

CalPal Interdialog Comparisons for Calibration Curve Switching (CCS).
CalPal Version 2024.5 (2nd June 2024).

We compare here CalPal-Interdialog ¹⁴C-age calibration results for two different ¹⁴C-ages from the site of Palaikastro (Crete), based on manual and automated Calibration Curve Switching (CCS). The first ¹⁴C-age (terrestrial bone sample GrA-28991: 3325 ± 40 BP) requires NH-Hemisphere calibration. The second ¹⁴C-age (marine shell sample GrA-21607: 3790 ± 60 BP) needs Marine calibration. Tested CalPal-Dialogs are CalTable, CalKN, Multigroup, CalDiet, Chronology- Composer, and Database-Calibration. The tests are performed for N=2 ¹⁴C-ages, but are run within a database framework that has global scope.

For NH-Calibration we apply INTCAL20 (Reimer & 2020). For Marine Calibration we apply Marine20 (Heaton & 2020). If only for purposes of comparison, following its Marine20 calibration, additional NH-calibration is applied to the marine sample. We complete the CalPal-Interdialog comparison by including a graphic comparison with the results achieved for the same dates with Calib810.

Note that for test-purposes the Calibration Curve Switching (CCS) is applied *automatically* for CalPal-Dialogs CalKN, Multigroup, Chronology-Composer and Database-Calibration (with CCS steered via sample-specific database variable CCS METHOD), in comparison to dialogs CalTable and CalDiet (where CCS is achieved by *manual* selection of CC from the respective pulldown menu). From archaeological perspective this study demonstrates that, when Marine-calibrated, the marine sample (GrA-21607) has the same calendar-age as the terrestrial sample (GrA-28991). Needless to say, since both ages have practically the same readings on the same calibration curve plateau, the results cannot be used to narrow down the date of the LMIA Santorini eruption.

Tab 1. Calibration Results achieved in different CalPal-Dialogs

Lab Code	¹⁴C-Age [BP]	[calBC ± 68%]	METHOD	CalPal-Dialog	Notes
GrA-21607	3790 ± 60	1600 ± 76	Marine	CalTable	Manual
GrA-21607	3790 ± 60	2227 ± 97	NHemisphere		CC-Selection
GrA-28991	3325 ± 40	1591 ± 53	NHemisphere		via Pulldown Menu
GrA-21607	3790 ± 60	1601 ± 79	Marine	CalKN	CCS/non-CCS
GrA-21607	3790 ± 60	2228 ± 101	NHemisphere		Automated
GrA-28991	3325 ± 40	1594 ± 56	NHemisphere		CC-Switch
GrA-21607	3790 ± 60	1601 ± 79	Marine	Multigroup	CCS/non-CCS
GrA-21607	3790 ± 60	2228 ± 98	NHemisphere		Automated
GrA-28991	3325 ± 40	1592 ± 54	NHemisphere		CC-Switch
GrA-21607	3790 ± 60	1600 ± 80	Marine	CalDiet	Manual
GrA-21607	3790 ± 60	2228 ± 101	NHemisphere		CC-Selection
GrA-28991	3325 ± 40	1593 ± 56	NHemisphere		via Pulldown-Menu
GrA-21607	3790 ± 60	1601 ± 78	Marine	Chronology	CCS/non-CCS
GrA-21607	3790 ± 60	2228 ± 100	NHemisphere		Automated
GrA-28991	3325 ± 40	1593 ± 56	NHemisphere		CC-Switch
GrA-21607	3790 ± 60	1601 ± 78	Marine	Database	CCS/non-CCS
GrA-21607	3790 ± 60	2228 ± 100	NHemisphere		Automated
GrA-28991	3325 ± 40	1593 ± 56	NHemisphere		CC-Switch

Tab 2. Interdialog Comparison of Automated/Manual CCS-Results

[BP ± 1σ]			CalPal-Dialog [calBC (68%)]	
GrA-21607	3790 ± 60	Marine	CalTable	1600 ± 76
			CalKN	1601 ± 79
			Multigroup	1601 ± 79
			CalDiet	1600 ± 80
			Chronology	1601 ± 78
			<u>Database</u>	<u>1601 ± 78</u>
			Standard Value	1601 ± 78
		Calib810	1605 <i>approx</i> Multinterval Centre	
GrA-21607	3790 ± 60	NHemisphere	CalTable	2227 ± 97
			CalKN	2228 ± 101
			Multigroup	2228 ± 98
			CalDiet	2228 ± 101
			Chronology	2228 ± 100
			<u>Database</u>	<u>2228 ± 100</u>
			Standard Value	2228 ± 100
		Calib810	2220 <i>approx</i> Multinterval Centre	
GrA-28991	3325 ± 40	NHemisphere	CalTable	1591 ± 53
			CalKN	1594 ± 56
			Multigroup	1592 ± 54
			CalDiet	1593 ± 56
			Chronology	1593 ± 56
			<u>Database</u>	<u>1593 ± 56</u>
			Standard Value	1593 ± 56
		Calib810	1580 <i>approx</i> Multinterval Centre	

Results

The CCS-study is based on the comparison of six different CalPal dialogs and two different Calibration Curves (INTCAL20, Marine20), whereby N=3 ¹⁴C-input ages are utilised. The results (**Tab.2**) indicate the existence of numeric interdialog CalAge-variability for CC-Switching in the range of ± 2 calyrs. Variations in CalAge-Error (STD: 68%) are also in the range of ± 2 calyrs.

