

UPPSALA RADIOCARBON MEASUREMENTS X

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The following list covers samples measured since the last list of atmospheric samples (Radiocarbon, 1967, v. 9, p. 471-476) was written, to determine the increase of the C^{14}/C^{12} ratio due to explosion of nuclear devices.

Technique is the same as described previously (Olsson, 1958). Collection of CO_2 is still made by static absorption in 0.5 N NaOH as described earlier (Radiocarbon, 1965, v. 7, p. 331-335). The reference sample is 95% of the activity of the NBS oxalic-acid standard in 1950. Corrections for deviations from the normal C^{13}/C^{12} ratio are applied. No correction for industrial effect is applied. The results in this list are given as an excess, Δ , over the reference sample:

$$\Delta = \delta C^{14} - (2\delta C^{13} + 50) \left(1 + \frac{\delta C^{14}}{1000}\right)$$

where δC^{14} is the age corrected C^{14} deviation from the reference sample per mil in 1950, and δC^{13} is the deviation from the PDB standard per mil.

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A. Abisko, Sweden

Abisko Naturvetenskapliga Station, a scientific station, belongs to Kungliga Vetenskapsakademien. Sampling apparatus ($68^\circ 20.5'$ N Lat, $18^\circ 49.3'$ E Long) is at +390 m near Lake Torne Träsk in mt. dist. of Sweden. Nearby r.r. is electrically operated; the few houses and tourist sta. 0.2 to 1.5 km away are heated with oil or wood. Due to absence of a road connection only a few motor vehicles are used. Thus contamination of the locality by fossil fuels is minimal. Apparatus is placed above treetops.

Dating no.	Sample no.	Month	Day	Year	$\delta C^{14}\%$	$\delta C^{13}\%$	$\Delta\%$
U-397	UA-164s	Sept.	5- 8,	1965	854	-25.1	855 \pm 14
U-398	UA-197	Aug.	16-19,	1966	747	-25.8	750 \pm 14
U-399	UA-204	Nov.	15-18,	1966	652	-25.5	654 \pm 10
U-907	UA-216	Mar.	15-18,	1967	626	-26.0	629 \pm 10
U-908	UA-219	Apr.	15-18,	1967	679	-26.5	685 \pm 9
U-909	UA-222	July	15-18,	1967	652	-23.0	645 \pm 10
U-910	UA-224	Aug.	15-18,	1967	649	-24.7	648 \pm 10
U-912	UA-211	Jan.	15-18,	1967	671	-29.0	684 \pm 10
U-913	UA-226	Sept.	16-19,	1967	611	-25.2	612 \pm 10
U-914	UA-196	Aug.	4- 7,	1966	725	-26.2	729 \pm 11
U-915	UA-220	June	17-20,	1967	641	-28.0	651 \pm 10
U-916	UA-228	Oct.	15-18,	1967	611	-26.0	615 \pm 10
U-917	UA-233	Dec.	30,	1967	595	-26.5	599 \pm 10
			to				
		Jan.	2,	1968			
U-918	UA-235	Mar.	16-19,	1968	568	-25.1	569 \pm 13
U-919	UA-237	May	15-18,	1968	585	-25.8*	(588 \pm 14)
U-920	UA-195	July	25-28,	1966	735	-24.5	734 \pm 12
U-2317	UA-194	July	15-18,	1965	750	-20.4	734 \pm 14
U-2319	UA-162	Aug.	5- 8,	1965	1115	-23.1	1107 \pm 18
U-2320	UA-202	Oct.	15-18,	1966	700	-25.8	702 \pm 11
U-2321	UA-214	Feb.	15-18,	1967	652	-27.0	659 \pm 11
U-2322	UA-208	Dec.	15-18,	1966	663	-27.2	670 \pm 14
U-2326	UA-230	Nov.	17-20,	1967	592	-25.2	593 \pm 12
U-2327	UA-232	Dec.	15-18,	1967	582	-28.0	592 \pm 15
U-2328	UA-234	Feb.	16-19,	1968	571	-27.7	579 \pm 11
U-2331	UA-236	Apr.	15-18,	1968	601	-25.8*	(603 \pm 15)

