**Rural Settlement Continuity and Land Use during the Bronze and Iron Ages in the Northern Franconian Low Mountain Range**

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Supplementary material

**Supplementary figures**

*A map of a plane

Description automatically generated*

*Figure S1. Plan of the Görauer Anger (eastern part only). Blue/green: archaeological features (first/second horizon); red: postholes of the Late Bronze Age house; yellow:sinkholes/sinks; orange: colluvial deposits in excavated parts. Arabic numbers refer to 14C-dated features, Roman numbers show the position of OSL-dated colluvial deposits (see Tables S1 and S2).*

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*Figure S2. Plan of the Görauer Anger (central part only). Blue/green: archaeological features (first/second horizon); yellow: sinkholes/sinks; orange: colluvial deposits in excavated parts. Arabic numbers refer to 14C-dated features, Roman numbers show the position of OSL-dated colluvial deposits (see Tables S1 and S2).*

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*Figure S3. Plan of the Görauer Anger (western part only). Blue/green: archaeological features (first/second horizon). Arabic numbers re fer to 14C-dated features (see Table S1).*

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*Figure S4. Plan of Weiden-Winkel (northern part only). Green: postholes; blue: pits; orange: presumed clay extraction pits; violet: presumed water harvesting pits; dark red: erosion channels; red: presumed tree-throws; yellow: sinkholes. Arabic numbers refer to 14C-dated features, Roman numbers show the position of OSL-dated colluvial deposits (see Tables S1 and S2).*

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*Figure S5. Plan of Weiden-Winkel (southern part only). Blue: archaeological features; green: the eleven stone cooking pits in the eastern part of the area. Arabic numbers refer to 14C-dated features (see Table S1).*

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*Figure S6. ERT profiles from Görauer Anger (a–b) and Weiden-Winkel (c–d). Profile length: 60 m.*

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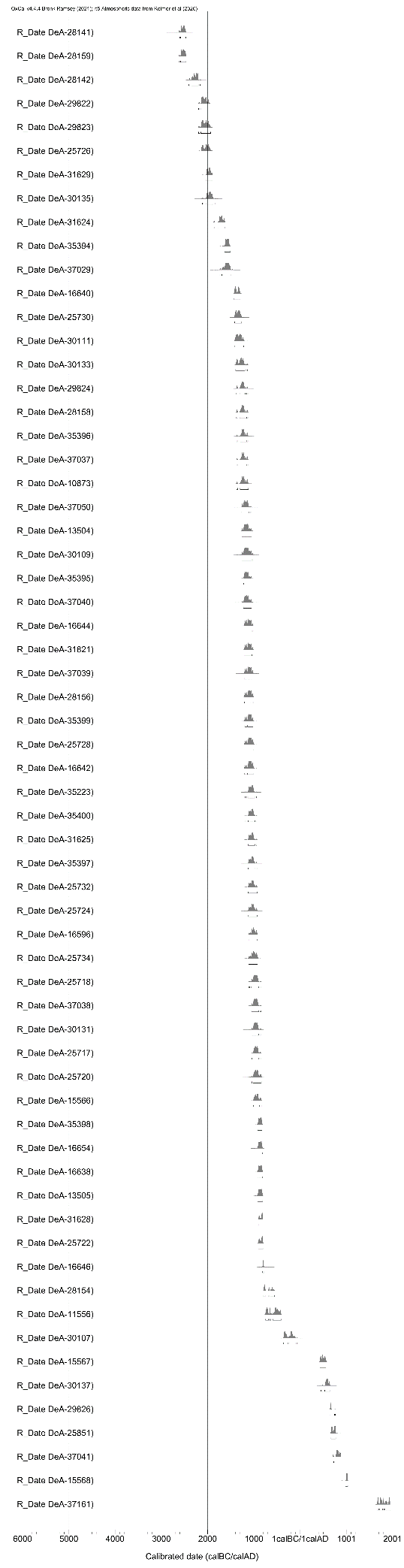
*Figure S7. The ERT-measured area 1 at Weiden-Winkel. The 3D inversion of parallel profiles with 1m distances located different kinds of pits. The black solid line shows excavation area 1, the dashed lines show excavated sectors, and the red lines the boundaries of features at horizon 1. Resistivity increases from dark blue (low) via light blue and green to yellow (high).*

