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Analysis Report

RAP110913-OCJ-01

ANALYSIS

Object : Evaluation of the environmental consequences in Japan caused by the Fukushima nuclear power plant accident

REPORT ID

RAP110913-OCJ-01 FROM : **September 13, 2011** version : **01**
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SAMPLES TYPES

ENVIRONMENT MATRICES : SOILS AND VEGETABLES

QUANTITY

06 Samples received : August 11, 2011

ANALYSES PERFORMED

MEASUREMENT OF GAMMA EMITTERS RADIONUCLIDES BY GAMMA SPECTROMETRY

SEARCH FOR ARTIFICIAL NUCLIDES

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1. SAMPLES IDENTIFICATION

Reception date: August-11, 2011

The samples were collected by Japanese citizens according to the regular instructions and methodology provided by ACRO. The samples characteristics are given in the table below.

Sample No.	Item	Place	Date	Obs.	ACRO Id.
0801S-1	ジャガイモ Potatoes	福島県喜多方市C (C) Kitakata-City, Fukushima prefecture	2011. 7. 16	-	110811-OCJ-05
0801S-2	土 Soil	福島県喜多方市C (C) Kitakata-City, Fukushima prefecture	2011. 7. 16	Surface : 10x10 cm Total : 550g	110811-OCJ-06
0801S-3	土 Soil	福島県喜多方市D (D) Kitakata-City, Fukushima prefecture	2011. 7. 16	Surface : 10x10 cm Total : 482g	110811-OCJ-07
0801S-4	土 Soil	北海道富良野市麓郷 Rokugou Frano-City, Hokkaido	2011. 6. 23	Surface : 10x10 cm Total : 450g	110811-OCJ-08
0801S-5	土 Soil	宮城県角田市台山公園 Daiyama Park, Kakuta-City, Miyagi pref.	2011. 6. 28	Surface : 10x10 cm Total : 1040g	110811-OCJ-09
0801S-5	土 Soil	宮城県白石市越河小学校 Koshigou primary school, Siraishi-City Miyagi prefecture	2011. 6. 28	Surface : 10x10 cm Total : 1034g	110811-OCJ-10

2. ANALYSIS METHOD

Soils :

After homogenization, a representative part of raw sample is conditioned in a geometry adapted to the gamma measurement.

Vegetables :

The potatoes are washed and grated to be conditioned in a geometry adapted to the gamma measurement.

The analyses are performed by gamma spectrometry (High-Purity Germanium) on raw material for soils, and fresh material for vegetables (see annex 1). The results are displayed in the following table.

The soils is prepared as the instrucion given by the norm.

3. RESULTS : MASS ACTIVITY (Bq/kg)

Sample identification							
ACRO Sample number registration		110811-OCJ-05	110811-OCJ-06	110811-OCJ-07	110811-OCJ-08	110811-OCJ-09	110811-OCJ-10
Type		potatoes	soil	soil	soil	soil	soil
sample number registration		0801S-1	0801S-2	0801S-3	0801S-4	0801S-5	0801S-6
Sampling							
date		July 16, 2011	July 16, 2011	July 16, 2011	June 23, 2011	June 28, 2011	June 28, 2011
place		(C) Kitakata-City, Fukushima Pref.	(C) Kitakata-City, Fukushima Pref.	(D) Kitakata-City, Fukushima Pref.	Rokugou Frano-City, Hokkaido	Daiyama Park Kakuta- City, Miyagi Pref.	Koshigou primary school, Siraishi-City, Miyagi Pref.
surface area collected			100 cm ²	100 cm ²	100 cm ²	100 cm ²	100 cm ²
Total mass collected (g)			550	482	450	1,040	1,034
Counting							
Geometry (ml)		500	61	61	61	61	61
Sample mass analysed (g)		404.3	59	56.7	70.4	96.4	124.7
analysed state		fresh	raw	raw	raw	raw	raw
Counting date		August 17, 2011	August 21, 2011	August 21, 2011	August 23, 2011	August 23, 2011	August 25, 2011
Results							
Reference date		July 16, 2011	July 16, 2011	July 16, 2011	June 23, 2011	June 28, 2011	June 28, 2011
Unit		Bq/kg fresh weight	Bq/kg raw weight	Bq/kg raw weight	Bq/kg raw weight	Bq/kg raw weight	Bq/kg raw weight
ARTIFICIALS RADIONUCLIDES							
Ag-110m	250 days	< 1	< 3	< 3	< 3	3.5 ± 1.3	5.9 ± 2.1
Te-129m	33,6 days	< 28	< 120	< 120	< 180	130 ± 8	330 ± 140
I-131	8 days	< 6	< 48	< 36	-	-	-
Cs-134	2.1 years	0.56 ± 0.30	270 ± 31	73 ± 9	2.2 ± 1.1	750 ± 90	1,570 ± 190
Cs-137	30 years	0.64 ± 0.25	315 ± 37	91 ± 11	3.9 ± 1.1	820 ± 100	1,750 ± 200