* δC^{13} assumed

B. Kapp Linné, Spitsbergen

Kapp Linné is a radio and meteorologic station belonging to Telegrafstyret, Oslo, Norway. Sampling apparatus (78° 04' N Lat, 13° 38' E Long) is only a few m above sea level near shore at mouth of Isfjorden. Apparatus is placed on top of a small house far from generators and their smoke.

Dating no.	Sample no.	Month	Day	Year	$\delta C^{14}\text{‰}$	$\delta C^{13}\text{‰}$	$\Delta \text{‰}$
U-395	US-49	Mar.	21-25,	1966	699	-26.7	705 \pm 10
U-396	US-42	Sept.	14-18,	1965	789	-26.1	793 \pm 10
U-900	US-50	June	22-26,	1966	726	-24.6	725 \pm 11
U-901	US-51	July	31,	1966	732	-22.2	722 \pm 11
			to				
		Aug.	4,	1966			
U-902	US-52	Aug.	31,	1966	709	-23.2	703 \pm 10
			to				
		Sept.	4,	1966			
U-903	US-53	Sept.	21-25,	1966	687	-25.4	689 \pm 10
U-904	US-54	Oct.	18-21,	1966	705	-25.5	707 \pm 8
U-905	US-56	Dec.	15-18,	1966	668	-26.7	674 \pm 10
U-906	US-59	Mar.	15-18,	1967	644	-26.1	647 \pm 10
U-911	US-61	May	15-18,	1967	644	-26.7	649 \pm 11
U-921	US-560	Aug.	16-19,	1967	647	-24.9	647 \pm 10
U-922	US-570	Sept.	15-18,	1967	642	-25.9	645 \pm 12
U-923	US-580	Oct.	17-20,	1967	615	-25.1	615 \pm 9
U-924	US-590	Nov.	15-18,	1967	622	-25.3	623 \pm 11
U-925	US-62	Jan.	15-18,	1968	583	-24.2	580 \pm 11
U-926	US-63	Feb.	17-20,	1968	573	-28.9	585 \pm 9
U-927	US-64	Mar.	17-20,	1968	592	-26.7	597 \pm 10
U-2315	US-48	Feb.	23-27,	1966	825	-25.8*	(828 \pm 80)
U-2318	US-43	Sept.	27,	1965	706	-26.4	711 \pm 15
			to				
		Oct.	1,	1965			
U-2323	US-60	Apr.	15-18,	1967	623	-29.1	637 \pm 14
U-2324	US-55	Nov.	16-19,	1966	674	-29.2	687 \pm 13
U-2325	US-58	Feb.	21-24,	1967	668	-24.9	668 \pm 14
U-2329	US-550	July	12-15,	1967	645	-25.8	648 \pm 13
U-2330	US-600	Dec.	16-19,	1967	598	-28.4	609 \pm 15

* δC^{13} assumed

General Comment: activity in 1967 showed only small summer increase, and seems to level out at value slightly less than 600‰ excess, which also reached in atmosphere of S hemisphere; it seems as if activity reached maximum there 1964 to 1965. Pretoria samples (pers. commun.) in 1964 showed almost 700‰ excess and Brazil samples in 1966 showed excess of ca. 600‰ (Radiocarbon, 1968, v. 10, p. 414). Since 1966, Uppsala values show no significant difference from Los Angeles values from China Lake (Radiocarbon, 1968, v. 10, p. 413). Since 1966 there is no significant difference between activity at Abisko and that on Spitsbergen.