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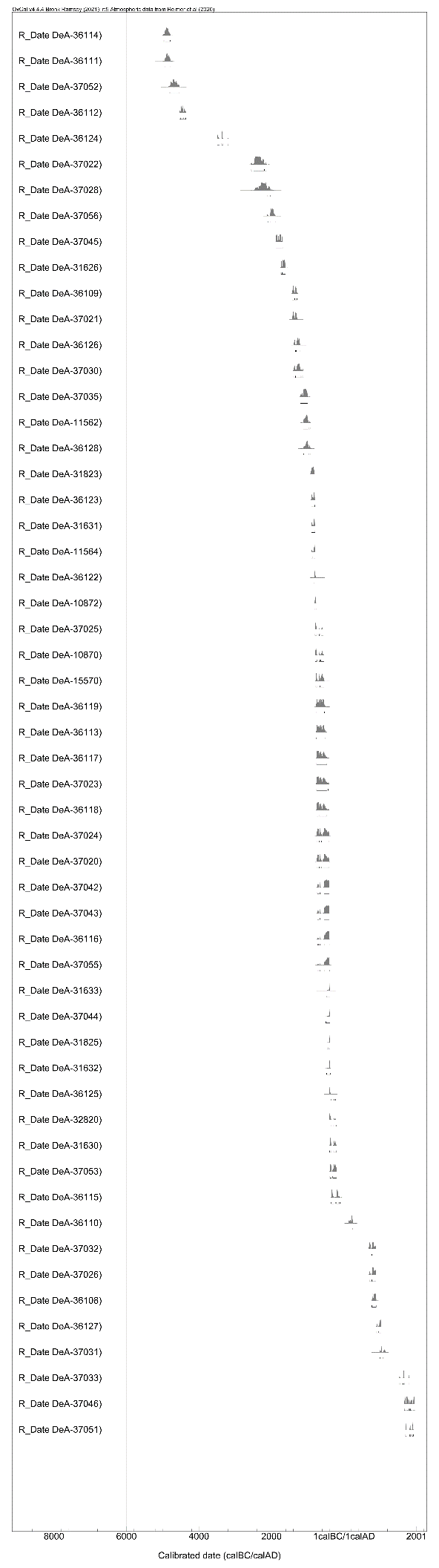
*Figure S8. Magnetometry results of the Görauer Anger. Excavated areas are marked with red lines.*

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*Figure S9. Magnetometry results of Weiden-Winkel. Excavated areas are marked with red lines.*

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*Figure S10. Multiplot of all 14C dates of the Görauer Anger.*

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*Figure S11. Multiplot of all 14C dates of Weiden-Winkel.*

