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Radioactivity from Fukushima nuclear accident detected in Lisbon: concerns of and communication with the public

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17th EAN Workshop, 15-17 May 2017, Lisbon

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Introduction

- Following the NPP accident in Fukushima (Japan, 11 March 2011), fission products from the reactor were released into the atmosphere

- In Portugal, anthropogenic radionuclides originated from the accident were first detected in aerosol samples (at Azores and Sacavém aerosol sampling stations about two weeks after the accident)

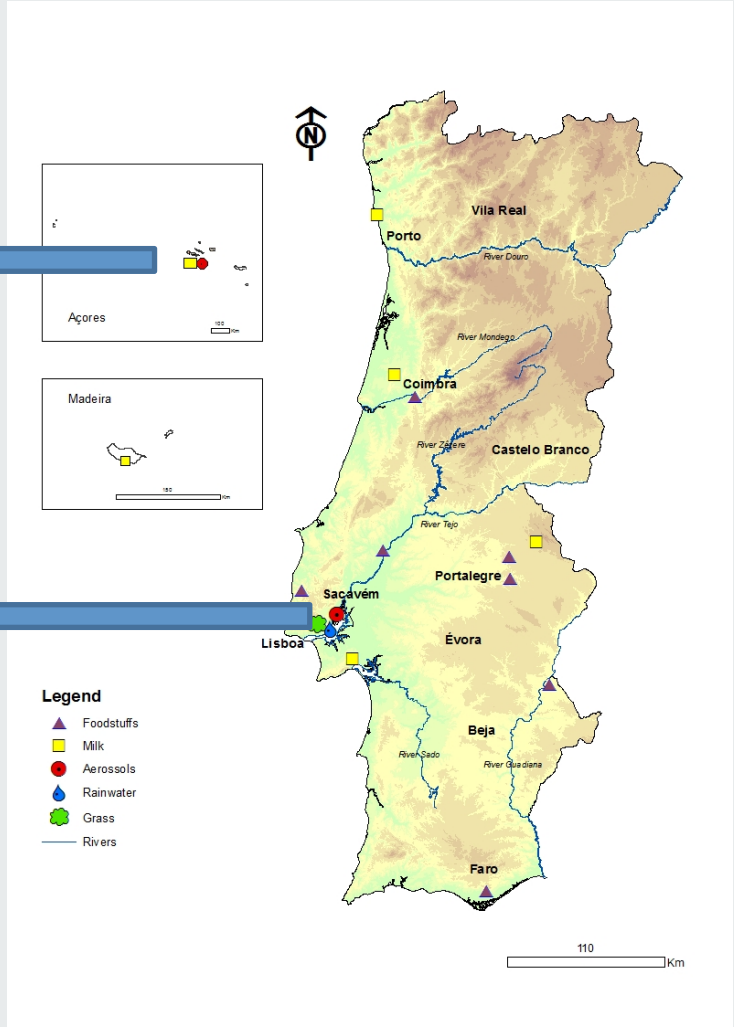
Radioactivity Environmental Monitoring

Radionuclide Particulate Station RN53

International Monitoring System for the verification of the Comphreensive nuclear Test Ban Treaty (CTBT)

Aerosol Sampling Station ASS-500

National Radiological Monitoring Programme and Art. 35 of the EURATOM Treaty



Aerosol sampling station (ASS-500)

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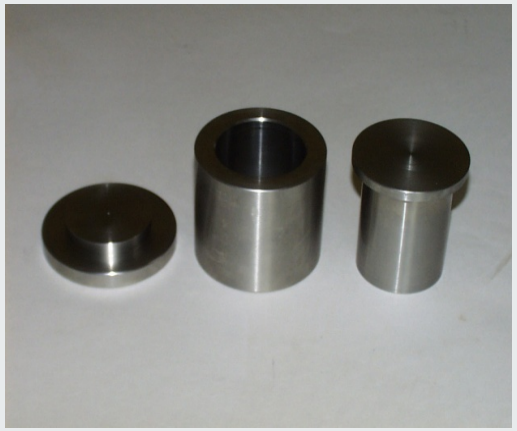
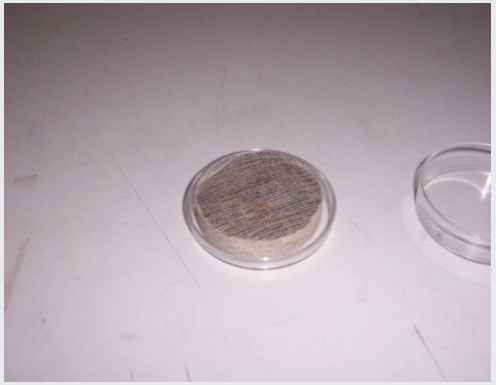