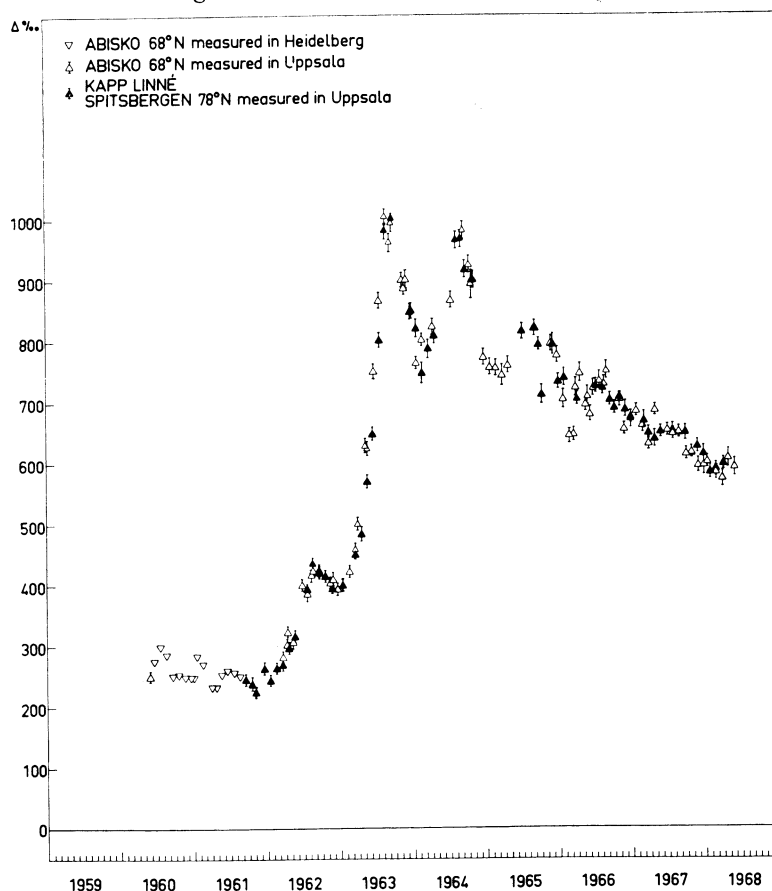


Fig. 1. Per mil C^{14} excess over natural concentration (Δ) at Abisko and on Kapp Linné. Points given with statistical errors are determined at the Uppsala C^{14} lab. Points given without statistical errors are determined at Heidelberg C^{14} Lab. (Münnich and Vogel, 1963) but collected through Uppsala Lab. Values from 1965 corresponding to contamination at Abisko (Olsson and Stenberg, 1967) are not included.

REFERENCES

Date lists:

- | | |
|--------------|---------------------------|
| UCLA VIII | Berger and Libby, 1968 |
| Uppsala VI | Olsson and Karlén, 1965 |
| Uppsala VIII | Stenberg and Olsson, 1967 |
- Berger, Rainer and Libby, W. F., 1968, UCLA radiocarbon dates VIII: Radiocarbon, v. 10, p. 402-416.
- Münnich, K. O. and Vogel, J. C., 1963, Investigation of meridional transport in the troposphere by means of carbon-14 measurements: Radioactive dating, IAEA, Vienna 1963, p. 189-197.
- Olsson, I. U., 1958, A C^{14} dating station using the CO_2 proportional counting method: Arkiv f. Fysik, v. 13, p. 37-60.
- Olsson, I. U. and Karlén, Ingvar, 1965, Uppsala radiocarbon measurements VI: Radiocarbon, v. 7, p. 331-335.
- Olsson, I. U. and Stenberg, Allan, 1967, Very high C^{14} activity in Abisko, Sweden, during summer, 1965: Radioactive dating and methods of low-level counting, IAEA, Vienna 1967, p. 69-78.
- Stenberg, Allan and Olsson, I. U., 1967, Uppsala radiocarbon measurements VIII: Radiocarbon, v. 9, p. 471-476.