**Supplementary tables**

***Table S1.*** *Radiocarbon-dated material from archaeological features and colluvial deposits. Sample type: c: charcoal, cc: charred crop, f: fruit (charred). BP: before present (= AD 1950). No. on plans is in bold, the feature no. is followed by the field no. after / (features from test excavations 2016–2018 are in italics). ‡14C age published in Kothieringer et al., 2018, 2022. All data calibrated with OxCal v.4.4.4 (Bronk Ramsey, 2021) and IntCal. 20 (Reimer et al., 2020). Modern dates are coloured light grey.*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Site** | **No. on plans**  (feature no./field no.) | **Type of feature** | **Sample type and wood/cereal type** | **Lab code (DeA-)** | **14C age BP±1σ** | **Calibrated age cal BC/AD±2σ** |
| **I Görauer Anger** | **1** *(4/1497)* ‡ | Posthole | c *(Fagus)*  c *(Maloideae)* | 16640  16638 | 3103±24  2726±26 | 1430–1291 cal BC  919–813 cal BC |
| **2** *(4/1501)* ‡ | Posthole | cc *(Hordeum)* | 13504 | 2951±29 | 1260–1052 cal BC |
| **3** *(5/1497)* ‡ | Storage pit | cc (*Triticum dicoccum*) cc *(Hordeum)* | 16642 16596 | 2900±27  2850±25 | 1204–1007 cal BC  1110–927 cal BC |
| **4** (5/1501) ‡ | Posthole | c *(Fagus)* | 35394 | 3318±23 | 1630–1511 cal BC |
| **5** *(5/1505)* ‡ | Colluvial deposit in sink | cc *(Hordeum)*  c *(Betula)*  c *(Corylus)*  c *(Maloideae)*  cc *(Hordeum)* | 10873  15566  15567  15568  10908 | 2992±27 2786±31  1567±23  1038±22  -677±26 | 1376-1123 cal BC  1011–835 cal BC  431–562 cal AD  979–1034 cal AD  modern |
| **6** *(6/1497)* ‡ | Posthole | cc (*Triticum dicoccum*) | 16644 | 2921±24 | 1212–1019 cal BC |
| **7** *(8/1501)* ‡ | Posthole or small pit | cc (*Triticum dicoccum*) | 13505 | 2725±29 | 921–811 cal BC |
| **8** *(9/1497)* ‡ | Posthole | cc (*Triticum dicoccum*)  cc (*Triticum*) | 16654  16646 | 2730±24  2626±23 | 921–816 cal BC  817–780 cal BC |
| **9** *(10/1509)* ‡ | Posthole | c *(Fagus)* | 11556 | 2446±22 | 750–412 cal BC |
| **10** (12/1501) | Posthole | c *(Fraxinus)* | 31628 | 2692±22 | 900–806 cal BC |
| **11** (15/1501) | Small ditch or long pit | c *(Fagus)* | 25851 | 1291±21 | 666–774 cal AD |
| **12** (23/1501) | Posthole | cc (*Triticum dicoccum*) | 25718 | 2817±37 | 1108–843 cal BC |
| **13** (24/1501) | Posthole | cc (*Triticum aestivum*) | 25720 | 2793±35 | 1043–834 cal BC |
| **14** (26/1501) | Posthole | c *(Populus/Salix)* | 31624 | 3416±24 | 1866–1626 cal BC |
| **15** (27/1501) | Posthole | cc *(indet.)* | 31821 | 2919±23 | 1210–1018 cal BC |
| **16** (28/1501) | Posthole | c *(Corylus)* | 31625 | 2876±21 | 1125–937 cal BC |
| **17** (34/1501) | Storage pit | cc *(Triticum durum)* | 25722 | 2689±31 | 903–802 cal BC |
| **18** (35/1501) | Settlement pit | cc *(indet.)* | 25724 | 2864±28 | 1121–931 cal BC |
| **19** (37/1501) | Posthole | cc *(Triticum dicoccum)* | 25726 | 3655±37 | 2141–1926 cal BC |
| **20** (40/1501) | Storage pit | c *(Betula)* | 25728 | 2902±31 | 1211–1006 cal BC |
| **21** (68/1499) | Colluvial deposit in sink (middle part) | c *(Betula)* | 37037 | 2994±23 | 1371–1126 cal BC |
| **21** (44/1499) | Colluvial deposit in sink (lowermost part) | c *(Ulmus)*  cc *(indet.)* | 28159  25730 | 4021±27  3080±27 | 2620–2468 cal BC  1417–1268 cal BC |
| **22** (47/1501) | Posthole | cc *(indet.)* | 25732 | 2868±27 | 1124–931 cal BC |
| **23** (49/1501) | Storage or settlement pit | cc *(Triticum dicoccum)* | 25734 | 2844±32 | 1113–918 cal BC |
| **24** (50/1501) | Posthole | cc *(Panicum)* | 37050 | 2963±26 | 1266–1055 cal BC |
| **25** (52/1501) | Storage pit | cc *(Hordeum)* | 28154 | 2541±23 | 795–554 cal BC |
| **26** (55/1501) | Storage pit | f *(Fabaceae)* | 37038 | 2815±31 | 1055–847 cal BC |
| **27** (58/1501) | Posthole | c *(Pinus)* | 37039 | 2915±24 | 1207–1016 cal BC |
