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# Radiocarbon Dates from Sohr Damb/Nal, Balochistan

## Introduction

Sohr Damb/Nal, the type site of the Nal complex, was excavated for one season by H. Hargreaves in 1924. The *Joint German-Pakistani Archaeological Mission to Kalat* re-opened excavations in 2001 and has worked at Sohr Damb for two seasons (Franke-Vogt/Ibrahim, in press; Franke-Vogt, this volume). The sequence unearthed so far has pushed back the initial date of the settlement into the 4th millennium BC and brought to light a substantial post-Nal occupation (Period III). This well-preserved settlement shows several links to sites such as Miri Qalat, Mehrgarh, Nausharo, Mundigak and Shahr-e Sokhta. In this paper, a series of $^{14}C$ dates obtained from the site will be presented and their chronological implications discussed.

## Methods

The samples were mostly taken by the team, partly by R. Neef. The correlation of sample material with archaeological periods was completed by U. Franke-Vogt, for Trench I based on the stratigraphic analysis carried out by St. Langer. Chemical pre-treatment of charcoal and wood samples was carried out by A-A-A treatment (Mook/Streurman 1983). The dating was performed with gas proportional counters of the Houtermans-Oeschger type, using methane at 133.3 kPa pressure as filling gas. Measurement control and data processing were done with the help of computers (Görsdorf 1990, 2000). A modern measurement electronic is used. Preamplifier, pulse amplifier, comparator, pulse shaper and anti-coincidence are located in a box (19 cm × 10 cm × 5 cm), which is directly connected with the counter. The detection of variation of the environmental radiation and the inspection of the long time stability of the electronic were required in order to reach the measurement accuracy. The $\delta^{13}C$-measurements were done by H. Erlenkeuser and colleagues (Leibniz-Labor, University of Kiel) and are reported with respect to PDB-standard.

## Results

The tree-ring count of charcoal and wood samples could not be determined. In the calibration program OxCal v3.8 (Ramsey 1995; 1998; 2001; 2002), the decadal calibration curve (Stuiver et al. 1998) was used as a first approximation for all samples. The calibration intervals were presented for a confidence of 68.2% in a 10 year rounded form. The following summary shows the dating results together with locations and periods, ordered by trench and stratigraphic sequence:

Period II, Trench IIIa

| | | | |
|---|---|---|---|
| **Bln-5384** | Period II | -25,3‰ | **4501 ± 32 BP** |
| charcoal | SD 01/S66 | | 3340–3260 cal BC |
| | Tr. IIIa, Loc. 811 | | 3240–3150 cal BC |
| | | | 3140–3100 cal BC |

Period III, Trench IIIa

| | | | |
|---|---|---|---|
| **Bln-5383** | Period III | -24,9‰ | **4033 ± 30 BP** |
| charcoal | SD 01/S94 | | 2620–2610 cal BC |
| | Tr. IIIa, Loc. 803 | | 2580–2490 cal BC |

Period III, Trench II

| | | | |
|---|---|---|---|
| **Bln-5382** | Period III | -24,4‰ | **3901 ± 34 BP** |
| charcoal | SD 01/S32 | | 2470–2340 cal BC |
| | Tr. IIc, Loc. 520 | | |

Period III, Trench I

| | | | |
|---|---|---|---|
| **Bln-5556** | Period III.3c–d | -25,9‰ | **3975 ± 37 BP** |
| charcoal | SD 02/S223 | | 2570–2510 cal BC |
| | Tr. Ig, Loc. 80 | | 2500–2460 cal BC |
| **Bln-5520** | Period III.3d | -25,9‰ | **4066 ± 35 BP** |
| charcoal | SD 02/S66 | | 2840–2810 cal BC |
| | Tr. Ig, Loc. 56 | | 2670–2640 cal BC |
| | | | 2630–2560 cal BC |
| | | | 2530–2490 cal BC |
| **Bln-5521** | Period III.4a | -24,6‰ | **3990 ± 38 BP** |
| charcoal | SD 02/S47 | | 2570–2520 cal BC |
| | Tr. Ii, Loc. 61 | | 2500–2460 cal BC |
| **Bln-5525** | Period III.4a | -24,4‰ | **3943 ± 37 BP** |
| charcoal | SD 02/S73 | | 2550–2540 cal BC |
| | Tr. If, Loc. 70 | | 2490–2400 cal BC |
| | below Loc. 62 | | 2380–2340 cal BC |

