**Supplementary Table 2.** All elemental results of the five different CRT clusters from the Alashan Desert and the average of element content from modern aeolian sand in the Tengger Desert.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Lab.no. | Latitude/ N | longitude/E | 14C yr BP | cal yr BP (2σ) | sample name | CaO/% | SiO2/% | Al2O3/% |
| Thefirstcluster | LUG13-58 | 39°31′21.7″ | 105°42′34.2″ | 6791±71 | 7650 (7513-7786) | W-02 | 15.53  | 61.17  | 5.97  |
| LUG13-57 | 39°30′31.1″ | 105°38′40.4″ | 5731±60 | 6534 (6404-6604) | W-01 | 16.55  | 52.55  | 7.23  |
| LUG13-70 | 39°39′1.80″ | 105°53′17.9″ | 5573±61 | 6382 (6280-6483) | W-13  | 14.95  | 53.70  | 5.35  |
| LUG11-129 | 38°47′2.10″ | 105°01′15.3″ | 5220±58 | 6039 (5895-6183) | T-01 | 25.94  | 46.27  | 6.46  |
| LUG13-60 | 39°34′28.7″ | 105°52′23.3″ | 3328±52 | 3570 (3448-3692) | W-04 | 21.75  | 51.01  | 5.28  |
| LUG13-61 | 39°37′40.3″ | 106°08′54.8″ | 3272±52 | 3498 (3385-3611) | W-05 | 20.93  | 50.48  | 6.66  |
| 　 | 　 | 　 | 　 | 　 | average | 19.28  | 52.53  | 6.16  |
| Thesecondcluster | LUG13-69 | 39°59′59.8″ | 106°37′34.5″ | 6198±64 | 7102 (6946-7257) | W-12 | 77.15  | 5.34  | 0.50  |
| LUG13-65 | 40°16′45.3″ | 106°45′44.6″ | 6125±61 | 6986 (6801-7171) | W-09 | 61.17  | 12.12  | 3.59  |
| LUG11-194 | 37°54′59.9″ | 104°52′13.0″ | 4090±60 | 4630 (4438-4821) | T-07 | 63.28  | 11.28  | 2.33  |
| LUG13-62 | 39°41′36.5″ | 106°33′7.1″ | 3755±55 | 4137 (3929-4345) | W-06 | 71.83  | 7.28  | 1.50  |
| LUG13-63 | 39°50′18.5″ | 106°39′14.1″ | 3566±53 | 3879 (3698-4060) | W-07 | 49.51  | 19.00  | 3.59  |
| 　 | 　 | 　 | 　 | 　 | average | 64.59  | 11.00  | 2.30  |
| Thethirdcluster | LUG11-174 | 38°48′21.2″ | 105°22′59.9″ | 6382±59 | 7301 (7177-7425) | T-08 | 48.49  | 10.15  | 1.24  |
| LUG11-193 | 38°12′48.4″ | 104°34′50.3″ | 5989±66 | 6829 (6670-6988) | T-06 | 45.38  | 11.81  | 1.10  |
| LUG11-178 | 38°46′33.7″ | 105°05′35.6″ | 5118±59 | 5859 (5727-5990) | T-11 | 36.07  | 19.72  | 2.86  |
| LUG11-188 | 38°55′31.8″ | 104°10′34.7″ | 4891±55 | 5612 (5482-5742) | T-02 | 38.81  | 17.77  | 2.43  |
| LUG11-179 | 38°48′58.9″ | 104°56′43.3″ | 4839±58 | 5523 (5333-5712) | T-12 | 40.45  | 15.82  | 2.54  |
| LUG11-192 | 38°24′1.70″ | 104°34′50.3″ | 4765±54 | 5462 (5326-5597) | T-05 | 38.41  | 17.24  | 2.50  |
| LUG11-181 | 38°44′30.4″ | 105°16′7.4″ | 2970±51 | 3150 (2971-3328) | T-14 | 30.79  | 24.75  | 3.59  |