| **28** (63/1501) | Posthole | cc (*Triticum aestivum*) | 37040 | 2941±24 | 1224–1049 cal BC |
| **29** (69/1499) | Small ditch or long pit | c *(Acer)* | 37041 | 1220±20 | 706–883 cal AD |
| **30** (70/1499) | Posthole | c *(Fraxinus)* | 31629 | 3611±21 | 2030–1898 cal BC |
| **31** (73/1499) | Long pit | cc *(Hordeum)* | 28156 | 2912±27 | 1207–1014 cal BC |
| **32** (76/1499) | Posthole | cc *(indet.)* | 30107 | 2167±33 | 360–58 cal BC |
| **33** (77/1499) | Posthole | cc *(indet.)* | 30109 | 2945±36 | 1262–1019 cal BC |
| **34** (80/1499) | Colluvial deposit | c *(Ulmus)* | 28141 | 4029±25 | 2622–2471 cal BC |
| **35** (82/1499) | Ditch | cc *(Hordeum)* | 28158 | 3004±25 | 1380–1127 cal BC |
| **36** (87/1499) | Posthole or small pit | c *(Fagus)* | 35395 | 2944±22 | 1223–1052 cal BC |
| **37** (94/1499) | Posthole | cc *(indet.)* | 35396 | 2994±23 | 1371–1126 cal BC |
| **38** (95/1499) | Posthole | cc *(indet.)* | 30111 | 3056±36 | 1413–1221 cal BC |
| **39** (101/1499) | Occupation layer in small sinkhole? | c *(Fagus)* | 28142 | 3830±22 | 2433–2151 cal BC |
| **40** (110/1509) | Small post- or stakehole | c *(Fagus)* | 29823 | 3668±39 | 2195–1937 cal BC |
| **41** (125/1501) | Posthole | cc *(indet.)* | 30131 | 2807±32 | 1049–843 cal BC |
| **42** (129/1501) | Posthole or settlement pit | cc *(indet.)* | 30133 | 3027±31 | 1397–1133 cal BC |
| **43** (135/1509) | Posthole | c *(Maloideae)* | 37029 | 3315±46 | 1736–1500 cal BC |
| **44** (137/1509) | Posthole | c *(Fagus)* | 30135 | 3600±33 | 2114–1830 cal BC |
| **45** (143/1509) | Layer below limestone substruction | c *(Pinus)*  c *(Fagus)* | 29824  30137 | 3007±24  1492±38 | 1381–1128 cal BC  441–649 cal AD |
| **46** (165/1499) | Posthole | cc *(indet.)* | 35397 | 2871±23 | 1124–933 cal BC |
| **47** (167/1499) | Posthole | cc *(indet.)* | 35398 | 2732±21 | 916–821 cal BC |
| **48** (172/1499) | Posthole | c *(Betula)* | 35399 | 2911±22 | 1201–1015 cal BC |
| **49** (173/1499) | Storage pit | cc *(indet.)* | 35223 | 2880±22 | 1188–940 cal BC |
| **50** (176/1499) | Posthole | c *(Pinus)* | 35400 | 2876±22 | 1185–936 cal BC |
| **51** (Geo/1508) | Cultural layer | c *(Fagus)*  c *(Fraxinus)* | 29826  29822 | 1355±22  3682±31 | 643–772 cal AD  2194–1959 cal BC |
|  |  |  |  |  |  |  |
| **Site** | **No. on plans**  (feature no./ field no.) | **Type of arch. feature** | **Sample type and wood/cereal type** | **Lab code (DeA-)** | **14C age BP±1σ** | **Calibrated age cal BC/AD±2σ** |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **II Weiden-Winkel** | **1** (3/1859) | Water harvesting pit or sinkhole? (uppermost part) | c *(Acer)* | 37020 | 2447±23 | 751–413 cal BC |
| **1** (3/1859) | Water harvesting pit or sinkhole? (middle part) | c *(Maolideae)* | 37021 | 3101±24 | 1429–1291 cal BC |
| **1** (3/1859) | Water harvesting pit or sinkhole? (lower part) | c *(Fagus)* | 31626 | 3385±32 | 1743–1617 cal BC |
| **1** (3/1859) | Water harvesting pit or sinkhole? (lowermost part) | c *(Fagus)* | 37022 | 3883±60 | 2561–2150 cal BC |
| **2** *(3\_6/1859)* | Irregular pit or natural depression filled with waste | c *(Carpinus)*  c *(Fraxinus)*  cc (*Triticum dicoccum)*  c *(Maloideae)* | 11562  11564  10870  15570 | 2870±23  2670±22  2546±26  2518±21 | 1124–933 cal BC  899–796 cal BC  797–551 cal BC  779–547 cal BC |
| **3** *(4/1859)* | Settlement pit | c *(Carpinus)* | 10872 | 2594±27 | 811–761 cal BC |
| **4** (8/1859) | Settlement pit | cc *(indet.)* | 31823 | 2729±25 | 920–816 cal BC |
| **5** (11/1859) | Water harvesting pit or sinkhole? | c *(Corylus)* | 37023 | 2468±25 | 761–422 cal BC |
| **6** (13/1859) | Water harvesting pit or sinkhole? | c *(Fraxinus)* | 37042 | 2426±22 | 741–406 cal BC |
| **7** (14/1859) | Posthole | c *(Maloideae)* | 31630 | 2265±20 | 395–209 cal BC |
