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RADIOCARBON DATING OF SOILS: DATABASE CONTRIBUTION BY BONN AND HAMBURG

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ABSTRACT. We present a compilation of ^{14}C soil dates measured at the University of Hamburg through 1984 (HAM-1597).

INTRODUCTION

The inherent problems in determining the "age of a soil" were described by Scharpenseel and Becker-Heidmann (1992). The dating procedure applied in the production of ^{14}C dates of soil profiles and samples listed below was described by Scharpenseel, Pietig and Tamers (1968) and Scharpenseel and Pietig (1970). For reasons of brevity, we report only the oldest ^{14}C age of the data set indicated for the layers, thin layers or horizons of the ^{14}C-dated soil profiles. We present an annotated bibliography as well as date lists of our work. We also include unpublished soil dates measured in our laboratory, and, following this contribution, Peter Becker-Heidmann reports continuing dates from HAM-1600 onward.

DATE LISTS IN *RADIOCARBON*: BONN I–VII AND HAMBURG I–IV*

Material dated	Lab code(s)	Age (yr BP)
University of Bonn, Natural Radiocarbon Measurements I (Scharpenseel, Pietig and Tamers 1968)		
Soil and Soil Profile Dates		
Germany		
Hapludoll, Söllingen A	B 26–31	≤ 4800 ± 100
Hapludoll, Söllingen B	B 33–40	≤ 4060 ± 80
Hapludoll, Söllingen C	B 98–104	≤ 5300 ± 80
Hapludoll, Söllingen D	B 106–113	≤ 5550 ± 80
Haplaquoll, Hildesheim A	B 114–120	≤ 3130 ± 70
Haplaquoll, Hildesheim A	B 121–128	≤ 4000 ± 80
Fossil Chernozem below Hapludalf, Soest II	B 3	4000 ± 80
Fossil Chernozem below Hapludalf, Soest I	B 4	4170 ± 80
Fossil Chernozem in dark-brown steppe soil, Wallertheim	B 22	2560 ± 60
Buried Eutrochrept below Allerød trachyt blanket	B 96	9130 ± 100
Udoll, Ostholsteen A, Grossenbrode	B 156	≤ 1850 ± 70
Udoll, Ostholsteen B, Grossenbrode	B 161–165	≤ 1390 ± 70
Plaggept, Greven (Albachtenesch, Marktesch, *etc.*)	B 9–13	≤ 1300 ± 80
Plaggept, Greven, Albachtenesch, whole profile	B 43–48	≤ 1220 ± 80
Plaggept, Rheine	B 49–54	≤ 1260 ± 60
Plaggept, Lengerich (B 135, 80 cm deep 3960 ± 80)	B 129–135	≤ 1190 ± 70
Spodosol, Sennesand	B 14	930 ± 80
Spodosol, Irrel	B 19	810 ± 50
Spodosols, Darlaten A and B	B 20, 21	≤ 1220 ± 60

*From 1968–1974 our laboratory was located in Bonn, and our laboratory code designation, as reported in *Radiocarbon*, was BONN. In 1976, our laboratory numbers changed to HAM- to reflect our relocation to Hamburg. (Lab codes in this table are abbreviated to "B" and "H".) This compilation of our work represents 27 years of soil dating from all over the world.

Material dated	Lab code(s)	Age (yr BP)
Spodosols, Scherpenseel A and B	B 90, 91	≤ 2960 ± 70
Spodosol, Wilsede	B 41	1140 ± 60
Spodosol, Obrehaverbeck	B 42	940 ± 50
Spodosols, Flaesheim	B 15–17	≤ 2420 ± 80
Hapludalf, Frimmersdorf	B 92–95	≤ 1880 ± 80
Half bog soils, Fibrist, Kalkarer Moor I	B 82–85	≤ 7790 ± 110
Half bog soils, Fibrist, Kalkarer Moor II	B 86–89	≤ 3160 ± 50
University of Bonn, Natural Radiocarbon Measurements II (Scharpenseel, Pietig and Tamers 1969)		
Germany		
Rendolls		
Tangelrendsina, Kramer (German Alps)	B 318–322	≤ 4180 ± 70
Moderrendsina Krottenkopf (German Alps)	B 324	600 ± 50
Udalfs, argillic horizon probably former A horizon of Mollisol:		
Parabrown earth, Eltville	B 326–331	≤ 4940 ± 80
Parabrown earth, Inden	B 334–342	≤ 4170 ± 70
Brown earth, Haaren-Sintfeld	B 355–358	≤ 1580 ± 50
Parachernozem, Fellbach	B 372–379	≤ 2730 ± 70
Parachernozem, Fellbach, brickpit	B 380–384	≤ 4150 ± 50
Plaggepts:		
Southeast of Rietberg	B 343–345	≤ 1200 ± 70
Brede near Rietberg	B 348	720 ± 70
Hoffeld	B 349–350	≤ 1130 ± 70
Sinnesche Brede	B 351	1540 ± 60
Am Hohen Lande	B 352	810 ± 70
Krax bei Neuenkirchen	B 353	900 ± 60
Modern bomb-carbon samples BONN 172–200 and BONN 303–317 (bomb C curve on cereals, beets, winter rape, wine, 1956–1967)		
University of Bonn, Natural Radiocarbon Measurements III (Scharpenseel and Pietig 1970)		
Udolls, Vertisols, Fossil A-horizon of Paleosol-Mollisol in Argillic Horizon of Hapludalf		
Germany		
Parabrown earth Lantershofen	B 403–409	≤ 5530 ± 90
Ochtendung (below trachytic pumice)	B 411–416	≤ 10,580 ± 100
Muddersheim, Thineland	B 417–421	≤ 3700 ± 60
Quarry "Schäferkalkwerke"	B 422–431	≤ 25,000 ± 700
Buried soil organic matter (SOM), Eddersheim	B 448	8300 ± 120
Humus containing sand with charcoal (fireplace), Amalienhof	B 608a	2530 ± 70
Buried humus, Heiligensee Forest, Berlin	B 609	760 ± 60
Bone collagen in paleosol below trachytic tuff, Michelsberg	B 763	10,800 ± 100
Bohemia, Czech Republic		
Argiudoll, Kozojedy, Jicin District	B 437–440	≤ 4150 ± 90
Agiudoll, Smince, Uradec, Kralové District	B 441	4020 ± 60
Hapludoll, Brazdim, Prahoviphod, Tilery District	B 442–444	≤ 3430 ± 65
Vertisol (Smonitza), Prunevor, Choumtov District	B 445–447	≤ 6370 ± 65
Hapludoll, Chernozem, Zozelice, Königgrätz District	B 485–487	≤ 1460 ± 110
Aquoll, Zozelice II, Königgrätz District	B 488–490	≤ 1950 ± 70
Moravia, Czech Republic		
Argiudoll, Brnicko, Olmütz District	B 491, 495	≤ 4055 ± 80
Udoll, sandy loess, Moravia	B 496–499	≤ 3610 ± 75
Udoll, Chernozem, Bilorice	B 500, 600–603	≤ 2450 ± 70
Vertic Udoll (Vertisol-like Chernozem), Tegel, Pole, Brünn	B 604–607	≤ 4070 ± 70