| 　 | 　 | 　 | 　 | 　 | average | 39.77  | 16.75  | 2.32  |
| Theforthcluster | LUG11-175 | 38°48′9.50″ | 105°20′30.6″ | 5198±57 | 5969 (5760-6178) | T-9 | 25.66  | 32.89  | 4.82  |
| BA110772 | 39°46′7.90″ | 102°28′34.77″ | 4585±38 | 5259 (5062-5449) | B-03 | 25.24  | 36.77  | 3.50  |
| BA110772 | 39°46′7.90″ | 102°28′34.8″ | 4585±37 | 5258 (5062-5449) | B-02 | 20.53  | 44.09  | 3.81  |
| BA110772 | 39°46′7.90″ | 102°28′34.8″ | 4585±36 | 5257 (5062-5449) | B-01 | 23.34  | 36.69  | 3.51  |
| LUG11-191 | 38°47′14.5″ | 104°17′8.9″ | 3779±59 | 4192 (3980-4404) | T-04 | 24.56  | 33.51  | 4.77  |
| LUG11-176 | 38°46′42.1″ | 105°14′28.9″ | 2262±72 | 2259 (2061-2457) | T-10 | 25.72  | 31.60  | 4.66  |
| 　 | 　 | 　 | 　 | 　 | 　 | 24.18  | 35.93  | 4.18  |
| Thefifthcluster | LUG13-67 | 40°10′41.2″ | 106°40′58.4″ | 5649±60 | 6451 (6301-6601) | W-11 | 39.72  | 27.70  | 4.96  |
| LUG11-190 | 38°48′53.5″ | 104°16′24.5″ | 5412±61 | 6154 (6004-6305) | T-03 | 39.76  | 29.61  | 5.08  |
| LUG13-59 | 39°34′40.4″ | 105°50′30.6″ | 4254±55 | 4791 (4617-4964) | W-03 | 35.91  | 33.34  | 5.33  |
| LUG13-66 | 40°17′29.7″ | 106°35′25.7″ | 4094±56 | 4631(4440-4821) | W-10 | 42.06  | 26.20  | 5.36  |
| LUG13-64 | 39°52′51.6″ | 106°32′6.3″ | 4062±56 | 4617 (4420-4813) | W-08 | 29.96  | 35.24  | 6.06  |
| LUG11-180 | 38°45′22.2″ | 105°05′13.1″ | 3339±49 | 3573 (3455-3691) | T-13 | 32.04  | 39.82  | 4.95  |
| LUG13-53 | 39°46′29.41″ | 102°10 ′42.45″ | 3071±51 | 3237(3083-3391) | B-5 | 36.36  | 31.90  | 5.18  |
| LUG13-52 | 39°51′27.13″ | 102°05 ′15.44″ | 2482±50 | 2553(2378-2728) | B-4 | 42.96  | 24.54  | 4.52  |
| 　 | 　 | 　 | 　 | 　 | 　 | 37.35  | 31.04  | 5.18  |
| 　 | 　 | 　 | 　 | 　 | 　 | MAS | 1.90  | 75.90  | 8.60  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 　 | sample name | MgO/% | Fe2O3/% | Na2O/% | K2O/% | Sr/ppm | Rb/ppm | Ti/ppm | P/ppm | Ba/ppm | Ce/ppm | Co/ppm | Cr/ppm | Mn/ppm | W/ppm | Zr/ppm |
| Thefirstcluster | W-02 | 4.05  | 1.58  | 1.29  | 3.03  | 741.7  | 59.2  | 1602.3  | 327.2  | 737.0  | 51.0  | 107.7  | 72.9  | 244.8  | 434.8  | 133.3  |
| W-01 | 4.12  | 2.05  | 1.59  | 3.50  | 712.6  | 73.5  | 2190.9  | 389.7  | 791.1  | 44.8  | 41.6  | 81.7  | 311.5  | 108.6  | 144.9  |
| W-13  | 1.59  | 1.02  | 2.19  | 1.77  | 510.1  | 41.8  | 821.5  | 186.3  | 495.6  | 60.1  | 130.1  | 22.2  | 168.5  | 502.6  | 77.4  |