| **8** (15\_33/1859) | Tree windthrow? | c *(Acer)*  c *(Betula)*  c *(Fraxinus)* | 37044  32820  36108 | 2355±24  2301±31  1187±19 | 514–386 cal BC  410–210 cal BC  772–890 cal AD |
| **9** (24/1859) | Posthole | c *(Pinus)* | 37051 | 52±20 | 1696–1914 cal AD |
| **10** (25/1859) | Posthole | c *(Populus/Salix)* | 37030 | 3017±32 | 1391–1128 cal BC |
| **11** (26/1859) | Settlement pit | c *(Carpinus)* | 31632 | 2340±25 | 478–374 cal BC |
| **12** (28/1859) | Settlement pit | c *(Alnus)* | 37024 | 2448±25 | 751–413 cal BC |
| **13** (29/1859) | Posthole | c *(Fraxinus)* | 37043 | 2420±24 | 735–405 cal BC |
| **14** (31/1859) | Posthole | c *(Fraxinus)* | 31631 | 2683±24 | 900–802 cal BC |
| **15** (42/1859) | Settlement pit | cc *(indet.)* | 31825 | 2350±20 | 466–386 cal BC |
| **16** (43/1859) | Posthole or small pit | c *(Acer)* | 31633 | 2360±21 | 512–388 cal BC |
| **17** (44/1859) | Colluvial deposit | cc *(Hordeum)* | 37031 | 993±24 | 993–1154 cal AD |
| **18** (45/1859) | Clay extraction pit? | c *(Ulmus)* | 37052 | 5832±52 | 4827–4546 cal BC |
| **19** (46/1859) | Water harvesting pit or sinkhole? | c *(Fagus)*  c *(Corylus)* | 36109  37053 | 3103±21  2250±26 | 1430–1295 cal BC  391–206 cal BC |
| **20** (55/1859) | Posthole | c *(Corylus)* | 37025 | 2556±23 | 801–569 cal BC |
| **21** (56/1859) | Clay extraction pit? | c *(Corylus)*  c *(Fraxinus)* | 36124  37028 | 4597±25  3790±65 | 3498–3193 cal BC  2456–2036 cal BC |
| **22** (59/1859) | Tree windthrow? | c *(Fagus)*  c *(Fraxinus)* | 36110  37026 | 1844±20  1222±21 | 130–240 cal AD  706–883 cal AD |
| **23** (69/1859) | Clay extraction pit? | c *(Ulmus)*  c *(Fagus)*  c *(Pinus)* | 36111  37045  37054 | 5983±26  3463±25  -142±21 | 4945–4791 cal BC  1881–1692 cal BC  modern |
| **24** (71/1859) | Posthole or small pit | c *(Populus/Salix)* | 36122 | 2623±26 | 821–776 cal BC |
| **25** (74/1859) | Posthole? | c *(Fagus)* | 37032 | 1236±24 | 683–880 cal AD |
| **26** (75/1859) | Water harvesting pit or sinkhole? | c *(Corylus)* | 36112 | 5631±25 | 4537–4366 cal BC |
| **27** (77/1859) | Settlement pit or  Clay extraction pit? | c *(Carpinus)* | 36123 | 2693±27 | 901–806 cal BC |
| **28** (79/1859) | Settlement pit or  Clay extraction pit? | c *(Betula)* | 36113 | 2478±21 | 768–516 cal BC |
| **29** (80/1859) | Clay extraction pit? | c *(Corylus)*  cc *(Triticum durum)* | 36114  37055 | 5996±27  2401±25 | 4986–4795 cal BC  720–399 cal BC |
| **30** (82/1859) | Clay extraction pit? | cc *(Hordeum)* | 37033 | 260±23 | 1524–1799 cal AD |
| **31** (83/1859) | Settlement pit or clay extraction pit? | c *(Carpinus)* | 36125 | 2308±22 | 406–234 cal BC |
| **32** (91/1859) | Settlement pit | c *(Betula)* | 36115 | 2162±20 | 353–110 cal BC |
| **33** (97/1859) | Colluvial deposit | c *(Pinus)* | 37034 | -4140±30 | modern |
| **34** (103/1859) | Cooking stone pit | c *(Acer)* | 36116 | 2412±21 | 722–403 cal BC |
| **35** (111/1859) | Quarry pit? | c *(Maloideae)* | 36126 | 3025±21 | 1387–1212 cal BC |
| **36** (118/1859) | Colluvial deposit | c *(Picea/Larix)* | 37046 | 154±20 | 1667–1945 cal AD |
| **37** (126/1859) | Colluvial deposit | c *(Fagus)* | 37056 | 3624±26 | 2120–1896 cal BC |
| **38** (130/1859) | Cooking stone pit | c *(Betula)* | 36117 | 2470±21 | 761–476 cal BC |
| **39** (132/1859) | Colluvial deposit in natural depression or water harvesting pit? | c *(Maloideae)* | 36127 | 1067±19 | 897–1025 cal AD |
| **40** (135/1859) | Colluvial deposit | c *(Corylus)* | 37035 | 2896±29 | 1208–1000 cal BC |
| **41** (139/1859) | Posthole | c *(Betula)* | 36118 | 2467±20 | 758–426 cal BC |
| **42** (140/1859) | Cooking stone pit | c *(Fagus)* | 36119 | 2487±21 | 770–540 cal BC |
| **43** (148/1834) | Colluvial deposit | c *(Fraxinus)* | 36128 | 2858±23 | 1115–931 cal BC |