Material dated	Lab code(s)	Age (yr BP)
Russia		
Hapludoll, Vermudoll, Chernozem, Orel	B 455–457	≤ 4720 ± 60
Udoll, Chernozem, Charkov	B 460–462	≤ 5920 ± 140
Udoll, Chernozem, Zaparoskje	B 464–466	≤ 3270 ± 80
Udoll, Chestnut soil, Askania Nova	B 468–470	≤ 2710 ± 80
Tunisia		
Vertisol, Beja (deepest humus layer)	B 433	2920 ± 40
Vertisol, Zouarine, Ebba Ksour	B 434	3680 ± 65
Finland		
Sandy humus 75 cm deep, Kevo, North Finlandia	B 449	2350 ± 70
Spitzbergen		
Fossil A horizon, 55 cm deep, Hohenstaufen Plateau, Barents I	B 432	3040 ± 80
Germany		
SOM fractions		
Chernozem, Söllingen, total organic matter	B 6A	2100 ± 80
Chernozem, Söllingen, humic acid extract only	B 6B	2240 ± 80
Spodosol, Scherpenseel, brown humic acid fraction	B 138	2060 ± 60
Spodosol, Scherpenseel, gray humic acid fraction	B 139	1720 ± 60
Spodosol, Scherpenseel, rim of gravel pit	B 366	2930 ± 40
Spodosol, Scherpenseel, hymatomelanic acid fraction	B 367	1580 ± 80
Spodosol, Scherpenseel, brown humic acid fraction	B 368	2530 ± 60
Spodosol, Scherpenseel, gray humic acid fraction	B 369	2980 ± 70
Spodosol, Scherpenseel, humin fraction	B 370	2850 ± 70
Histosol, Kalkarer Moor, fulvic acid fraction	B 360	4270 ± 80
Histosol, Kalkarer Moor, hymatomelanic acid fraction	B 361	4510 ± 80
Histosol, Kalkarer Moor, brown humic acid fraction	B 362	5380 ± 80
Histosol, Kalkarer Moor, gray humic acid fraction	B 363	5970 ± 40
Histosol, Kalkarer Moor, humin fraction	B 364	3490 ± 70
Histosol, Kalkarer Moor, humus coal fraction	B 365	4460 ± 80
Aquoll, pseudogley-Chernozem, Adlum, fulvic acid fraction	B 397	1800 ± 60
Aquoll, pseudogley-Chernozem, hymatomelanic acid fraction	B 398	1390 ± 70
Aquoll, pseudogley-Chernozem, brown and gray humic acid fraction	B 399	4890 ± 50
Aquoll, pseudogley-Chernozem, humin fraction	B 401	2980 ± 70
Aquoll, pseudogley-Chernozem, humus coal fraction	B 402	2810 ± 60

University of Bonn, Natural Radiocarbon Measurements IV (Scharpenseel and Pietig 1971)

Soil Profiles

Hungary		
Udalf, Chernozem, Erd, southeast Budapest	B 611–615	≤ 9680 ± 100
Udalf, Chernozem in sand-loess, Balatonföldvár, south bank of Lake Balaton	B 625–627	≤ 4690 ± 60
Udalf, Chernozem in fine sandy loess, Koszarhegy	B 633–636	≤ 4575 ± 60
Udalf, meadow soil, Boconad, east-northeast Budapest	B 616–620	≤ 5260 ± 50
Eutrochrept, Brown earth in loess, Kapoly	B 628–632	≤ 3990 ± 70
Hapludalf, Nagyrésce, southeast Budapest (below 112 cm, ^{14}C age jumps to 16,750 ± 290)	B 621–624	≤ 2870 ± 115
Natrustalf, Hortobagy, southwest Debrecen, Rusta Plain	B 648–651	≤ 10,080 ± 160
Histosol, bog soil, Nadasdladany, northeast of Lake Balaton	B 637–647	≤ 9300 ± 340
Russia		
Udoll, deep Chernozem, Orel (240 cm)	B 458	12,470 ± 360

Material dated	Lab code(s)	Age (yr BP)
Ireland		
Plaggept, Donoure, Ardfield	B 660	480 ± 50
Plaggept, Cahesetrant, Dingle	B 661–663	≤ 2135 ± 50
Australia		
Ustoll, Krasnozem, Wollongbar	B 664	1400 ± 60
Ustoll, Krasnozem, Babbinbar	B 679–680, 766	≤ 6010 ± 100
Ustoll, Krasnozem, Beechmont	B 681, 767	≤ 3850 ± 360
Krasnozem, Binjour on lateritic plateau	B 682 and 768	≤ 1780 ± 70
Krasnozem, Gurgena on lateritic plateau	B 683 and 769	≤ 570 ± 70
Krasnozem, Coulston Lakes I, valley plain	B 684 and 770	≤ 950 ± 50
Krasnozem, Coulston Lakes II, valley plain	B 685 and 771	≤ 980 ± 50
Krasnozem, Maleny, dissected plateau, 15 cm	B 685	150 ± 50
Krasnozem, Memerambi, dissected plateau	B 687 and 772	4000 ± 150
Argentina		
Vertisol, Entre Rios, Concepción del Uruguay	B 804–813	≤ 11,160 ± 150
Germany		
Humod, Hauset/Hergenrath	B 652–656	≤ 2240 ± 50
Placorthod, Schliffkopfhaus	B 859–861	≤ 2280 ± 60
Andosol, Brown earth in trachytic ash, 200 m south of Andernach-Kruft road	B 818–822	≤ 4470 ± 70
Andosol, Brown earth in trachytic ash, Neuwied basin	B 823–828	≤ 4210 ± 80
Inceptisol, Brown earth in trachytic ash, Niedermendig	B 829	3990 ± 100
Mardelle with peat-carbon, Pirmasens	B 1132	900 ± 60
Czech Republic		
Udalf, Chernozem (buried), Sedlec	B 843–845	≤ 12,480 ± 120
Udalf, Chernozem (not buried), Sedlec	B 843–845	≤ 5910 ± 60
Udalf, Chernozem (buried) underlying Holocene Chernozem	B 847	25,730 ± 550
Udalf, Chernozem, Chabry (Holocene)	B 848–849	≤ 5810 ± 60
Udalf, Chernozem, Chabry (Pleistocene)	B 850–853	≤ 17,520 ± 540
Udalf, Chernozem, Chabry (some locations, deepest point)	B 854	25,630 ± 710
Italy		
Fossil steppe soil, buried, Vintschgau, Bolzano	B 864	5270 ± 60
SOM Fractions		
Germany		
Udoll, Chernozem, Söllingen, fulvic acids	B 670	104.3 ± 0.5 pMC
Same soil, brown- and gray humic acids	B 671	1560 ± 70
Same soil, humin and humus coal	B 672	2275 ± 60
Michelsberg, fulvic acids	B 673	4310 ± 210
Same soil, brown and gray humic acids	B 674	7600 ± 220
Same soil, humins	B 675	6930 ± 80
Same soil, humus coal	B 676	6830 ± 100
SOM of Udalf, Chernozem, Söllingen, different centrifugal gravity		
500 rpm	B 831	2000 ± 50
2000 rpm	B 832	1870 ± 70
3000 rpm	B 833	1680 ± 50
4000 rpm	B 834	1820 ± 100
5000 rpm	B 835	1770 ± 60
5400 rpm	B 836	1780 ± 50