4. RESULTS : SURFACE ACTIVITY OF SOILS (Bq/m²)

Sample identification						
ACRO Sample number registration	110811-OCJ-06	110811-OCJ-07	110811-OCJ-08	110811-OCJ-09	110811-OCJ-10	
Type	soil	soil	soil	soil	soil	
sample number registration	0801S-2	0801S-3	0801S-4	0801S-5	0801S-6	
Sampling						
date	July 16, 2011	July 16, 2011	June 23, 2011	June 28, 2011	June 28, 2011	
place	(C) Kitakata-City, Fukushima Pref.	(D) Kitakata-City, Fukushima Pref.	Rokugou Frano-City, Hokkaido	Daiyama Park Kakuta- City, Miyagi Pref.	Koshigou primary school, Siraishi-City, Miyagi Pref.	
surface area collected	100 cm ²	100 cm ²	100 cm ²	100 cm ²	100 cm ²	
Total mass collected (g)	550	482	450	1,040	1,034	
Counting						
Geometry (ml)	61	61	61	61	61	
Sample mass analysed (g)	59	56.7	70.4	96.4	124.7	
analysed state	raw	raw	raw	raw	raw	
Counting date	August 21, 2011	August 21, 2011	August 23, 2011	August 23, 2011	August 25, 2011	
Results						
Reference date	July 16, 2011	July 16, 2011	June 23, 2011	June 28, 2011	June 28, 2011	
Unit	Bq/m ²	Bq/m ²	Bq/m ²	Bq/m ²	Bq/m ²	
ARTIFICIALS RADIONUCLIDES						
Ag-110m	250 days	< 165	< 144.6	< 135	364 ± 135	610.1 ± 217.14
Te-129m	33,6 days	< 6,600	< 5,784	< 8,100	13520 ± 832	34,122 ± 14,476
I-131	8 days	< 2,640	< 1,735	-	-	-
Cs-134	2.1 years	14,850 ± 1,705	3,519 ± 434	99 ± 50	78,000 ± 9,360	162,338 ± 19,646
Cs-137	30 years	17,325 ± 2,035	4,386 ± 530	176 ± 50	85,280 ± 10,400	180,950 ± 20,680

APPENDIX 1

ANALYSIS	GAMMA
TITLE	Measurement of gamma emitters nuclides by gamma spectrometry
TREATMENT	The soil sample is homogenized and a representative part is taken to be conditioned in a geometry adapted to the gamma measurement. Vegetables are washed and grated to be conditioned.
MATERIAL	High-Purity Germanium (HPGe), type N coaxial , 32% efficiency, mounted in a vertical cryostate. The samples are placed in a 10-cm thick lead shielding. Data are readout by a digital acquisition system (DSPEC-ORTECH). The energy range is taken as 27-2000 keV. The containers are plastic round boxes with a fiducial volume of 61ml (ref. 7215) and standard geometries of 500ml.
UNITS	The measured quantity is the activity in becquerel (Bq) per kilogram of raw or fresh material (kg), and becquerel (Bq) per square meter (m ²)

RESULTS	
IN GENERAL	<p>Measurements are performed with identical geometries as those of the standard (calibrated) sources. They concern gamma-emitters radionuclides displaying one or several emission peaks within the reference energy range. Among all the radionuclides detected in the samples, only the most abundant are displayed in the tables, without any specific demand from the client. In all cases, the tables display at least all detected artificial radionuclides.</p> <p>Only elements with activity larger than the decision threshold are given. On the contrary, for the specified radionuclides, the detection limit –LD- (detection limit) is indicated, with the inferior “<” sign. When it is not possible to deduce a satisfying detection limit LD, the data are replaced by the sign “-“. When an element has been detected but cannot be quantified properly, the mention “Identified but Not Quantified” (INQ) is reported. The measured activity of each radioelement is given with its absolute uncertainty calculated within a 95% interval of confidence (2 times the standard deviation). Each expressed activity, including the detection limit, is calculated at the reference date indicated in the table (collection date and time).</p>

APPENDIX 2

INFORMATION ABOUT THE LABORATORY ACRO	
Measurements capacities	The ACRO laboratory can measure radon concentration in the air, tritium (HTO) in liquids and gamma radionuclides in all kind of matrices. Other measurements are under development. The measurement protocols are in accordance to the actual French and International standards (ISO/CEI 17025).
QUALIFICATION	
The laboratory is qualified for radioactivity measurements in the environment by the French nuclear safety authority (ASN)	
Decision n°DEP-DEU-0704-2009 du 8/12/09 Of French nuclear safety authority (ASN)	<ul style="list-style-type: none"> - Measurement of gamma-emitters radionuclides in biological matrices - Tritium measurement in waters
Decision n°DEP-DIS-346-2008	<ul style="list-style-type: none"> - Radon concentration (volume activity) in public places
Decision n°CODEP-DEU-2010-031543 du 15/06/10	<ul style="list-style-type: none"> - Measurement of gamma-emitters radionuclides in waters and soils - Uranium isotopes in soils - Thorium isotopes in soils
Decision CODEP-DEU-2011-031763 du 15/06/11	<ul style="list-style-type: none"> - Radium-226/228 and decaying partners in soils. - Measurement of gamma-emitters radionuclides in soils