Compressed filter



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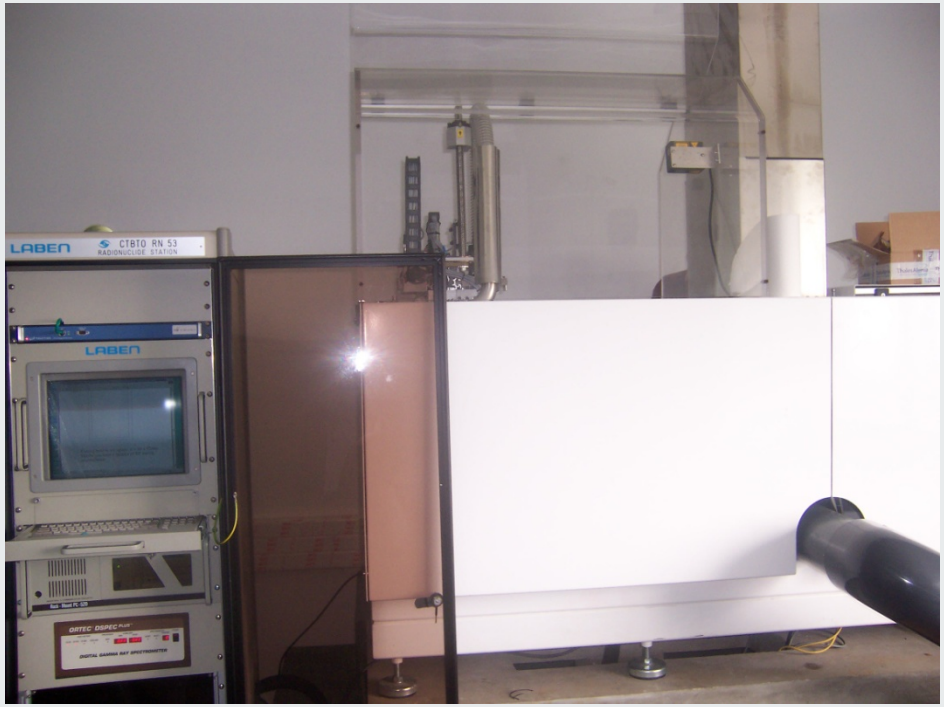
Radionuclide Particulate Station RN53 (S. Miguel)



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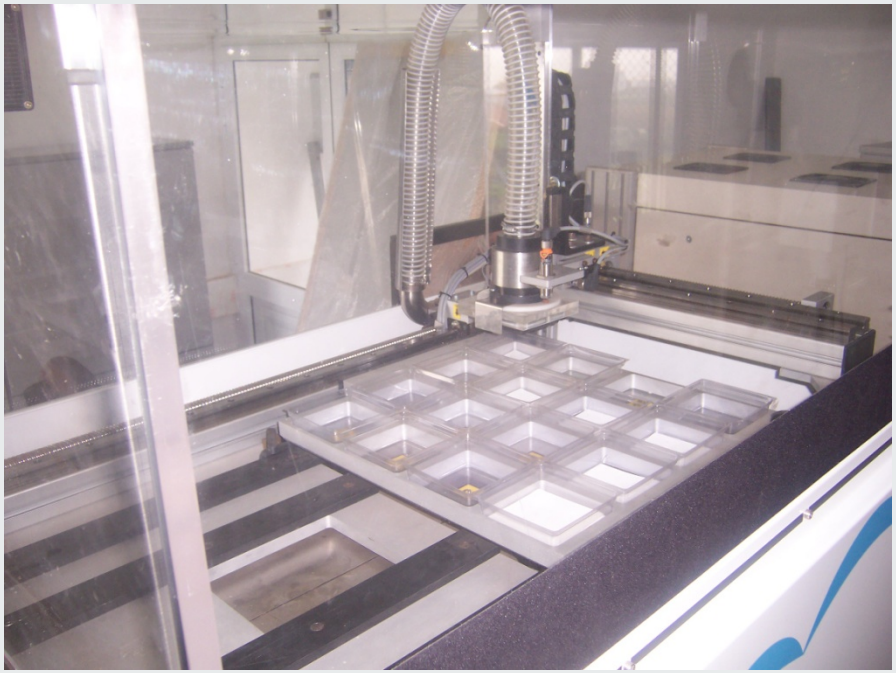