Material dated	Lab code(s)	Age (yr BP)
Hapludalf, Inden, fossil A horizon in B_t (argillic horizon), varying texture fractions		
>60 μ ø	B 1133	3170 ± 80
60–2 μ	B 1134	3450 ± 80
2–1 μ	B 1135	3280 ± 80
1–0.5 μ	B 1136	2790 ± 770
0.5–0.25 μ	B 1137	2500 ± 70
Subhydrous Soils, Gyttja		
Germany		
Schalkenmeerer Maar, 0–230 cm	B 781–802	≤ 4600 ± 70
Lake of Selent, gyttja, 0–560 cm	B 882–908	≤ 6800 ± 150
University of Bonn, Natural Radiocarbon Measurements V (Scharpenseel and Pietig 1973a)		
Soil Profiles		
Israel		
Xeralf, Hamra, below dune cover, Tel Aviv–Haifa highway, corner of Richlon Street	B 688–691	≤ 14,740 ± 200
Xeralf, same location, foot of slope, no continuous dune cover	B 692–695	≤ 10,470 ± 130
Xeralf, same location, emerging into recent soil, no dune cover	B 696–699	≤ 11,860 ± 150
Xeralf, Hamra, in dune material with lime concretions (Curcar), Wingate Institute of Athletics, near Tel Aviv–Haifa highway	B 701–706	≤ 17,920 ± 180
Xeralf, calcinated root in Hamra, street to Ecron	B 709	16,930 ± 240
Curcar-Hamra sequence, Rehovot, corner of Main Street and Batia Markov	B 711	14,920 ± 230
Aqualf, Nazas, Jashresh	B 712, 713	≤ 2960 ± 220
Soil Assocations on Limestone		
Xeroll on soft limestone, Mitzpe Mesua	B 742, 743	≤ 1500 ± 50
Xerochrept, calcareous brown earth on harder limestone, near Mitzpe Mesua	B 744	2040 ± 60
Rhodustalf–Terra Rossa on hard limestone, Mattah	B 745	2420 ± 70
Xeralft with recalcification (Husmas soil), Agricultural School, Kanot	B 748, 749	≤ 5050 ± 160
Xeroll, Burozem, overlying Xeralf with recalcification (Husmas), Kibbutz Ruchama		
Xeroll	B 751, 752	≤ 9000 ± 200
Underlying recalcified Xeralf	B 753–755	≤ 13,400 ± 190
Fossil clay below recalcified Xeralf	B 757	19,920 ± 340
Dark brown soil in calcareous dune sand, chesnut-like soil, Mafkiim, south of Ashkalon	B 750	4760 ± 80
Palexeroll near Shuval, road from Beer Shewa to Tel Aviv	B 760–762	≤ 15,470 ± 230
Paleorthid in loess, Eshel Hanassi, neer Beer Sheva	B 758–759	≤ 4020 ± 220
Xerert, west Plain of Barkai, road from Afula to Hedra	B 715–718	≤ 1850 ± 70
Xerert, Valley of Jesrael	B 719–723	≤ 2760 ± 80
Xerert, Valley of Jesrael, drainage ditch	B 724–728	≤ 7440 ± 80
Xerert, El Hamma	B 729–734	≤ 19,430 ± 350
Xerert, near Kefar Manachem Kibbutz	B 735–741	≤ 16,100 ± 270
Xerert along Syrian Quarantine Station and Jordan flow into Lake Genezareth	B 773–776	≤ 2670 ± 100
Bulgaria		
Vertic Albaqualf, Glavatsi	B 1071–1074	≤ 8050 ± 80
Udic Haplustoll, leached Chernozem, near Gorni Dubnik	B 1075–1079	≤ 11,100 ± 90

Material dated	Lab code(s)	Age (yr BP)
Typic Caciustoll, calcareous Chernozem, northwest Pleven	B 1080–1085	≤ 5760 ± 90
Paleustalf, Gray Forest soil, 12 km south of Pleven	B 1086–1092	≤ 18,920 ± 340
Udic Haplustalf, Gray Forest soil, Kozlevo–Shoumen	B 1093–1097	≤ 3370 ± 100
Udertic Paleustalf, degraded Cinnamon Forest soil, near Bourgas	B 1098–1104	≤ 14,150 ± 240
Vertic Albaqualf, Cinnamonic, podzolized Planosol, Badeshte, Thracian plain	B 1105–1108	≤ 9850 ± 240
Pellustert, Smonitsa-Vertisol, Sredets, Thracian Plain	B 1108–1114	≤ 16,140 ± 460
Chromic Luvisol, Cinnamonic Forest soil, Koren	B 1115–1119	≤ 8480 ± 140
Sardinia		
Xerert (aquic), Plane de Cuga, Ittiri, southwest Sassari	B 1154–1157	≤ 570 ± 50
Chromoxerert, river terrace, Rio Mannu di S. Vero	B 1141–1164	≤ 3870 ± 130
Pelloxerert, Arziadas, Tuvoi	B 1167–1174	5430 ± 100
Chromoxerert, Monastir, 20 km north of Cagliari	B 1175–1178	≤ 2270 ± 70
Pellustert, Nurallo	B 1180–1187	≤ 3220 ± 80
Sicily		
Chromoxerert, Scalilli near Corleone	B 1326–1331	≤ 3030 ± 90
Pelloxerert, Plana di Scala, Corleone	B 1332–1338	≤ 3670 ± 100
Pelloxerert, Aziena Sporacia, Farm, Università di Palermo	B 1339–1351	≤ 5470 ± 120
Pelloxerert, Aziena Sporacia, Farm, Università di Palermo	B 1352–1363	≤ 15,160 ± 370
Romania		
Humic horizon underlying Danube alluvium, near Bucharest	B 1379–1385	≤ 8070 ± 130
Germany		
Aqualfic Fragiorthod, Amelsbüren (below 160 cm, 15,170 ± 230)	B 1363–1369	≤ 1980 ± 80
Placorthod, Grindenschwarzwald, Gemsbach	B 1371–1377	≤ 2550 ± 70