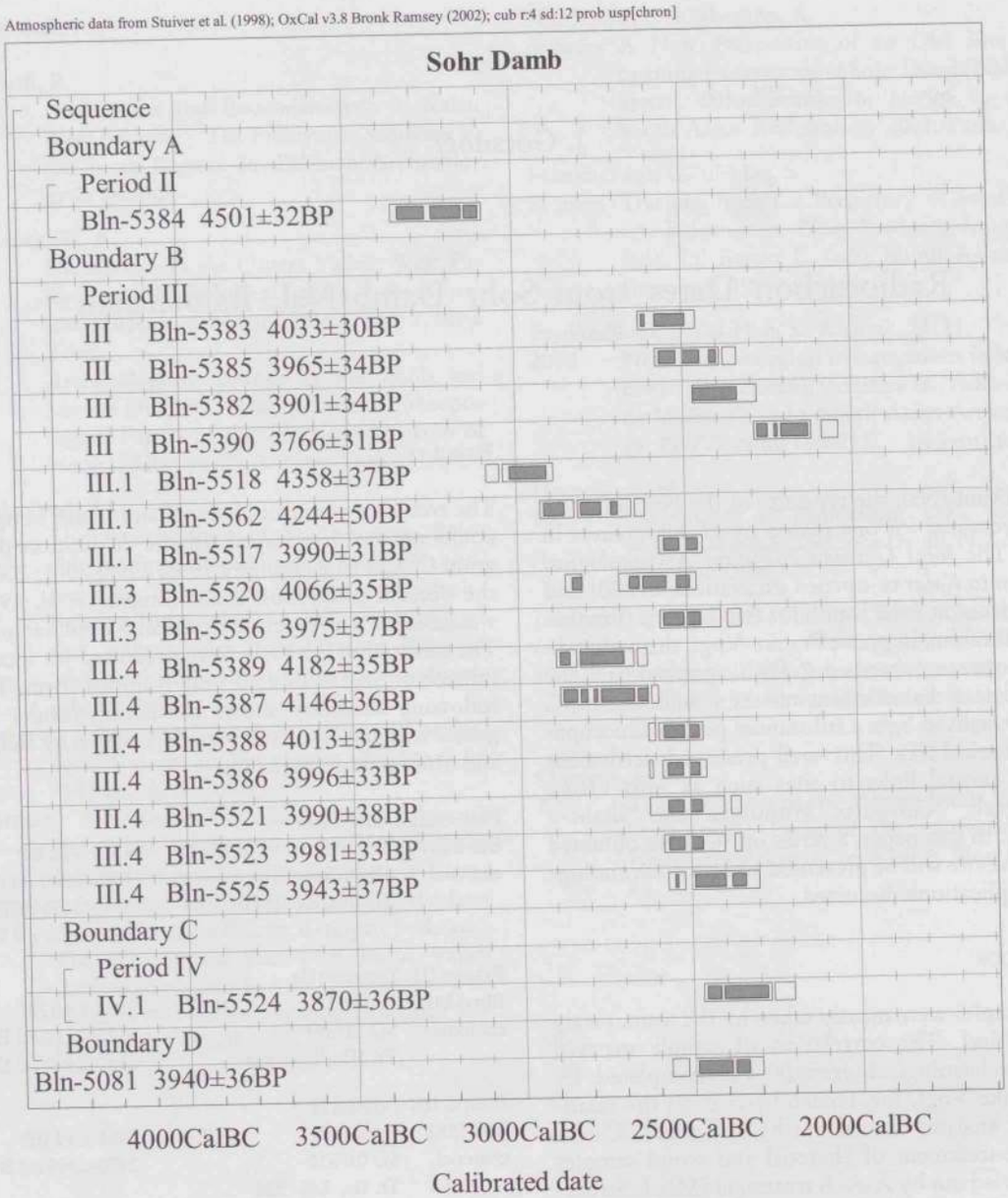


*Fig. 1.* Calibration of dating results with the program OxCal v3.8. The confidence limit of the smaller, hatched boxes is 68.2%, of the broader boxes 95.4%.

