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J. Görsdorf

## 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 4<sup>th</sup> 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 <sup>14</sup>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/Streuerman 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  $\delta^{13}\text{C}$ -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			
<b>Bln-5384</b>	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			
<b>Bln-5383</b>	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			
<b>Bln-5382</b>	Period III	-24,4‰	3901 ± 34 BP
charcoal	SD 01/S32		2470–2340 cal BC
	Tr. IIc, Loc. 520		
PERIOD III, TRENCH I			
<b>Bln-5556</b>	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
<b>Bln-5520</b>	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
<b>Bln-5521</b>	Period III.4a	-24,6‰	3990 ± 38 BP
charcoal	SD 02/S47		2570–2520 cal BC
	Tr. II, Loc. 61		2500–2460 cal BC
<b>Bln-5525</b>	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



Atmospheric data from Stuiver et al. (1998); OxCal v3.8 Bronk Ramsey (2002); cub r:4 sd:12 prob usp[chron]

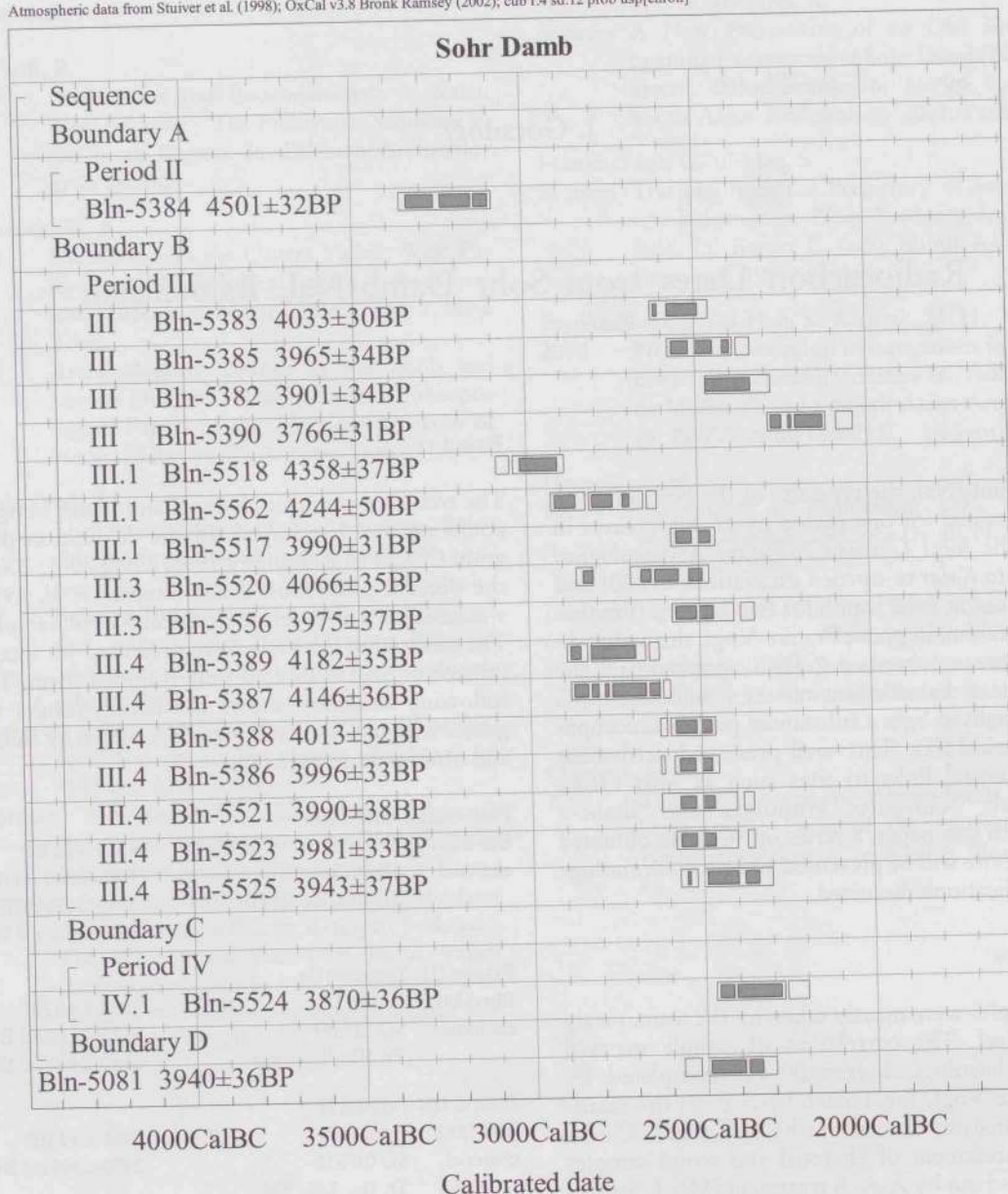


Fig. 1. Calibration of dating results with the program OxCal v3.8. The confidence limit of the smaller, hatched boxes is 68.2%, of the broader boxes 95.4%.