***Table S2.*** *OSL ages in kiloyears (ka) from Görauer Anger with 1σ uncertainties and their respective periods (BC/AD).*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Site** | **No. in plans** (feature no.) | **Type of feature and position** | **Depth (m) below AP** | **Lab code** | **OSL age (ka)** | **OSL age (BC/AD)** |
| **I Görauer Anger** | **I**(43) | Colluvial deposit in sink (upper part) | 0.46 | Gi 916 | 2.85±0.27 | 1100–560 BC |
| **I** (68) | Colluvial deposit in sink (middle part) | 0.63 | Gi 917 | 5.07±0.52 | 3570–2530 BC |
| **I** (44) | Colluvial deposit in sink (lower part) | 0.75 | Gi 921 | 5.59±0.71 | 4280–2860 BC |
| **II** (79) | Colluvial deposit in larger sinkhole (upper part) | 0.40 | Gi 918 | 1.37±0.13 | 520–780 AD |
| **II** (80) | Colluvial deposit in larger sinkhole (lower part) | 0.55 | Gi 919 | 3.62±0.32 | 1920–1280 BC |
| **II** (83*)* | Terra fusca (probably relocated in late Pleistocene) | 0.72 | Gi 920 | 12.68±1.64 | 12300–9020 BC |
| **III** (91) | Colluvial deposit in smaller sinkhole (upper part) | 0.40 | Gi 922 | 3.13±0.29 | 1400–820 BC |
| **III** (101) | Colluvial deposit in smaller sinkhole (lower part) | 0.53 | Gi 923 | 6.56±0.53 | 5070–4010 BC |
| **III** (102) | Terra fusca (probably relocated in late Pleistocene) | 0.65 | Gi 924 | 13.84±1.37 | 13190–10450 BC |
| **II Weiden–Winkel** | **I**(3) | Colluvial deposit in cistern pit or small sinkhole (upper part) | 0.51 | Gi 984 | 2.21±0.31 | 498 BC–122 AD |
| **I** (3) | Colluvial deposit in cistern pit or small sinkhole (middle part) | 0.75 | Gi 985 | 2.56±0.36 | 898–178 BC |
| **I** (3) | Colluvial deposit in cistern pit or small sinkhole (lower part) | 1.23 | Gi 986 | 3.60±0.51 | 2088–1068 BC |
| **I** (2) | Terra fusca (probably relocated in late Pleistocene) | 1.41 | Gi 987 | 26.34±3.76 | 28078–20558 BC |
| **II** (11) | Colluvial deposit in cistern pit or small sinkhole (upper part) | 0.60 | Gi 988 | 2.34±0.36 | 678 BC–42 AD |