University of Bonn, Natural Radiocarbon Measurements VI (Scharpenseel and Pietig 1973b)

Soil Profiles

Spain		
Xerert, La Rinconada (Seville), Casas vacas	B 1388–1392	≤ 6470 ± 130
Xerert, Carmona, km 10.5 Carmona-Arahal Street	B 1393–1397	≤ 6650 ± 120
Xerert, Los Palacios, Torbiscal Farm	B 1398–1406	≤ 8850 ± 130
Xerert, El Arahal, Estrella Farm, 40 km east of Seville	B 1407–1413	≤ 3480 ± 100
Xerert, Carmona, La Motilla Chica Farm	B 1417–1423	≤ 3440 ± 290
Portugal		
Xerert, Black Barros, Beja	B 1425–1432	≤ 3070 ± 140
Vertic Xerochrept, Safara-Camauros Farm	B 1433–1437	≤ 2430 ± 70
Xerert, Safara field	B 1438–1442	≤ 2230 ± 190
Red Xerert, Salvada-Beja	B 1443–1446	≤ 1380 ± 70
Roman grain silo in Xerert, Beja-Serpa	B 1447	5150 ± 100
Dark red Xerert, Montes Velhos Aljustrel	B 1452-1457	≤ 2240 ± 80
Red-brown Xerert, Terra Grande de Lisboa, Tapaiao da Ajuda, university campus near Lisbon	B 1458–1463	≤ 3170 ± 80
Australia		
Ustert, Lillimur, Kaniva District, Victoria, Gilgai mound	B 1466–1485	≤ 5880 ± 180
Ustert, Lillimur, Kaniva District, Victoria, Gilgai depression	B 1486–1507	≤ 2280 ± 150
Ustert, Miram, Kaniva District, Victoria, Gilgai mound	B 1508–1527	≤ 8530 ± 250
Ustert, Miram, Kaniva District, Victoria, Gilgai depression	B 1528–1548	≤ 8450 ± 260

Material dated	Lab code(s)	Age (yr BP)
Germany		
Fossil A horizon, Eberspoint, 10 km west of Freising	B 1464	6160 ± 90
Fossil A horizon, terrace brown earth, 5 km south of Siegenburg, Abens Valley, north Bavaria	B 1648	2270 ± 70
Charcoal from different fireplaces	B 1648, 1649	≤ 1460 ± 70
Hapludalf in flood loam, lower terrace of the Rhine River	B 1652	5080 ± 110
Fossil A horizon below Hapludalf, same location	B 1653	8230 ± 470
Bituminous coating on gravel in younger Isar terrace, Ascholding, Wolfratshausen Basin	B 1657	28,320 ± 470
Umbrept (Plaggept?), Würmian basal moraine of Isar foreland glacier, Unterbuchen, Bavaria	B 1669–1672	≤ 3800 ± 80
Root in Maintag gravel pit, Upper Franconia	B 1700	1810 ± 70
Fossil A horizon in Maintag gravel pit, Upper Franconia	B 1801	7980 ± 110
Root, vertical in sediment, Maintag gravel pit	B 1802	4360 ± 90
Fossil A horizon, covered by Pleistocene terrace material, Kärlich, Rhineland	B 1659	30,450 ± 1270
Humus in silty A horizon, below tuffaceous material, north slope of Bausenberg, Lengsdorf, Rhineland	B 1699	22,360 ± 510
Fossil A horizon, gravelly gley, Gammelsbach valley, North Eberbach, Odenwald	B 1815	1350 ± 110
Soil Fractions		
Fossil A horizon, underlying Allerød trachytic tuff, charcoal only	B 1681	11,550 ± 160
Same location, particle size fraction > 0.2 mm	B 1681	7570 ± 190
Same location, particle size fraction 63–2 μ	B 1684	10,950 ± 150
SOM from continuous extraction, successive fractions (1st extraction: 0.1N H_2SO_4; 2nd extraction: 0.15 M $Na_4P_2O_7$)		
Udalf Aseler Holz:		
	B 1809	1030 ± 100
	B 1810	4130 ± 270
	B 1811	4970 ± 80
Spodosol (Humod) gravel pit Weber, Scherpenseel (Dutch border):		
	B 1688	1400 ± 140
	B 1689	1160 ± 70
	B 1691	1460 ± 80
	B 1692	1350 ± 110
	B 1693	1510 ± 130
Humod, Scherpenseel, Weber gravel pit	B 1697	1290 ± 70
Subhydrous Soils		
Gyttja, bottom of Schalkenmehrer Maar, Eifel I	B 994–1005	≤ 12,130 ± 140
Gyttja, bottom of Schalkenmehrer Maar, Eifel II	B 1007–1025	≤ 12,160 ± 130
Gyttja, bottom of Schalkenmehrer Maar, Eifel IV	B 1026–1045	≤ 12,130 ± 140
Gyttja, bottom of Schalkenmehrer Maar, Eifel V	B 1046–1064	≤ 3840 ± 80
Gyttja, bottom of Lake of Selent, Holsteen I	B 869–880, 1122–1125	≤ 1670 ± 100
2 m below end of case lot (sampling instrument)		10,170 ± 140
Gyttja, bottom of Lake of Selent, Holsteen III	B 911–932, 963–964	≤ 24,830 ± 970
Gyttja, bottom of Lake of Selent, Holsteen IV	B 933–959	≤ 17,390 ± 460
On-shore profile, Lake of Selent, Holsteen IV (opposite Profile IV)	B 1127–1131	≤ 2670 ± 70
Gyttja, bottom of Lake of Selent, Holsteen V	B 967–976	≤ 14,180 ± 670
Gyttja, bottom of Lake of Selent, Holsteen VI	B 977–993	≤ 10,080 ± 520
at 340 cm depth		30,930 ± 1150

