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POLICIES OF APARTHEID OF THE GOVERNMENT OF SOUTH AFRICA

Inquiry into the reports concerning a nuclear explosion by South Africa

Report of the Secretary-General

Addendum

1. In pursuance of the request addressed to the Secretary-General by the General Assembly at its 47th plenary meeting, on 26 October 1979, the Secretary-General submitted a report to the Assembly dated 12 November 1979 (A/34/674).

2. The Secretary-General has received from the Permanent Representative of New Zealand to the United Nations a letter dated 23 November 1979 on the subject of the report. The text of the letter is annexed hereto.

ANNEX

Letter dated 23 November 1979 from the Permanent Representative of New Zealand to the United Nations addressed to the Secretary-General

I refer to the interim report dated 31 October 1979 on your inquiry into the reports concerning a nuclear explosion by South Africa (A/34/639), in which you invited Member States to make available any relevant information on this matter they might be in a position to provide.

Three New Zealand Government research centres - the National Radiation Laboratory of the Department of Health, the Institute of Nuclear Sciences and the Seismological Observatory, both of the Department of Scientific and Industrial Research - were requested to provide any information relevant to your inquiry. The research centres concerned having concluded their substantive investigations, I now attach the following:

(a) Letter dated 8 November 1979 from the Director of the National Radiation Laboratory to the Secretary of Foreign Affairs, Wellington, being a preliminary statement in response to the above request (appendix I);

(b) Report by the Director of the National Radiation Laboratory, dated 12 November 1979 (appendix II);

(c) Report by the Superintendent of the Seismological Observatory, dated 9 November 1979. (This is a summary based on detailed examination of extensive seismograph records which, numbering many hundreds of pages, could not easily be reduced to a format suitable for transmission.) (appendix III);

(d) Report by the Director of the Institute of Nuclear Sciences, dated 16 November 1979 (appendix IV);

(e) Report by the Director of the Institute of Nuclear Sciences, dated 23 November 1979 (appendix V).

It is clear, from these reports, that scientific evidence and research in New Zealand does not verify reports that South Africa, or any other country, detonated a nuclear device in the southern hemisphere on or around 22 September 1979.

(Signed) H. H. FRANCIS

APPENDIX I

LETTER DATED 8 NOVEMBER 1979 FROM THE DIRECTOR, NATIONAL RADIATION LABORATORY, DEPARTMENT OF HEALTH, TO SECRETARY OF FOREIGN AFFAIRS, WELLINGTON

In response to your request for technical information to enable you to respond to the invitation from the Secretary-General of the United Nations to provide any relevant information concerning reports that South Africa had conducted an atomic explosion, the following preliminary statement from the National Radiation Laboratory may be of assistance.

Total beta activity measures in thrice weekly air filters and weekly rain collections at Fiji, Samoa, Tonga and the Cook Islands, and in New Zealand at Auckland, Wellington, Hokitika and Christchurch give levels at or below the limit of detection in all samples measured. Measurements are complete to the end of October for Pacific Islands. The limits of detection for air in picocuries per cubic metre are 0.01 for New Zealand stations and 0.02 for Pacific Islands. The limits of detection for rain in millicuries per square kilometre are 0.05 for New Zealand stations and 0.15 for Pacific Islands.

The Kaitaia October monthly pot collection for strontium-90 analysis now concentrated on ion exchange resin is being evaluated on the high resolution gamma spectrometer. No fresh fission products have been detected in a 24 hour measurement. Long lived caesium-137 is detectable in this sample significantly above its limit of detection of 0.004 millicuries per square kilometre.

Other resin samples for October are now coming to hand. Measurements on these will be made by gamma spectroscopy. They will also be measured for strontium-89. Monthly air filters for all stations for October will be aggregated for extended measurement on the gamma spectrometer.

APPENDIX II

REPORT OF DIRECTOR, NATIONAL RADIATION LABORATORY, DEPARTMENT OF HEALTH, DATED 12 NOVEMBER 1979

SUMMARY

Maximum probability of detecting any fresh fission products which may have been present in the atmosphere during September and October, was achieved by bulking the two months' collection of routine air filters from our Christchurch, Hokitika, Wellington and Auckland monitoring stations. The bulked filters (representing a total sampled air volume of 40,000 m^3), together with the Hokitika October rainwater sample (concentrated by ion exchange techniques), were analysed by our low-background, high-resolution gamma spectroscopy equipment using a 3-1/2 day counting time. Qualitative analysis of the resulting gamma spectrum by computer revealed no statistically-significant levels of fresh fission products. Only expected naturally-occurring radionuclides (beryllium-7, potassium-40, lead-210, radium-226 and decay products, thorium-232 decay products) and traces of relatively long-term bomb-test fallout (caesium-137, cerium-144, ruthenium-106) were detected. There was thus no evidence of any recent release of fission products.