| T-01 | 0.72  | 1.89  | 2.40  | 2.16  | 350.0  | 46.9  | 1701.3  | 218.7  | 644.3  | 67.7  | 200.1  | 72.1  | 274.1  | 515.2  | 105.1  |
| W-04 | 4.55  | 1.50  | 1.34  | 2.55  | 581.6  | 54.1  | 1453.9  | 475.8  | 704.1  | 25.1  | 62.0  | 89.3  | 209.9  | 168.4  | 100.5  |
| W-05 | 0.92  | 1.56  | 2.40  | 2.52  | 436.4  | 53.7  | 1370.1  | 364.9  | 825.0  | 69.8  | 146.9  | 62.9  | 210.0  | 397.6  | 92.6  |
| average | 2.66  | 1.60  | 1.87  | 2.59  | 555.4  | 54.9  | 1523.3  | 327.1  | 699.5  | 53.1  | 114.7  | 66.9  | 236.5  | 354.5  | 109.0  |
| Thesecondcluster | W-12 | 1.82  | 0.27  | 0.31  | 0.21  | 1441.2  | 1.3  | 290.4  | 125.6  | 350.6  | 0.0  | 31.5  | 50.6  | 88.4  | 0.0  | 33.4  |
| W-09 | 1.45  | 1.91  | 1.11  | 0.92  | 1792.4  | 22.1  | 1231.7  | 185.4  | 621.3  | 4.7  | 125.0  | 44.7  | 2163.1  | 0.0  | 89.6  |
| T-07 | 0.88  | 0.79  | 1.02  | 0.73  | 709.5  | 15.0  | 682.7  | 153.3  | 505.8  | 0.0  | 188.6  | 73.8  | 139.6  | 0.0  | 48.8  |
| W-06 | 1.07  | 0.54  | 0.66  | 0.50  | 747.2  | 10.2  | 475.7  | 165.9  | 445.1  | 0.0  | 53.1  | 68.6  | 165.3  | 0.0  | 36.8  |
| W-07 | 0.99  | 1.08  | 1.50  | 1.25  | 637.1  | 33.2  | 897.9  | 350.9  | 569.1  | 15.3  | 112.3  | 83.6  | 200.7  | 54.4  | 65.0  |
| average | 1.24  | 0.92  | 0.92  | 0.72  | 1065.5  | 16.4  | 715.7  | 196.2  | 498.4  | 4.0  | 102.1  | 64.3  | 551.4  | 10.9  | 54.7  |
| Thethirdcluster | T-08 | 1.99  | 0.42  | 0.68  | 0.42  | 918.9  | 5.9  | 388.9  | 386.0  | 262.5  | 5.8  | 31.6  | 59.5  | 87.8  | 8.1  | 46.1  |
| T-06 | 6.01  | 0.58  | 0.58  | 0.38  | 1663.0  | 10.6  | 519.5  | 262.0  | 189.7  | 22.2  | 34.5  | 73.8  | 107.2  | 11.2  | 80.1  |
| T-11 | 0.77  | 0.97  | 1.54  | 0.80  | 507.1  | 27.2  | 701.2  | 308.9  | 382.3  | 30.0  | 62.9  | 58.2  | 143.8  | 62.8  | 55.8  |
| T-02 | 2.22  | 0.80  | 1.27  | 0.69  | 994.2  | 23.0  | 598.9  | 318.5  | 316.4  | 26.6  | 58.7  | 49.1  | 116.7  | 45.9  | 72.7  |
| T-12 | 0.98  | 0.88  | 1.24  | 0.67  | 608.2  | 19.5  | 656.8  | 390.8  | 275.6  | 26.8  | 33.9  | 41.5  | 127.2  | 26.5  | 56.3  |
| T-05 | 0.87  | 0.90  | 1.26  | 0.73  | 510.5  | 25.7  | 708.6  | 289.3  | 368.7  | 19.9  | 49.2  | 37.9  | 128.4  | 41.1  | 69.8  |
| T-14 | 0.86  | 1.07  | 1.84  | 1.15  | 460.7  | 40.1  | 792.4  | 313.8  | 398.5  | 38.5  | 46.6  | 33.5  | 150.1  | 68.6  | 72.7  |
| average | 1.96  | 0.80  | 1.20  | 0.69  | 808.9  | 21.7  | 623.8  | 324.2  | 313.4  | 24.3  | 45.3  | 50.5  | 123.0  | 37.7  | 64.8  |