Finally, we note that - strictly speaking - the (abbreviated) comparison of Calib810 and CalPal results as provided in **Tab.2** is not particularly useful for the present purpose, which is aimed at annual scale comparisons. This is due to the different notation of the age results: Calib810 uses multiple intervals; CalPal uses central values. A more meaningful comparison can be achieved, when based - not on the numeric output of the two programs (which is secondarily abbreviated) - but on their graphic output (which is closer to the primary calculations). Notwithstanding the lack of an efficient comparison methodology, as can be taken from **Fig.1** the *initial* graphic results of CalPal and OxCal are actually so highly similar, that pertaining differences (**Tab.2**) can probably be attributed – albeit completely - to the applied *secondary* methods of graphic and statistical processing. In other words, any apparent differences (**Tab.2**) are most probably due to the use of multiple calibration readings (Calib), in comparison to the use of central values (CalPal). Beyond this, there there are no measurable differences (± 2 calyrs) between the different CalPal-dialogs, nor do discernible differences exist between the results of CalPal and Calib810. As can be taken from **Tab.3**, satisfactory agreement is also achieved for a wider range of N-Hemispheric ¹⁴C-ages (**Tab.3 upper**), as well as for a comparison of CalPal/Calib results for Marine20 calibration with regional DeltaR/σ corrections (**Tab.3 lower**) based on values provided under <http://calib.org/marine/>.

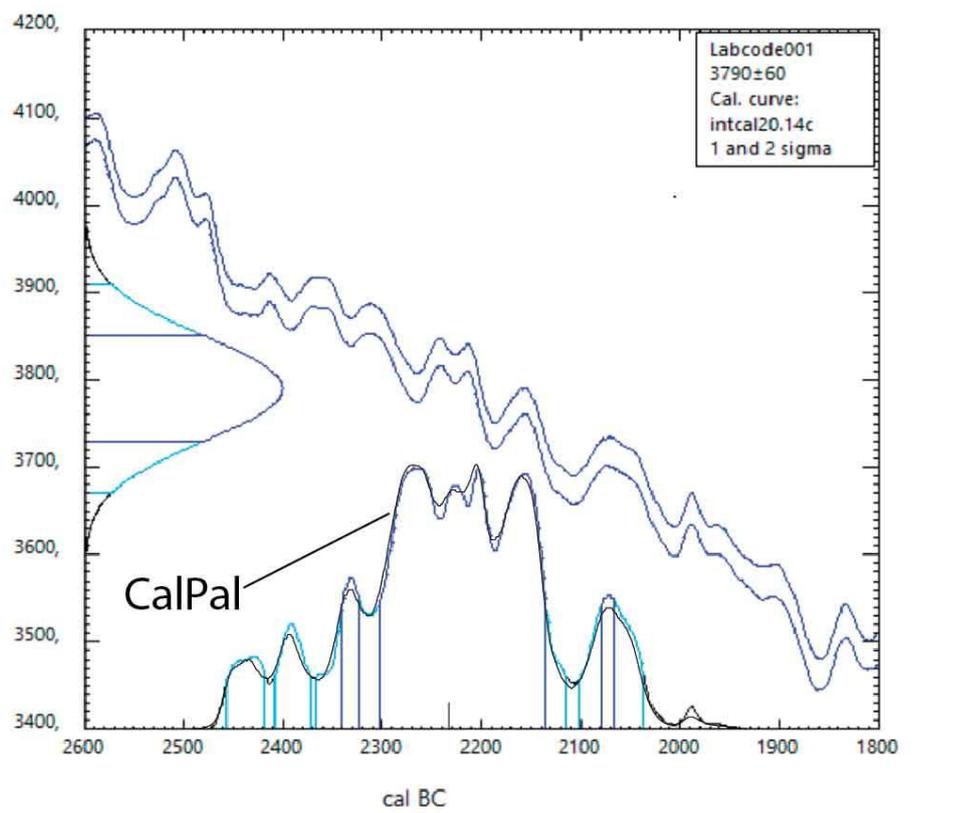


Fig.1 Comparison of Graphic Output for Calib810 and CalPal for the ¹⁴C-Age 3790 ± 60 BP

Tab 3. CalPal-Calib810 Comparison of CCS-Results with/without DeltaR/σ-corrections

Database	METHOD	Lab Code	¹⁴ C-Age	STD	DeltaR	STD	CalAge	68%	Calib810
Sheet			[BP]		[BP]		[calBC]		~ [calBC]
Europe	NHemisphere	UC-43405	4025	20	0	0	2525	35	2515
Europe	NHemisphere	UC-43406	4090	20	0	0	2633	48	2605
Europe	N-Hemisphere	Beta-426501	15360	50	0	0	16764	40	16765
Europe	N-Hemisphere	Beta-426504	15140	50	0	0	16506	134	16516
Europe	N-Hemisphere	Beta-426506	14440	50	0	0	15661	121	15649
Polynesia	Marine	Beta-313868	3480	30	-163	73	1425	93	1426
Polynesia	Marine	Beta-313869	3440	30	-163	73	1376	93	1384
Polynesia	Marine	Beta-316282	3400	30	-163	73	1328	91	1336
Polynesia	Marine	Beta-316283	3390	30	-163	73	1317	92	1325
Polynesia	Marine	Beta-316284	3500	30	-163	73	1452	93	1468

References

Calib810

CALIB rev. 8; Stuiver, M., and Reimer, P.J., 1993, *Radiocarbon*, 35, 215-230

INTCAL20

Reimer PJ, Austin WEN, Bard E, et al. The IntCal20 Northern Hemisphere Radiocarbon Age Calibration Curve (0–55 cal kBP). *Radiocarbon*. 2020;62(4):725-757. doi:10.1017/RDC.2020.41

Marine20

Heaton TJ, Köhler P, Butzin M, et al. Marine20 . The Marine Radiocarbon Age Calibration Curve (0–55,000 cal BP). *Radiocarbon*. 2020;62(4):779-820. doi:10.1017/RDC.2020.68