**Bln-5523** charcoal — Period III.4b, SD 02/S88, Tr. If, Loc. 62 above Loc. 70 — -24,9‰ — **3981 ± 33 BP** 2570–2520 cal BC 2500–2460 cal BC

**Bln-5387** charcoal — Period III.4a, SD 01/S55, Tr. Ia, Loc. 26 below Loc. 7 — -25,6‰ — **4146 ± 36 BP** 2870–2830 cal BC 2820–2800 cal BC 2780–2770 cal BC 2760–2660 cal BC 2650–2620 cal BC

**Bln-5386** wood — Period III.4a, SD 01/S46, Tr. Ia, Loc. 7 above Loc. 26 — -26,6‰ — **3996 ± 33 BP** 2570–2520 cal BC 2500–2470 cal BC

**Bln-5388** charcoal — Period III.4a, SD 01/S10, Tr. Ia, Loc. 7 above Loc. 26 — -24,2‰ — **4013 ± 32 BP** 2580–2510 cal BC 2500–2470 cal BC

**Bln-5389** charcoal — Period III.4a, SD 01/S22, Tr. Ia, Loc. 7 above Loc. 26 — -25,2‰ — **4182 ± 35 BP** 2880–2850 cal BC 2820–2690 cal BC

**Bln-5390** charcoal — Period III, SD 01/S30, Tr. Ib, Loc. 13, eroded level below surface, similar Loc. 7 and 26 — -25,8‰ — **3766 ± 31 BP** 2280–2250 cal BC 2230–2220 cal BC 2210–2130 cal BC

