3: Modules and domain parameters applied to run the WRF-Chem-LGM simulations. University of Cologne (UC)

| | |
|---|---|
| WRF-Chem version | 3.5.1 |
| Time step | 3 min |
| Horizontal resolution | 50 km |
| Vertical levels | 35 |
| MPI-LGM boundary data input interval | 6 h |
| Microphysics | Lin Scheme [35] |
| Longwave, Shortwave Radiation | RRTMG [36] |
| Surface Layer | MM5 Similarity Scheme [37] |
| Land Surface Model | Unified Noah [38–40] |
| Planetary Boundary layer | Yonsei Univ. Scheme [41] |
| Cumulus convection parameter | Tiedtke Scheme [42] |
| Non hydrostatic | Yes |
| Chemistry modules active | Dust-only |
| Dry deposition | Yes [43] |
| Vertical turbulent mixing | Yes |
| Dust option | GOCART [44] |
| Dust emissions | UC Simplified Scheme [28] |
| Wet deposition | Enabled [45] |

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