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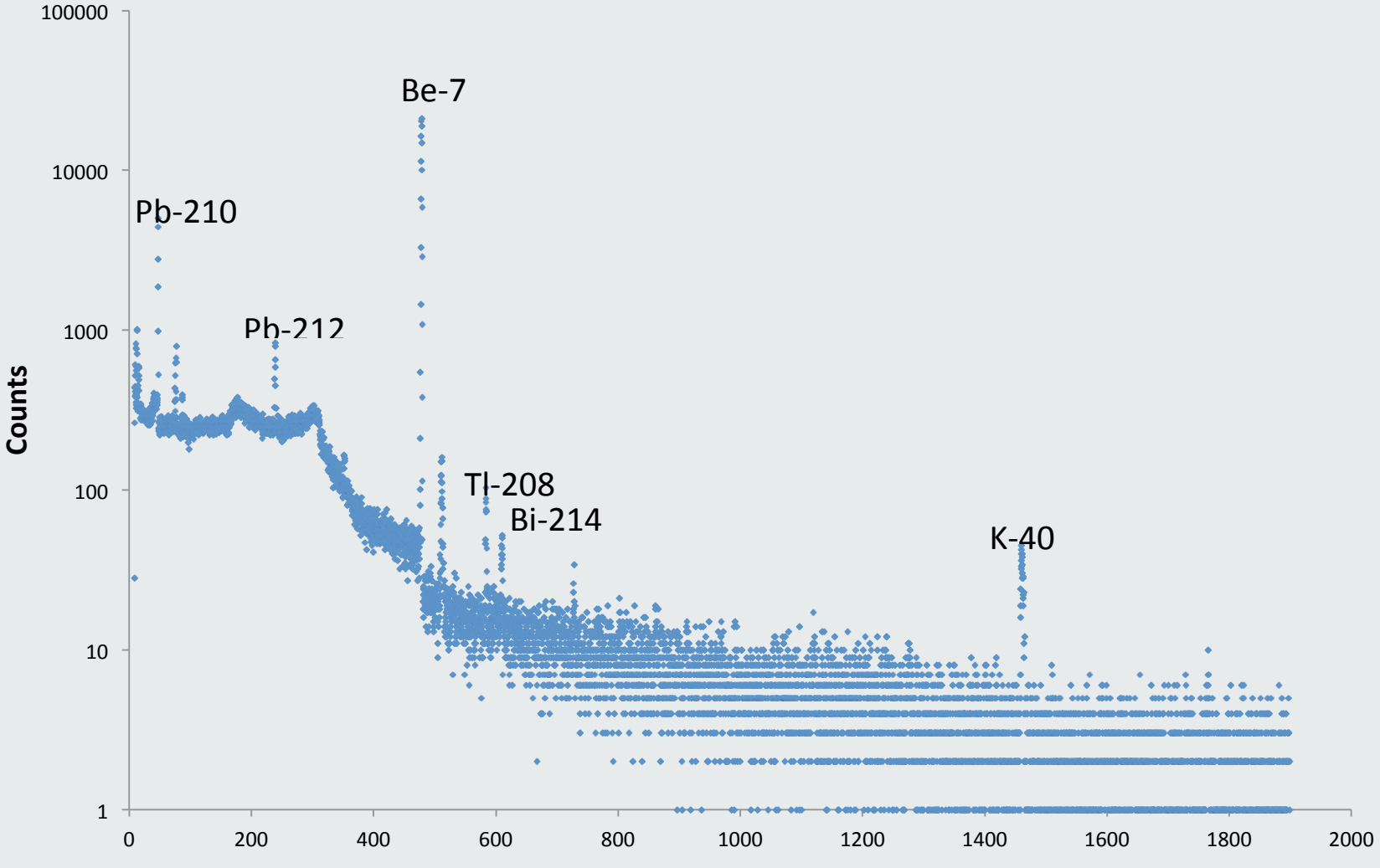