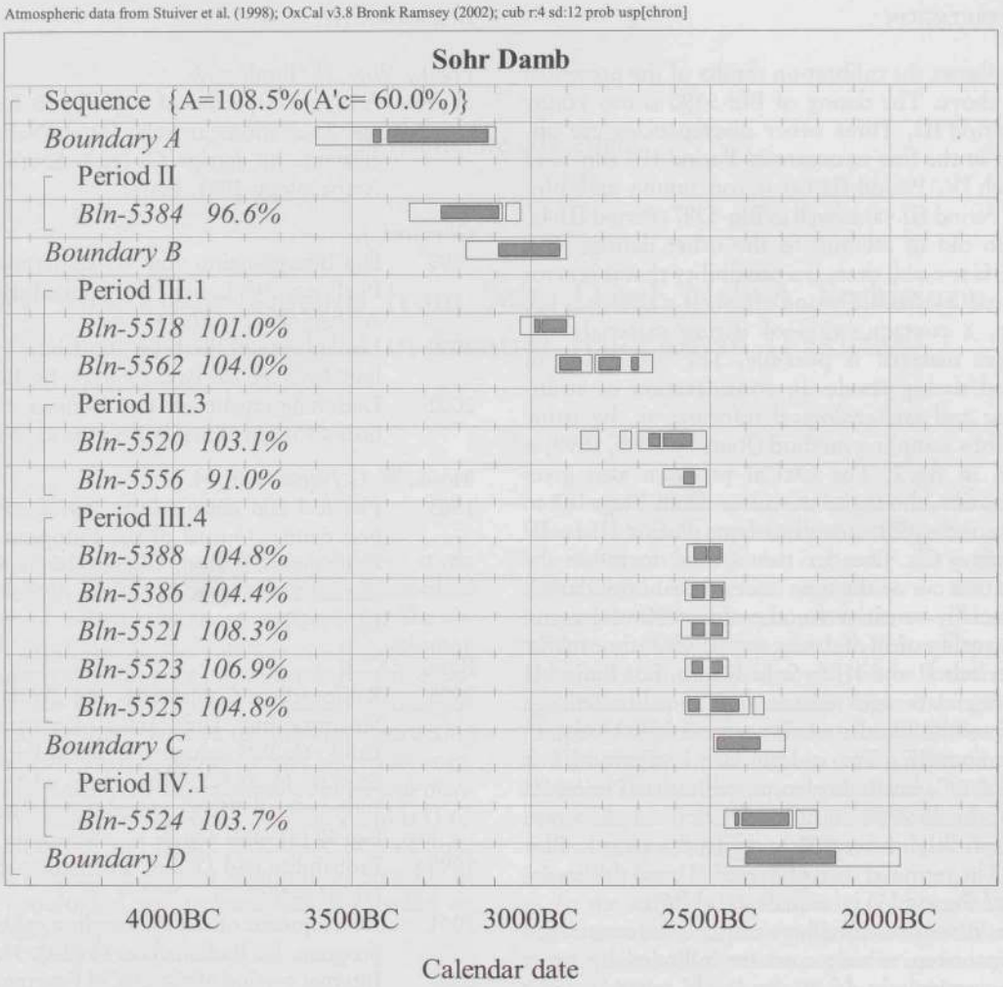


*Fig. 2.* Calibration of selected dating results with the program OxCal v3.8 in consideration of the stratigraphic and archaeological information, by using the Gibbs sampling method. The confidence limit of the smaller, hatched boxes is 68.2%, of the broader boxes 95.4%.

PERIOD III, TRENCH IV: preliminary assignments to sub-phases, relative sequence confirmed

| | | | |
|---|---|---|---|
| **Bln-5517** | Period III.1a | -24,1‰ | **3990 ± 31 BP** |
| charcoal | SD 02/S39 | | 2570–2520 cal BC |
| | Tr. IV, Loc. 912 | | 2500–2460 cal BC |
| **Bln-5518** | Period III.1b | -24,7‰ | **4358 ± 37 BP** |
| charcoal | SD 02/S1 | | 3020–2910 cal BC |
| | Tr. IV, Loc. 907 | | |
| **Bln-5562** | Period III.1b | -25,3‰ | **4244 ± 50 BP** |
| charcoal | SD 02/S1 | | 2920–2860 cal BC |
| | Tr. IV, Loc. 907 | | 2810–2750 cal BC |
| | | | 2720–2700 cal BC |
| **Bln-5385** | Period III | -24,5‰ | **3965 ± 34 BP** |
| charcoal | SD 01/S87 | | 2570–2520 cal BC |
| | Tr. IV, Loc. 903 | | 2500–2450 cal BC |
| | | | 2420–2400 cal BC |

PERIOD IV, TRENCH I, erosion layers, to be confirmed

| | | | |
|---|---|---|---|
| **Bln-5524** | Period IV.1 | -24,4‰ | **3870 ± 36 BP** |
| charcoal | SD 02/S102 | | 2460–2420 cal BC |
| | Tr. If, Loc. 65 | | 2410–2280 cal BC |
| | Ash pits, near surface, above Loc. 62 | | |

NORTH SECTION

| | | | |
|---|---|---|---|
| **Bln-5081** | Survey | -15,2‰ | **3940 ± 36 BP** |
| charcoal | SD 98/S28 | | 2490–2390 cal BC |
| | Ash layer betw. | | 2380–2340 cal BC |
| | Per. II and III levels in North Section | | |

## Interpretation

Fig. 1 shows the calibration results of the presented dates above. The dating of Bln-5390 is too young for Period III. Three other discrepancies are observed in the fine structure of Period III: Bln-5517 (Trench IV, Period III.1a) is too young and Bln-5389 (Period III.4a) as well as Bln-5387 (Period III.4a) are too old in relation to the other datings. If a dating is too old, there is a possibility that this error is caused by the old wood effect. If a dating is too young, a contamination of dating material with younger material is possible. The calibration of selected dating results in consideration of stratigraphic and archaeological information, by using the Gibbs sampling method (Ramsey 1995, 1998) is shown in fig. 2. The OxCal program also gives information about the transition from Period II to III (Boundary B) as well as from Period III to IV (Boundary C). Due to the special form of the calibration curve, the time interval near boundary B is especially sensitive for the old wood effect.

The calibration of dating results gives time marks for Periods II and III in Sohr Damb. For Period II only one date was measured. The calibrated age falls into the middle of the second half of the 4th millennium BC. The oldest date of Period III is 3100 cal BC, but it is also possible that Period III starts around 2700 cal BC, if there is an old wood effect of only about 100 years in the sample Bln-5518. The terminal date of Period III and the beginning of Period IV is near 2400 cal BC.

The dates presented here can only be considered as a first step, which must be followed by more dates, particularly from the levels related to the transition between Period II and III, and between Period III and IV. Likewise, further dates for Period II are required to approach the chronology of this occupation[1].

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[1] In 2004, a large number of samples pertinent to these problems were collected and are being processed now.