Material dated	Lab code(s)	Age (yr BP)
University of Bonn, Natural Radiocarbon Measurements VII (Scharpenseel and Pietig 1974)		
Germany		
Subhydrous Soils		
Gyttja, bottom of Lake Laach, Eifel I	B 1572–1590	≤ 23,010 ± 460
Gyttja, bottom of Lake Laach, Eifel II	B 1591–1607	≤ 20,500 ± 380
Gyttja, bottom of Lake Laach, Eifel III	B 1609–1622	≤ 22,070 ± 440
Gyttja, bottom of Lake Laach, Eifel IV	B 1623–1636	≤ 10,700 ± 140
Gyttja, bottom of Lake Laach, Eifel V	B 1637–1643	≤ 20,130 ± 300
Gyttja, bottom of Meerfelder Maar, Eifel I	B 1818–1832	≤ 6800 ± 100
Gyttja, bottom of Meerfelder Maar, Eifel II	B 1838–1838	≤ 9140 ± 120
Gyttja, bottom of Meerfelder Maar, Eifel III	B 1839–1849	≤ 7380 ± 90
Gyttja, bottom of Meerfelder Maar, Eifel IV	B 1850–1859	≤ 5550 ± 90
Gyttja, bottom of Meerfelder Maar, Eifel V	B 1860–1867	≤ 3520 ± 80
Gyttja, bottom of Meerfelder Maar, Eifel VI	B 1868–1876	≤ 4050 ± 80
Gyttja, bottom of Pulvermaar, Eifel I	B 1877–1891	≤ 8040 ± 120
Gyttja, bottom of Pulvermaar, Eifel II	B 1892–1903	≤ 6720 ± 110
Gyttja, bottom of Pulvermaar, Eifel III	B 1904–1916	≤ 6420 ± 180
Gyttja, bottom of Pulvermaar, Eifel IV	B 1917–1930	≤ 4980 ± 80
Gyttja, bottom of Pulvermaar, Eifel VI	B 1931–1946	≤ 5170 ± 180
Hamburg University, Radiocarbon Dates I (Scharpenseel, Pietig and Schiffmann 1976)		
Germany		
Soil samples and soil profile samples		
Argillic horizon of Hapludalf, Friesdorf near Bonn	H 1	5010 ± 280
South side of same pit, Friesdorf	H 2	3620 ± 70
Aquept, alluvial loess, Isar terrace, Landshut/Ergolding	H 4–7	≤ 10,880 ± 140
Udoll high terrace of Isar, Landshut/Ergolding	H 8–10	≤ 3190 ± 80
Hapludalf, high terrace of Isar, Lanshut/Ergolding	H 11–13	≤ 3320 ± 70
Koislhof, lower to upper nether terrace, Isar River	H 14–25	≤ 10,680 ± 140
North Bavaria, north of Danube, humic colluvium on old Riss moraine north of Landsberg	H 26–31	≤ 4340 ± 70
Mollisol in steep bank of Lech River, Kaufering	H 32–36	≤ 4410 ± 80
Fossil organic matter in tuffaceous limestone, Neuenried, near sources of Mindel River	H 37–43	≤ 4580 ± 90
Fossil argillic horizon between terrace gravel and loess loam, Fellheim brick factory, Iller River	H 44–46	≤ 4340 ± 130
Eutochrept, Hohentrüdigen on Dogger (Jurassic)	H 47–49	≤ 15,730 ± 410
Vertisol on Tertiary deposits in the Ries, Maihingen	H 50–55	≤ 11,820 ± 170
Aquic Vertisol on younger Ries lake deposits, Pfäfflingen	H 56–60	≤ 10,470 ± 130
Aquic Vertisol, Ries lake deposits Wechingen	H 61, 62	≤ 3860 ± 80
Vertic Brown earth (Inceptisol), Ries lake deposits, Munningen	H 63, 64	≤ 4840 ± 60
Folist, Nether Moor, Koislhof, near Landshut	H 64	10,960 ± 180
Udalf Smonica/Chernozem, Lötzweiler, Rheinhessen	H 66, 67	≤ 5430 ± 90
	H 68,69	≤ 2580 ± 70
Mollisol/Hapludalf, Dorla I/2, Fritzlar-Gudensberg	H 70	3300 ± 70
Mollisol/Hapludalf, Lohne I, north of village of Lohne	H 71	2040 ± 60
Mollisol/Hapludalf, Wehren I/2, Wehren-Kirchberg	H 72	2890 ± 70
Mollisol/Hapludalf, Wehren I/3, Wehren-Kirchberg	H 73	4740 ± 80
Mollisol Heuchelheim, overlying degraded Chernozem	H 74	3660 ± 90
Colluvium overlying degraded Chernozem, Bleichen II	H 75	6480 ± 80
Loess on solifluction debris, south of Höingen, Vogelsberg	H 76	10,550 ± 130
Humus in solifluction debris, 300 m east of Taufstein, Vogelsberg	H 77, 78	≤ 5360 ± 80

Material dated	Lab code(s)	Age (yr BP)
High flood loam, Main River, Kelsterbach-Lerchenberg, Kiesgrube Schmidt	H 79, 80	≤ 7900 ± 100
Fossil epipedon, on Allerød trachyte, Buchslag, plain south of Main River	H 81	10,000 ± 210
Colluvial loam, Hochheim, Hattersheim, valley sediments	H 82–93	≤ 6970 ± 100
Colluvium, Waldeck (Freienhagen, Ippinghausen)	H 94, 95	≤ 820 ± 110
Spodosol, "Raseneisengley", Black Forest, Altglashütten	H 96–101	≤ 3120 ± 90
Spodosol, Black Forest, between Breitnau and Hollertal	H 109–112	≤ 1120 ± 60
Charcoal and fossil Brown earth, Trescher, Black Forest	H 113–117	≤ 1040 ± 50
Low moor peat, charcoal, paleosol on Riss boulder marl, Altenerding, Bavaria	H 118–122	≤ 30,340 ± 1130
Cliff wall at Baltic Sea coastline, Heiligenhafen	H 123–127	≤ 4020 ± 90
Fossil Chernozem (Udalf), outskirts of Homberg, Kassel County	H 128	5650 ± 80
Fossil Chernozem (Udalf), Worms I, near town of Worms	H 129	3530 ± 70
Bones, wood, sediments believed from Roman times, Xanten	H 130–133	≤ 3150 ± 70
Humic soils near Dutch border, organic matter from plaggen or deep ploughing, total samples and 6 N HCl hydrolysis residue		
Walbecker Heide	H 134, 135	≤ 9580 ± 100
Maasaue near Velden	H 136, 137	≤ 2070 ± 90
Haus Beerenbruck	H 138, 139	≤ 1860 ± 90
Schandelah	H 140, 141	≤ 1440 ± 60
Walbeck	H 142, 143	≤ 1880 ± 130
Subhydrous soil samples, Baldeney lake, Essen-Werden, south shore	H 183–188	≤ 12,160 ± 270
Clay pit Kaerlich, wood sample underlying Allerød and Holocene soil	H 189	29,600 ± 1150
Wales		
Placorthods, Hiraethog, Denbighmors, Denbigshire	H 103–108	≤ 5810 ± 150
Peny Gwrydd Pass, Snowdonia National Park, Caernarvonshire	H 105–106	≤ 1770 ± 80
Austria		
Low moor (Histosol), Neumarkt, Am Wallersee, Salzburg	H 144–145	≤ 3770 ± 70
Former USSR		
Predkaokadzye Chernozem (Ustoll), south Rostov	H 146	11,330 ± 980
Chernozem, lower terrace of Don River, from krotovinas	H 147	5250 ± 150
Meadow Chernozem in Azow system	H 148	6510 ± 260
Dark Gray Forest soil, Zhiguli	H 149	5490 ± 280
Pelehydromorphic Chernozem, Zhiguli, krotovina	H 150–151	≤ 4750 ± 80
Chernozem Privolzhye Upland, Karlinsky Far, Ulyanovsk	H 152	5390 ± 120
Chernozem near Solod Meadow, Ulyanovsk Agricultural Institute campus	H 153	5550 ± 140
Gray Forest soil, Vysokogorsky, Tatar SSR	H 154	7890 ± 680
Chernozem, Tour I, 10th International Congress on Soil Science, Moscow	H 155–156	≤ 4540 ± 80
Tunisia		
Paleosol in pasture, Ain Oktor, Korbous	H 157	2250 ± 60
Fossil horizons, Ferme Korba, pasture experiment	H 158–160	≤ 2300 ± 100
Fossil horizons near Ferme Korba, pasture experiment	H 161–162	≤ 2470 ± 70
Fossil horizons, Ferme Ennasser near Bir Bou Rekba	H 163–164	≤ 4230 ± 60
Fossil horizon near Enfida, km 52, road to Kairouan	H 165	4510 ± 80
Fossil horizon, Medjerdah alluvium near Ghardimaou bridge	H 166–167	≤ 8000 ± 180
Fossil horizons in Medjerdah alluvium, near Bou Salem	H 168–171	≤ 7800 ± 160
Fossil horizons, Medjerdah River, Bou Huertma River	H 172–174	≤ 2400 ± 120
Pale-Xerochrept, Sol Brun à Croûte (crust faintly developed), Medjerdah Valley, hill site	H 175–182	≤ 27,160 ± 1090