ATTEMPT TO DETECT DEBRIS FROM THE HYPOTHETICAL SOUTH AFRICAN BOMB TEST

In order to maximise the probability of detecting any fresh fission products which might have been present in the atmosphere during September or October 1979, an aggregate of our routine fallout monitoring samples, collected during those months, was prepared and analysed. The aggregate represented effectively the largest volume of sampled air obtainable from our existing routine monitoring network.

SAMPLE

All daily air filters (GFA . 11 cm) from Christchurch, Hokitika, Wellington and Auckland stations for September and October were compressed together. These combined filters represented a sampled air volume of 40,000 m^3.

Included with the air filters was the ion exchange resin from the Hokitika October rainwater collection. The Hokitika resin was chosen because (a) Hokitika had the heaviest rainfall (378 mm) of any New Zealand stations, and (b) it is on the west coast.

COUNTING EQUIPMENT

The sample was analysed using a high-resolution, lithium-drifted germanium detector (Canberra type 7229; 65 cm^3; relative efficiency 12.5 percent at 1332 kev, with 2.0 kev resolution) coupled to a Canberra-8180 4096 Channel Pulse Height Analyser. The detector was housed in a low-background, 12.5 cm wall thickness, lead shield.

A count time of 3 x 105 seconds was used, 8-11 November.

COUNTING GEOMETRY

The aggregate of filters and resin was counted in a perspex 400 ml Marinelli beaker designed to fit the above detector. Filters were compressed into the side sections of the beaker and the resin was held in a petri dish in the centre position above the detector.

COUNTING RESULT

Under the counting condition used, background count rate decreased with increasing pulse height (energy) such that the minimum detectable level (2 S.D. above background) for any γ-emission decreased from roughly 50 counts (per

300,000 seconds) to 10 counts over the energy range 50 - 1500 kev. For Cs-137, for example, the lower limit of detection was approximately 0.1 picocuries.

The following radionuclides were detected:

Ra 226 and associated decay products in dust	)	
Pb 212 : decay product of Th 232 in dust	)	Naturally occurring
Pb 210	)	
K40	)	
Be 7	)	
Cs 137 half-life 30 y : 500 counts	)	
Ce 144 half-life 0.8 y) trace amounts	)	Long term fallout
Ru 106 half-life 1 y	)	

No statistically-significant levels of any other artificial radionuclides were present, i.e. no fresh fission products were detected.

APPENDIX III

REPORT BY THE SUPERINTENDENT OF THE SEISMOLOGICAL OBSERVATORY, DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH, 9 NOVEMBER 1979

Seismographic records for 22 September from the seismic station at Rarotonga in the Cook Islands - a station which is capable of detecting hydroacoustic pulses from explosions in the sea - have been examined, but no response attributable to an explosion has been found.

As Rarotonga is 13,500 kilometres from South Africa, with the whole of Antarctica interposed, the negative result is not significant.

New Zealand seismic stations are not normally capable of detecting hydroacoustic waves nor atmospheric explosions.

APPENDIX IV

REPORT BY DIRECTOR, INSTITUTE OF NUCLEAR SCIENCES, DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH, DATED 16 NOVEMBER 1979

SUMMARY

Measurements made on a 30-litre rainfall sample collected at Gracefield, between 1 August and 28 October 1979, indicated the presence of the short-lived fission products barium-140, praseodymium-143/neodymium-147. The activities were very low, being about 0.02 picocuries per litre of water, but quite significantly above background. After counting for a number of days, the activity of the lanthanum-140, that is formed from the decay of barium-140, decayed at a rate consistent with the half-life of lanthanum-140 (40 hours). If there was no contamination of the extracted samples, these would represent fresh fallout debris.

Analysis for a new sample of lanthanum-140 was carried out, and this produced a null result. In addition, the original lanthanum sample did not decay to zero, indicating some form of long-lived contamination.

Further tests are being made to determine whether the activity in the original extracts are fission products or other contaminant material.

At this time, the evidence for the presence of fresh fallout is in doubt.

MEASUREMENT OF RADIOACTIVE FALLOUT AT GRACEFIELD IN RAIN COLLECTED BETWEEN 1 AUGUST AND 28 OCTOBER 1979

SAMPLE

Some 30 litres of rain water collected in a stainless steel pot of area 734 cm^3, and into which carrier elements

had been inserted at the beginning of the collection period, was retrieved on the 28 October 1979.

SEPARATION PROCEDURE

The sample was chemically processed, by scavenging the rare earth elements with iron hydroxide and then by separating the different elements on ion exchange columns (resin).

The elements separated are caesium, strontium, promethium, cerium, yttrium, praseodymium, barium and neodymium.

The short-lived radionuclides being sought are (with half-lives in brackets), yttrium-91 (59 days), barium-140 (12.8 days), praseodymium-143 (13.7 days), and neodymium-147 (11.1 days).