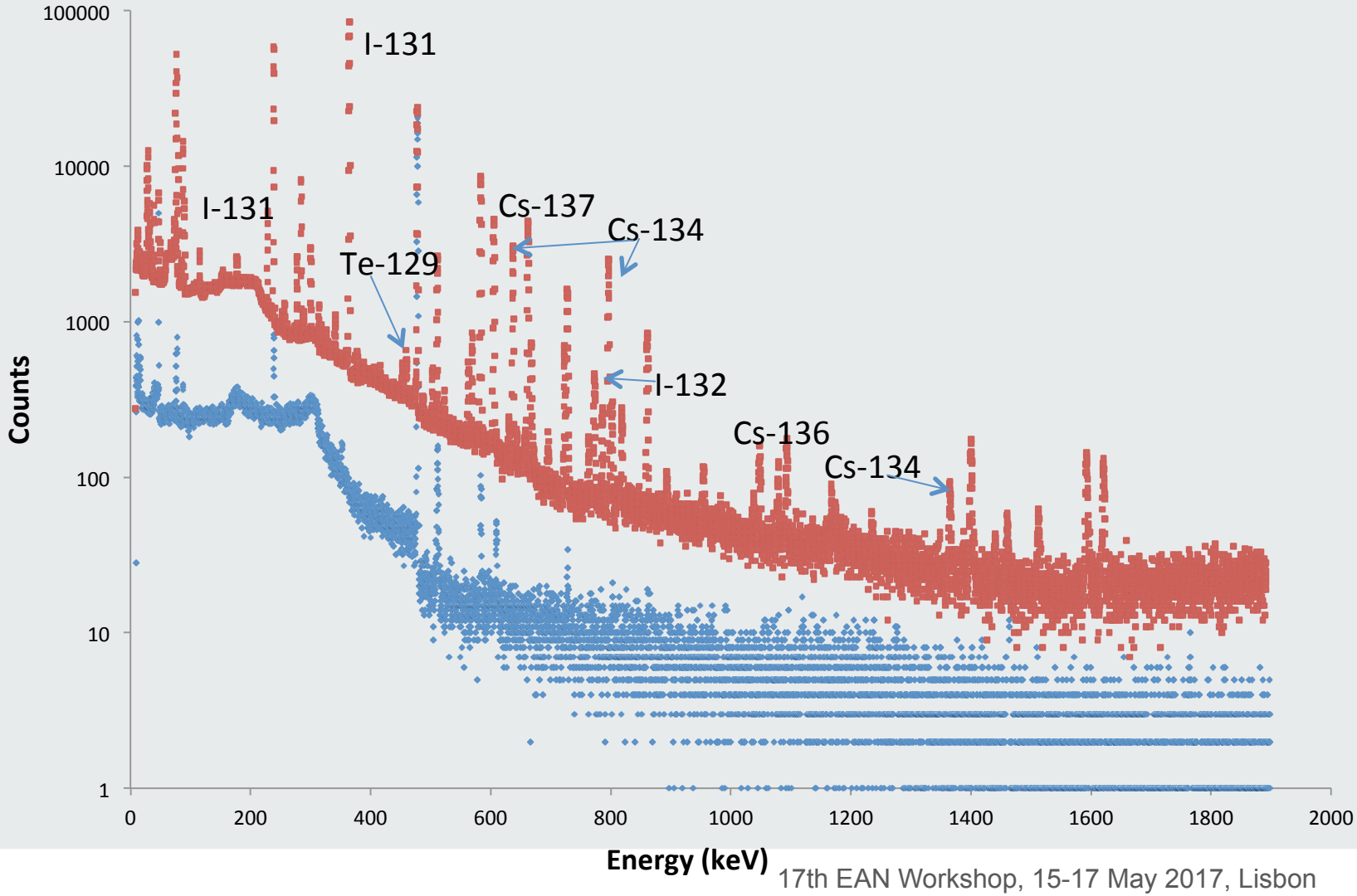
100000
10000
1000
100
10
1
Counts
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Energy (keV)
I-131
I-131
Te-129
Cs-137
Cs-134
I-132
Cs-136
Cs-134

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Backward trajectories

- “Backward trajectories” – To determine the origin of the air masses that reach the aerosol sampling station;
- HYSPLIT Model (HYbrid Single-Particle Lagrangian Integrated Trajectory) - Air Resources Laboratory (USA) from NOAA (National Oceanic and Atmospheric Administration);
- Archive meteorological data GDAS (Global Data Assimilation System) from the National Weather Service of USA – NCEP (National Centers for Environmental Prediction).