Material dated	Lab code(s)	Age (yr BP)
Hamburg University, Radiocarbon Dates II (Scharpenseel and Schiffmann 1977)		
Argentina		
Argiudoll, Brunizem, Rafaela	H 231–237	≤ 480 ± 80
Argiudoll, Brunizem, Esperanza	H 238–244	≤ 2030 ± 80
Argiudoll, slightly planosolic Brunizem, Angel Gallardo	H 246–252	≤ 2780 ± 80
Arguidoll, Profile B9, Villa Concepción del Tío	H 253–257	≤ 1870 ± 90
Tunisia		
Paleosol in Bou Huertma alluvium	H 258–259	≤ 4930 ± 80
Germany		
Mud in old river bed of Ems River, on top of low moor, Rietberg	H 280–281	≤ 6680 ± 90
Ochrept, Holzkirchen, near Munich-Salzburg highway	H 631–634	≤ 2510 ± 50
Humic acid samples of Lower Saxonian soils	H 260–279	≤ 19,800 ± 710
SOM fractions, Spodosol, Scherpenseel, near Dutch border	H 282–285	≤ 5410 ± 90
SOM fractions, Udoll, Aseler Wald, near Hildesheim	H 286–297	≤ 3160 ± 70
SOM fraction, paleosol of loess, below trachytic tuff of Allerød volcanism	H 298–310	≤ 11,360 ± 150
SOM fractions, vertic, clayey Histosol, Koislhof, lower terrace of Isar River	H 311–328	≤ 13,140 ± 200
SOM fractions after repeated 6 HCl hydrolysis, Udoll from Asel clay pit near Hildesheim	H 623–630, 801	≤ 3260 ± 100
SOM fractions after repeated 6 HCl hydrolysis, histic Udoll, Ergolding near Landshut	H 762–788, 800	≤ 6110 ± 90
Sea level–coast line study based on peat dating, North Sea shore	H 765–776	≤ 6130 ± 240
Humus in Elbe River alluvium, Billwerder-Allermöhe, south Hamburg, measurement of deposition date	H 791–799	≤ 3370 ± 100
Hamburg University, Radiocarbon Dates III (Scharpenseel, Schiffmann and Hintze 1984)		
Germany		
Histic Hapludoll, 5 km south of Söllingen, 0–90 cm, at 5-cm intervals		
Carbonate-free soil	B 2255–2272	≤ 6210 ± 90
6 N HCl hydrolysis residue	B 2401—433	≤ 6370 ± 80
6N HCl hydrolyzate	B 2400–2428	≤ 3240 ± 70
Acid from carbonate destruction	B 2438–2450	≤ 3570 ± 70
Typic Hapludoll, Söllingen, near old windmill, 0–75 cm, at 5-cm intervals, carbonate-free soil	B 2275–2289	≤ 2450 ± 60
6 N HCl hydrolysis residue	B 2476, 2478, 2484–2492, 2500, 2502, 2504	≤ 3260 ± 60
6 N HCl hydrolyzate	B 75, 2477, 2483–2491, 2499, 2501, 2503	≤ 40 ± 60
Acid from carbonate destruction	B 2459–2469	≤ 240 ± 90
Eutochrept, near Hohentrüdingen, Jurassic Dogger, near Nördlinger Ries crater, taken in 5-cm intervals, 5 to 105 cm depth	H 635–654	≤ 16,776 ± 280
Haplaquept on Isar River terrace, near Landshut, Ergolding, Bavaria, taken in 5-cm intervals, 0 to 90 cm depth	H 655-672	≤ 5560 ± 80
Humic matter, coastline levee along Baltic coast, near Heiligenhafen	B 2367–2385	≤ 6240 ± 110
Elbe River marsh series, Allermöhe, Vier and Marschlande, south of Hamburg (H 835, paleosol, 7420 ± 110)	H 826–841	≤ 3970 ± 80

Material dated	Lab code(s)	Age (yr BP)
Peaty material, underlying valley of Elbe River, sampled in three cross-sections, east and west of Hamburg	H 1393–1406	≤ 8140 ± 100
Australia (see also B 664 to 772, Scharpenseel and Pietig (1973b: 258–263))		
Vertisol (Chromustert), Chinchilla	H 674–702	≤ 9850 ± 170
Vertisol (Chromustert), Paget	H 734–758	≤ 11,570 ± 210
Eutrustox (Krasnozem) Gabbinbar (H 731, 200–220 cm, 7420 ± 110)	H 719–726	≤ 1810 ± 80
Eutrustox (Krasnozem), Beechmont (subtropical rainforest)	H 703–711	≤ 2020 ± 70

Hamburg University, Radiocarbon Dates IV (Scharpenseel, Schiffmann and Becker 1984)