| Theforthcluster | T-9 | 0.75  | 1.12  | 2.34  | 1.55  | 367.0  | 41.4  | 842.9  | 376.1  | 412.3  | 48.8  | 76.4  | 36.0  | 157.3  | 136.0  | 70.4  |
| B-03 | 0.86  | 1.00  | 1.84  | 0.88  | 543.7  | 20.3  | 779.7  | 372.1  | 250.2  | 51.6  | 107.8  | 28.6  | 190.5  | 258.2  | 68.1  |
| B-02 | 0.79  | 1.17  | 1.84  | 0.99  | 498.1  | 27.8  | 895.1  | 309.8  | 322.1  | 81.3  | 161.3  | 69.5  | 175.5  | 507.7  | 90.8  |
| B-01 | 0.80  | 1.40  | 1.77  | 0.89  | 451.0  | 26.4  | 848.2  | 299.9  | 326.9  | 51.6  | 104.7  | 958.5  | 271.4  | 250.6  | 79.9  |
| T-04 | 0.89  | 1.28  | 2.33  | 1.35  | 350.9  | 31.8  | 938.7  | 371.8  | 333.8  | 41.6  | 62.0  | 39.6  | 164.6  | 101.0  | 67.0  |
| T-10 | 0.76  | 1.37  | 2.29  | 1.39  | 418.6  | 53.1  | 1007.9  | 285.4  | 553.1  | 71.3  | 57.5  | 57.4  | 173.0  | 115.4  | 120.4  |
| 　 | 0.81  | 1.22  | 2.07  | 1.18  | 438.2  | 33.5  | 885.4  | 335.9  | 366.4  | 57.7  | 95.0  | 198.3  | 188.7  | 228.2  | 82.8  |
| Thefifthcluster | W-11 | 1.20  | 1.54  | 1.89  | 1.66  | 593.3  | 43.8  | 1396.1  | 434.8  | 667.3  | 28.9  | 113.9  | 106.0  | 242.1  | 124.3  | 79.0  |
| T-03 | 1.29  | 1.18  | 2.23  | 1.71  | 814.2  | 40.5  | 954.2  | 215.0  | 632.5  | 46.4  | 119.3  | 51.1  | 171.3  | 134.7  | 67.6  |
| W-03 | 1.86  | 1.39  | 2.14  | 1.93  | 852.3  | 42.7  | 1186.5  | 308.2  | 645.3  | 28.4  | 171.3  | 56.8  | 218.9  | 265.8  | 81.4  |
| W-10 | 1.35  | 1.89  | 1.83  | 1.72  | 533.8  | 45.4  | 1495.2  | 280.3  | 546.6  | 48.5  | 154.4  | 37.9  | 576.1  | 149.7  | 85.3  |
| W-08 | 1.26  | 1.92  | 2.16  | 2.17  | 445.2  | 56.3  | 1769.0  | 473.1  | 746.7  | 22.9  | 52.0  | 74.2  | 303.6  | 84.7  | 114.5  |
| T-13 | 0.57  | 1.08  | 2.09  | 1.87  | 427.2  | 39.5  | 924.8  | 215.6  | 597.5  | 65.7  | 212.4  | 36.4  | 168.3  | 462.6  | 64.0  |
| B-5 | 1.11  | 1.90  | 2.13  | 1.55  | 619.3  | 36.7  | 1474.6  | 309.9  | 519.8  | 10.2  | 88.9  | 72.0  | 396.3  | 121.9  | 97.2  |
| B-4 | 1.44  | 1.94  | 2.06  | 1.34  | 551.8  | 32.6  | 1558.0  | 449.2  | 432.7  | 29.6  | 113.1  | 122.1  | 350.6  | 96.9  | 105.4  |
| 　 | 1.26  | 1.61  | 2.07  | 1.74  | 604.6  | 42.2  | 1344.8  | 335.8  | 598.6  | 35.1  | 128.2  | 69.6  | 303.4  | 180.1  | 86.8  |
| 　 | MAS | 1.00  | 2.00  | 1.90  | 2.60  | 181.6  | 74.7  | 1651.2  | 273.0  | 690.8  | 63.7  | 93.5  | 57.7  | 244.6  | 585.8  | 153.3  |

MAS: modern aeolian sand.