Bln-5523	Period III.4b	-24,9‰	3981 ± 33 BP	Bln-5388	Period III.4a	-24,2‰	4013 ± 32 BP
charcoal	SD 02/S88		2570–2520 cal BC	charcoal	SD 01/S10		2580–2510 cal BC
	Tr. If, Loc. 62		2500–2460 cal BC		Tr. Ia, Loc. 7		2500–2470 cal BC
	above Loc. 70				above Loc. 26		
Bln-5387	Period III.4a	-25,6‰	4146 ± 36 BP	Bln-5389	Period III.4a	-25,2‰	4182 ± 35 BP
charcoal	SD 01/S55		2870–2830 cal BC	charcoal	SD 01/S22		2880–2850 cal BC
	Tr. Ia, Loc. 26		2820–2800 cal BC		Tr. Ia, Loc. 7		2820–2690 cal BC
	below Loc. 7		2780–2770 cal BC		above Loc. 26		
			2760–2660 cal BC				
			2650–2620 cal BC	Bln-5390	Period III	-25,8‰	3766 ± 31 BP
Bln-5386	Period III.4a	-26,6‰	3996 ± 33 BP	charcoal	SD 01/S30		2280–2250 cal BC
wood	SD 01/S46		2570–2520 cal BC		Tr. Ib, Loc. 13		2230–2220 cal BC
	Tr. Ia, Loc. 7		2500–2470 cal BC		eroded level below surface		2210–2130 cal BC
	above Loc. 26				similar Loc. 7 and 26		



Atmospheric data from Stuiver et al. (1998); OxCal v3.8 Bronk Ramsey (2002); cub r:4 sd:12 prob usp[chron]

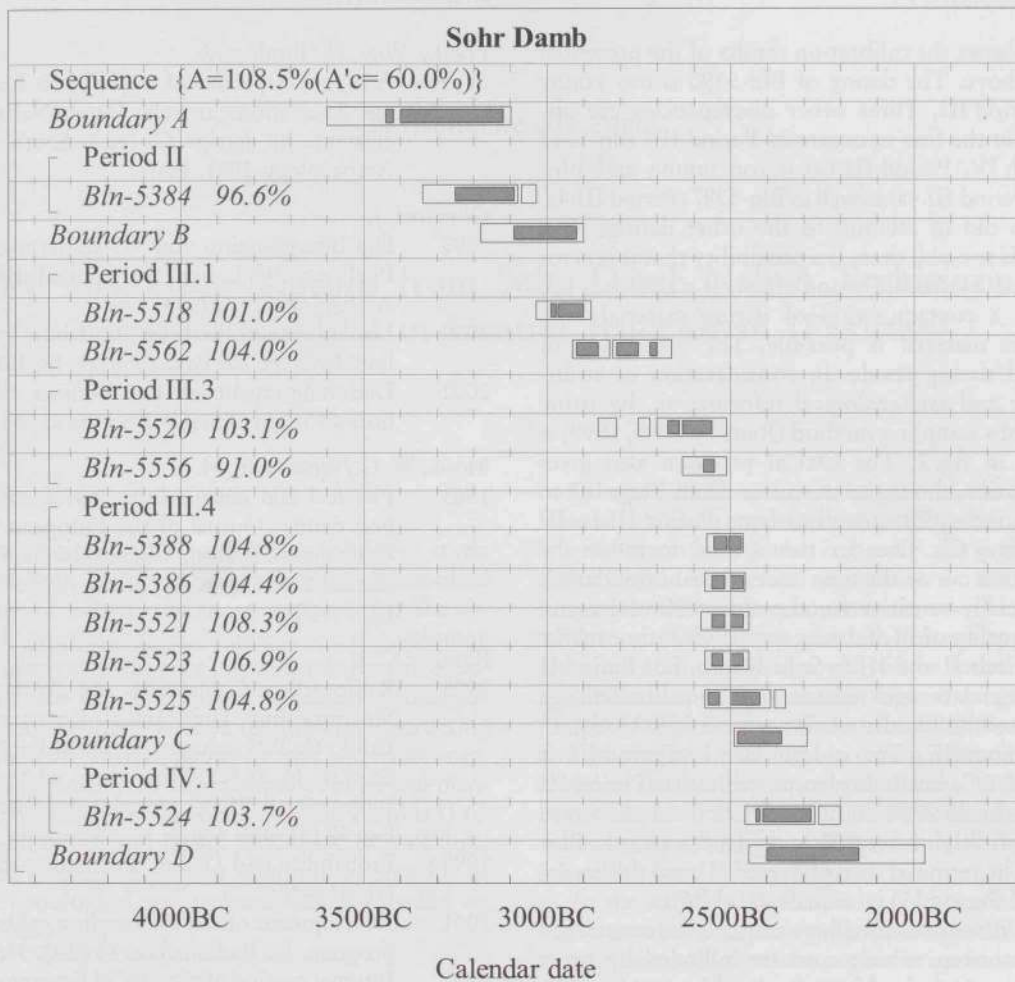


Fig. 2. Calibration of selected dating results with the program OxCal v3.8 in consideration of the stratigraphic and archaeological information, by using the Gibbs sampling method. The confidence limit of the smaller, hatched boxes is 68.2%, of the broader boxes 95.4%.

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 4<sup>th</sup> 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<sup>1</sup>.

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<sup>1</sup> In 2004, a large number of samples pertinent to these problems were collected and are being processed now.