Soil Samples and Profiles

Tunisia

Fossil gyttja, northwest Degache, Chott el Rharsa	H 1029	2420 ± 70
Paleoargid, near Algerian border, underlying fringe of dunes	H 1030	22,730 ± 400
Paleosol in terrace, Oued Lakarit	H 1031	8050 ± 100
Buried Argixeroll, 12 km from Ksour Essaf	H 1032	3470 ± 70
Tirsoid Xerert, Enfida, Station, Amélioration des Parcours	H 1033	4550 ± 80
Paleroll, 18 km from Tadjerouine toward Le Kef	H 1034	7960 ± 110
Saem profile fossil horizon 180 cm deep	H 1035	8520 ± 180
Dates of paleosols from perhumid to Saharian climate, 20 km west of Nefta	H 1222–1223	≤ 10,260 ± 120
North rim of Chott Djerid, 13 km from Nefta	H 1224–1226	≤ 4330 ± 90
Humic layer, gravel terrace, rim of Chott	H 1227	1950 ± 60
Paleosol, street bridge G P 16, Kebili to Gabes, 62 km west of Gabes	H 1229	920 ± 80
Polyphasic steppe soil, bank of Oued Ersifa, 25 km from Matmata	H 1233–1236	≤ 6420 ± 130
Paleosol in bank of Oued, 5 km north of Remada, near GP 19	H 1237, 1239	≤ 5200 ± 160
Paleosols in Oued Tatahouine, profile north of Foum Tatahouine	H 1240, 1247	≤ 13,490 ± 220
Cut in sediments 300 m southwest of Matmata-Toujane Street	H 1248–1251	≤ 13,530 ± 370
Sequence of paleosols, south of St. M 201 Gafsa-Moulares, cut in bank of Oued Melah	H 1264–1274	≤ 5520 ± 80
Polyphasic paleosol, west El Frouch, Djebel Chambi, east of road to Serept	H 1275–1279	≤ 7270 ± 90
Red relict soil in rock crevices, Sta. Bordj Chambi, Djebel Chambi	H 1283	4080 ± 80
Polyphasic paleosol, *ca.* 800 m from H 1275–1279	H 1285–1292	≤ 4880 ± 80
Cut in bank of Oued Bou Hamid, foot of Djebel Semmama	H 1295, 1304	≤ 3070 ± 90
Bank of Oued Bou Hamid, profile 200 m downstream from H 1295–1304	H 1305–1311	≤ 6860 ± 100
	(H 1311 300 cm	14,530 ± 250)
Transition to terrace at base of previous profile	H 1312	9920 ± 120
Organic matter in Oued Bou Hamid terrace, opposite bank to profile H 1305–1312	H 1313-1318	≤ 4670 ± 90
Duplex Vertisol, northwest Jendouba, north of street to Chamtou, before Satfoura	H 1319–1324	≤ 6760 ± 90
Polyphasic paleosol, bank of Oued Ogla, 2 km west of GP 17, Le Kef-Tadjerouine, north bank	H 1326–1330	≤ 5550 ± 80
Mejerdah alluvium, east Tebourba	H 1334–1340	≤ 5850 ± 90
Alluvium of Oued Miliane, north of street Pont du Fahs-Smindja, 10 km from Pont du Fahs	H 1341–1346	≤ 3350 ± 90
Paleosol in Wadi north of GP 3, Kairouan to Sbeitla	H 1347–1352	≤ 4030 ± 90
Cut in alluvium of Oued Melize, south of GP 6, Jendouba to Ghardimaou, near bridge	H 1358–1364	≤ 11,020 ± 130
West of GP 1, Tunis-Sfax, 84 km from Sousse, near crossing to Hammamet Road cut	H 1365–1367	≤ 780 ± 80

Material dated	Lab code(s)	Age (yr BP)
Paleosol in bank of Oued Guilene, east of GP 12, Haffouz to Maktar, near bridge	H 1369	1040 ± 80
Paleosol in bank of Oued Hatab, south of GP 4, Maktar to Tebessa, 300 m before crossing with MC 71	H 1371–1377	≤ 8080 ± 130
Paleosol in Bank of Medjerdah River, 500 m east of Ghardimaou Bridge (H 1381, 100 m west 15,000 ± 210)	H 1378–1381	≤ 3820 ± 80
Sudan		
Vertisol profiles from Gezira		
Profile southwest of Wad Shawer	H 1407–1420	≤ 5570 ± 100
Profile Selemme Hum Dalik Minor, Wad Mahmoud Major	H 1424–1434	≤ 6300 ± 90
Vertisol 400 m west of Sara Omeir Minor	H 1440–1454	≤ 10,370 ± 150
Vertisol, Madina Block 15	H 1455–1464	≤ 4390 ± 120
Vertisol, 1 km west of Meheiriba	H 1473–1487	≤ 5980 ± 170
Vertisol, Qoz er Ruheid	H 1488–1497	≤ 4940 ± 250
Vertisol, in terrace of White Nile, southeast rim of Tureina	H 1500–1506	≤ 5340 ± 100
Vertisol, 1 km west of Buweika	H 1511–1515	≤ 4310 ± 100
Vertisol, 8 km west of Mesou, direction of Secondary School, Laota Block	H 1521–1524	≤ 5560 ± 100
Vertisol, 3 km northeast of Esh Shaval	H 1530–1538	≤ 5930 ± 120
Vertisol, 3 km north of Tamsul	H 1539–1547	≤ 5320 ± 110
Vertisol, entic Pellustert, Hosh series, Ghabsaneblock	H 1012–1016	≤ 3360 ± 90
Vertisol, entic Chromustert, Wad Medani, fallow plot in Gezira Research Station	H 1017–1021	≤ 1740 ± 80
Argentina		
Argiudoll, soil from rolling pampa near Pergamino	H 1178	2810 ± 70
Typic Argiudoll, loess, Rojas series	H 1179	2220 ± 70
Typic Hapludoll, sandy loess, Segui series	H 1180	1650 ± 60
Pelludert, intersection of La Paz Highway and Feliciano Street, San Gustavo	H 1204–1208	≤ 4440 ± 110
Pelludert, Facultad de Agricultura, Universidad Nacional del Litoral (UNL) near Parana	H 1209–1212	≤ 2180 ± 90
Argiudoll, Facultad de Agricultura, UNL near Parana	H 1213	108 ± 1% pMC
Pelludert, 10 km southwest of General Campos, near main street	H 1214, 1550–1554, 1666	≤ 4140 ± 90
Argiudoll, Oro Verde 2, 1.25 km northwest of INTA Experimental Station, Parana, Campo anexo	H 1556	1910 ± 60
Argiudoll, Facultad de Agricultura, UNL near Parana, Febré 2	H 1549	1110 ± 70

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APPENDIX 1: ANNOTATED BIBLIOGRAPHY

(Publications based partly to completely on ^{14}C dates on soil and secondary carbonates in soils; arranged in chronological order)

Mückenhausen, E., Scharpenseel, H. W. and Pietig, F. 1968 Zum Alter des Plaggeneschs. *Eiszeitalter und Gegenwart* 19: 190–196.