***Table S3.*** *Absolute numbers and percentages of determinable charcoal samples from Görauer Anger (n=2946) and Weiden-Winkel (n=2399).*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Taxa** | **Görauer Anger (number)** | **Görauer Anger (%)** | **Weiden-Winkel (number)** | **Weiden-Winkel (%)** |
| Oak *(Quercus)* | 1582 | 53.7 | 861 | 35.9 |
| Beech *(Fagus)* | 753 | 25.6 | 623 | 26.0 |
| Birch *(Betula)* | 175 | 5.9 | 212 | 8.8 |
| Pine *(Pinus)* | 112 | 3.8 | 159 | 6.6 |
| Ash *(Fraxinus)* | 88 | 3.0 | 140 | 5.8 |
| Maple *(Acer)* | 67 | 2.3 | 97 | 4.0 |
| Hazel (*Corylus)* | 40 | 1.4 | 91 | 3.8 |
| Hornbeam *(Carpinus)* | 28 | 1.0 | 94 | 3.9 |
| Maloideae | 42 | 1.4 | 14 | 0.6 |
| Poplar/Willow *(Populus/Salix)* | 26 | 0.9 | 50 | 2.1 |
| Elm *(Ulmus)* | 16 | 0.5 | 17 | 0.7 |
| *Prunus* | 9 | 0.3 | 10 | 0.4 |
| Fir *(Abies)* | 7 | 0.2 | 6 | 0.3 |
| Spruce/Larch *(Picea/Larix)* | 1 | 0 | 17 | 0.7 |
| Linden *(Tilia)* | 0 | 0 | 4 | 0.2 |
| Alder *(Alnus)* | 0 | 0 | 4 | 0.2 |
| **Total** | **2946** | **100** | **2399** | **100** |

**References**

Bronk Ramsey, C. 2021. OxCal v,4.4.4. Available at: http://c14.arch.ox.ac.uk/oxcal

Reimer, P.J., Austin W.E.N., Bard E., Bayliss, A., Blackwell, P.G., Bronk Ramsey, C. et al. 2020. The IntCal20 Northern Hemisphere Radiocarbon Age Calibration Curve (0–55 cal kBP). *Radiocarbon*, 62: 25–757. <https://doi.org/10.1017/RDC.2020.41>