The barium-140 is not counted directly, but the daughter product lanthanum-140 (half-life of 40 hours), which is separated from the barium on an ion-exchange column.

The different elements are precipitated and collected on filter paper for counting.

COUNTING EQUIPMENT

Sharp low beta gas flow counter.
Tracerlab low background gas flow beta counter.
Ortec lithium drifted germanium detector, 86 cc size, surrounded by NaI Scintillometer Annulus.

COUNTING RESULTS

The samples for ^{140}La, ^{91}Y, Ce and ^{143}Pr + ^{147}Nd, were first counted on 6 November 1979, and they were then recounted several times until 9 November 1979. The results are, in counts per minute (the errors shown being counting statistics):

^{143}Pr ^{147}Nd

Elapsed Time (m)	Count Rate
262	2.23 ± 0.071
1021	2.10 ± 0.045
400	2.13 ± 0.073
920	2.03 ± 0.047
Blank sample count rate	0.89 ± 0.012 cpm

This represents a net count rate of 1.23 cpm, or 1.17 pci, or a specific activity in water of about 0.04 pci/ℓ

^{91}Y

Elapsed Time (m)	Count Rate
262	1.33 ± 0.071
1021	1.36 ± 0.036
400	1.30 ± 0.057
920	1.30 ± 0.057
241	1.27 ± 0.037
Blank sample count rate	0.55 ± 0.018 cpm
Net count rate	0.7 cpm
which is an activity of	0.7 pci

^{140}La

Elapsed Time (m)	Mean Time of Count after 00.00 a.m. 6 November 1979 (km)	Count Rate	Net Count Rate
262	803	0.83	0.34 ± 0.058
1021	1448	0.70	0.21 ± 0.030
400	2164	0.62	0.13 ± 0.042
920	2675	0.70	0.21 ± 0.032
530	3557	0.59	0.10 ± 0.036
870	4269	0.59	0.10 ± 0.030
481	4945	0.67	0.18 ± 0.039

Blank sample count rate was, 0.49 ± 0.015 cpm. The net count had a half decay time consistent with 40 hours,

that expected for ^{140}La. This indicated an original activity for ^{140}Ba of about 0.02 pci/ℓ

Cerium

Elapsed Time (m)	Count Rate
262	3.44
1021	3.43
400	3.37
920	3.33

Blank sample count rate, 1.92 ± 0.018

Net count rate, 1.47 cpm

The ^{140}La and $^{143}Pr/\ ^{147}Nd$ results were significantly above background and were indicative of fresh nuclear debris. It was decided that further tests should be done to confirm that the samplers were not contaminated with other radionuclides. One option was to 'milk' a new sample of ^{140}La from the ^{140}Ba. Because there was a crack in the water jacket of the ion-exchange column, a new column was assembled, using new resin. A new ^{140}La sample was produced on 15 November 1979, and counted over night. The result was:

0.49 cpm, blank sample rate, 0.49 ± 0.015

Net count rate, 0.0.

This indicated that the original ^{140}La sample may have been contaminated. In addition, the activity of the original ^{140}La sample did not fall below a net count rate of 0.10 cpm; this also indicates that the original ^{140}La sample was contaminated with a radionuclide of longer life. The original ^{140}La and $^{143}Pr/\ ^{147}Nd$ filter papers are being measured in a gamma-ray spectrometer in order to determine whether there are any gamma-ray emitting contaminants present. The counting will take from several days to a week. They will then be examined in an alpha-ray counter (probably at National Radiation Laboratory) to determine whether there is radioactivity of natural origin present (from dust).

Until this work is complete, the original suggestion that fresh radioactive fission products are present should be considered to be doubtful.

APPENDIX V

REPORT BY DIRECTOR, INSTITUTE OF NUCLEAR SCIENCES, DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH, DATED 23 NOVEMBER 1979

Measure of radioactive fallout at Gracefield, Lower Hutt.

New measurements made at the Institute of Nuclear Sciences on the original rain water sample, and also on a larger 150-litre rain water sample collected up to the 8 November, do not confirm our earlier results. We can now definitely say that within the limits of detection available with the new sample, there is no barium-140 or praseodymium-143 present in the sample. The limit of detection with the large sample is about one-thousandth of a pico-curie per litre. The final conclusion of extensive measurements on both these samples is that there is no evidence of fresh radioactive fallout during the past three months.

Measurements have indicated that the original samples were contaminated with other radionuclides. The original lanthanum sample did not decay to zero, and the original praseodymium sample did not appear to decay at all, which indicates that there was longer-lived radioactivity present. We are still not certain what this radioactivity is, but within our limits of detection, it does not emit any gamma rays. There may have been some natural radioactive contamination, but we have no definite proof of this at present. We will attempt to determine the identity of these contaminant radionuclides by beta-ray spectroscopy during the next few weeks. Determination of the decay rates of the contaminants will also be made, but this may take up to a year to accomplish. However, these findings will not alter the above conclusions.