- Description of Plaggepts
- Table of three ^{14}C-dated Plaggepts, in 10-cm intervals
- Table of 14 additional Plaggept ^{14}C-dating results

Scharpenseel, H. W., Ronzani, C. and Pietig, F. 1968 Comparative age determination on different humic-matter fractions. In *Isotopes and Radiation in Soil Organic Matter Studies*. Vienna, IAEA: 67–73.

- Fractionation method; table of ^{14}C dating, by 10-cm intervals, of Udoll, Aquoll, Rendoll, Hapludalf, Spodosol soils; table of comparative humus SOM fraction dates of Udalf, two Spodosols, Histosol and Aquoll, indicating highest C residence time in the Gray humic acid fractions

Scharpenseel, H. W., Tamers, M. A. and Pietig, F. 1968 Altersbestimmung von Böden durch die Radiokohlenstoffdatierungsmethode. *Zeitschrift für Pflanzenernährung und Bodenkunde* 119(1): 44–52.

- Tables with separate sets of ^{14}C dates: Mollisols of Germany, Hapludalfs, Rendolls and Histosols, Plaggepts, Histosols and Spodosols

Scharpenseel, H. W., Tamers, M. A. and Pietig, F. 1968 Altersbestimmung von Böden durch dei Radiokohlenstoffdatierungsmethode. *Zeitschrift für Pflanzenernährung und Bodenkunde* 119(1): 34–44.

- Bomb-carbon curve of year-specific field-experimental crop samples and alcohol, distilled from wine of specific origin
- Description of sample preparation and method of benzene synthesis
- Reflection on rejuvenation of soil carbon
- Histogram of all ^{14}C dates known through 1967, identified by soil types and Quaternary geological origin

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- Table of ^{14}C dates from Hapludalfs, probably formerly Udolls; dating of individual genetic horizons and subhorizons; the highest ^{14}C ages always occur in argillic horizons
- Table with ^{14}C dates of paleosols (Mollisols), some > 10,000 BP

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- Table of ^{14}C dates on SOM fractions from Histosol, Spodosols, Aquoll, Udoll and a Paleudoll
- Table of ^{14}C dates of different particle fractions of silt and clay, compared with charcoal samples; highest age among particle fractions in fine silt and coarse clay
- Diagrams with date-points: regression line and correlation equation for available dates of Spodosols, Alfisols, Udolls, Plaggepts and Vertisols
- Age *vs.* depth curves of 39 Vertisols in diagram, split into six fields of different countries of origin

Scharpenseel, H. W. 1972 Messung der natürlichen C-14 Konzentration in der organischer Substanz von rezenten Böden. Eien Zwischenbilanz. *Zeitschrift für Pflanzenernährung und Bodenkunde* 133(3): 241–263.
- Balance of work: Reference collection, 12 figures and 3 tables, summarizing all our ^{14}C-dating of soil samples, profile scans, SOM-fractions and integral regression/correlation curves

Scharpenseel, H. W. 1974 Zur Berechtigung der Interpretation natürlicher Radiokohlenstoffmessungen an organischem Kohlenstoff $CaCO_3$-reicher Böden. *Mitteilungen der Deutschen Bodenkundlichen Gesellschaft* 18: 198–201.
- Seven Udoll, Vertisol and Hapludlf profiles from Czechoslovakia, Bulgaria, Italy and Germany; ^{14}C dating and $\delta^{13}C$ measurement in all genetic horizons

Scharpenseel, H. W. 1975 Relative age sequence of fractions of soil organic matter. *Application of Nuclear Methods in Biology and Agriculture*. ENSA (European Society of Nuclear Methods in Agriculture) 5: 10–17.
- Table of SOM fraction dating, including Sephadex gel fractionation
- Setup for preparative gel fractionation as a graph

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- Soil fraction ^{14}C dating; all available fractionation methods are compared. Dimethylsulfoxide extract as well as 6N HCl hydrolysis residue seem to produce the highest ^{14}C ages

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- Review of the state of the art

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- Four Vertisol profiles, sampled in 10-cm intervals; one mound and one depression profile each from Lillimur and Miram were ^{14}C-dated. Mound samples are superior in carbon residence time to depression samples.

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- Bomb-carbon transfer pCi/gC in grass, milk and human hair
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- ^{14}C dates due to profile scan reflecting preferential link of C to clay minerals by clay-organic complexation

APPENDIX 2: PREVIOUSLY UNPUBLISHED SOIL DATES

Lab code	Site	Age (yr BP)
Four samples from Mosbruch, base of Histosol		
HAM 1557	Mosbruch 1	11,760 ± 435
HAM 1558	Mosbruch 2	11,580 ± 500
HAM 1559	Mosbruch 3	12,200 ± 500
HAM 1560	Mosbruch 4	11,980 ± 435
HAM 1566	Fossil argillic horizon,Tunisia, 50–60 cm, sand dunes 4 km east of Algerian border, south Tozeur	430 ± 200
HAM 1568	Sample of Vertisol, Argentina, San Gustavo, 130–150 cm	5600 ± 100
Channel cast, Waldsee		
HAM 1570	Waldsee 1, 99–104 cm, lightly decomposed peat	3440 ± 80
HAM 1571	Waldsee 2, 199–204 cm, strongly decomposing peat	4200 ± 80
HAM 1573	Waldsee 4, 209–219 cm, fossil stem material, Alnus	4630 ± 80
HAM 1572	Waldsee 3, 295–300 cm fine detritral gyttja and plant remains	20,600 ± 350
Relics found in soil profile		
HAM 1574	Knodl 1, floating wood pieces	9220 ± 100
HAM 1575	Knodl 2, floating wood pieces	25,500 ± 900
HAM 1576	Grapel, pine wood at base of low moor	8700 ± 160
Peat and gyttja samples of palynologically tested profile, Moor (peat) Plidutscha, Canton Graubünden, Switzerland		
HAM 1587	VM 7.3 A, peat, 24–35 cm	2710 ± 85
HAM 1588	VM 7.2 A, peat, 50–60 cm	910 ± 140
HAM 1589	VM 7.1 A, peat, 77–87 cm	620 ± 150
HAM 1590	VM 3.1 B, peat with gyttja, 181–192 cm	2810 ± 120
HAM 1591	VM 3.1 A, gyttja with peat, 195–207 cm	3380 ± 120
HAM 1592	VM 4.2, gyttja, 229–242 cm	3820 ± 150
HAM 1593	VM 4.1, gyttja, 256–270 cm	4990 ± 140
HAM 1594	VM 5.3, gyttja, 280–292 cm	5130 ± 145
HAM 1595	VM 6.2 A, clayey gyttja, 382–390 cm	9050 ± 250
HAM 1597	Sediment from Hamburg harbor basin	1730 ± 80