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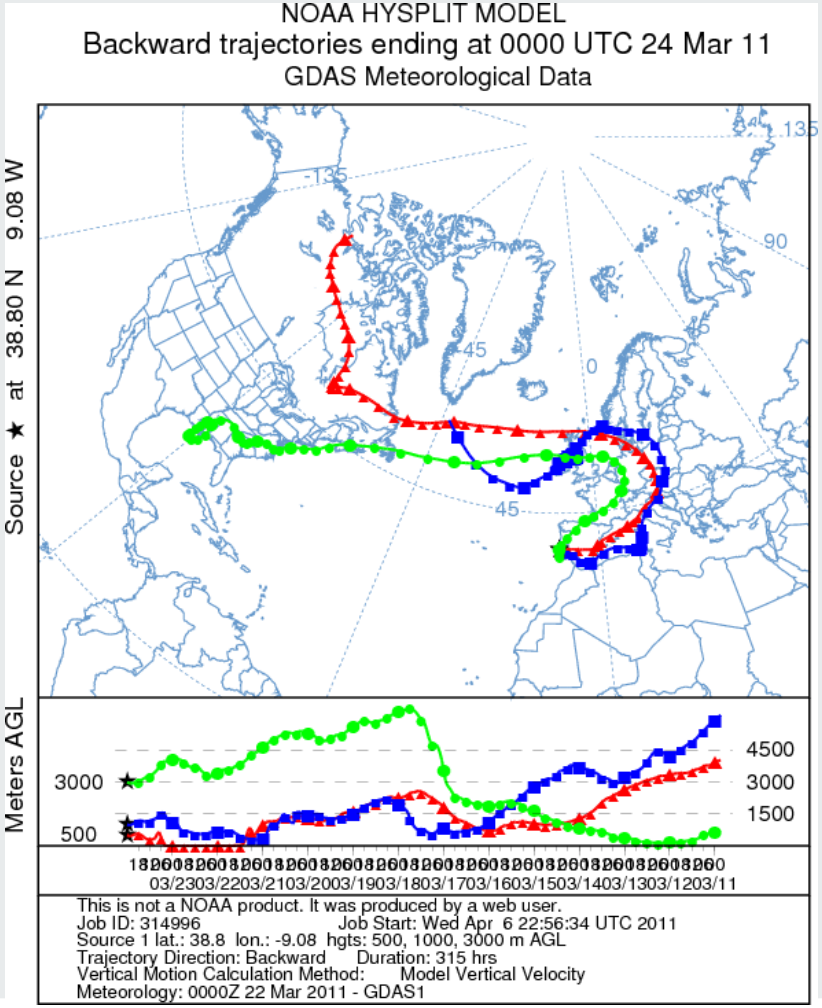
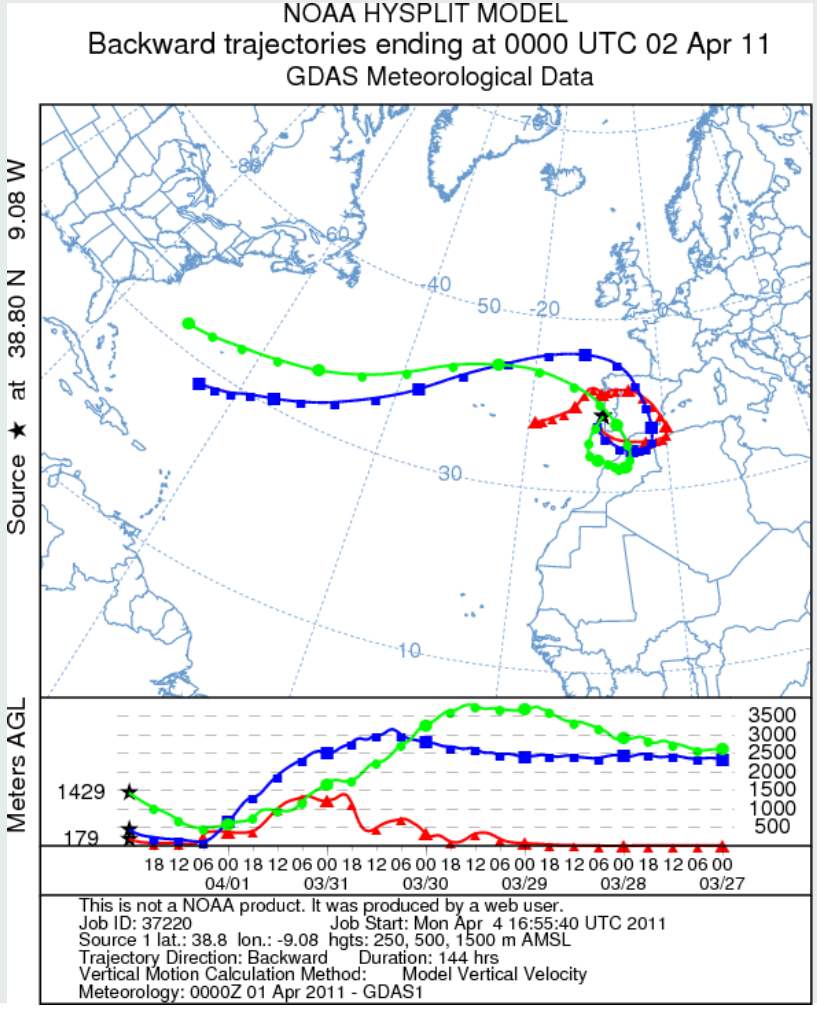
Backward trajectories





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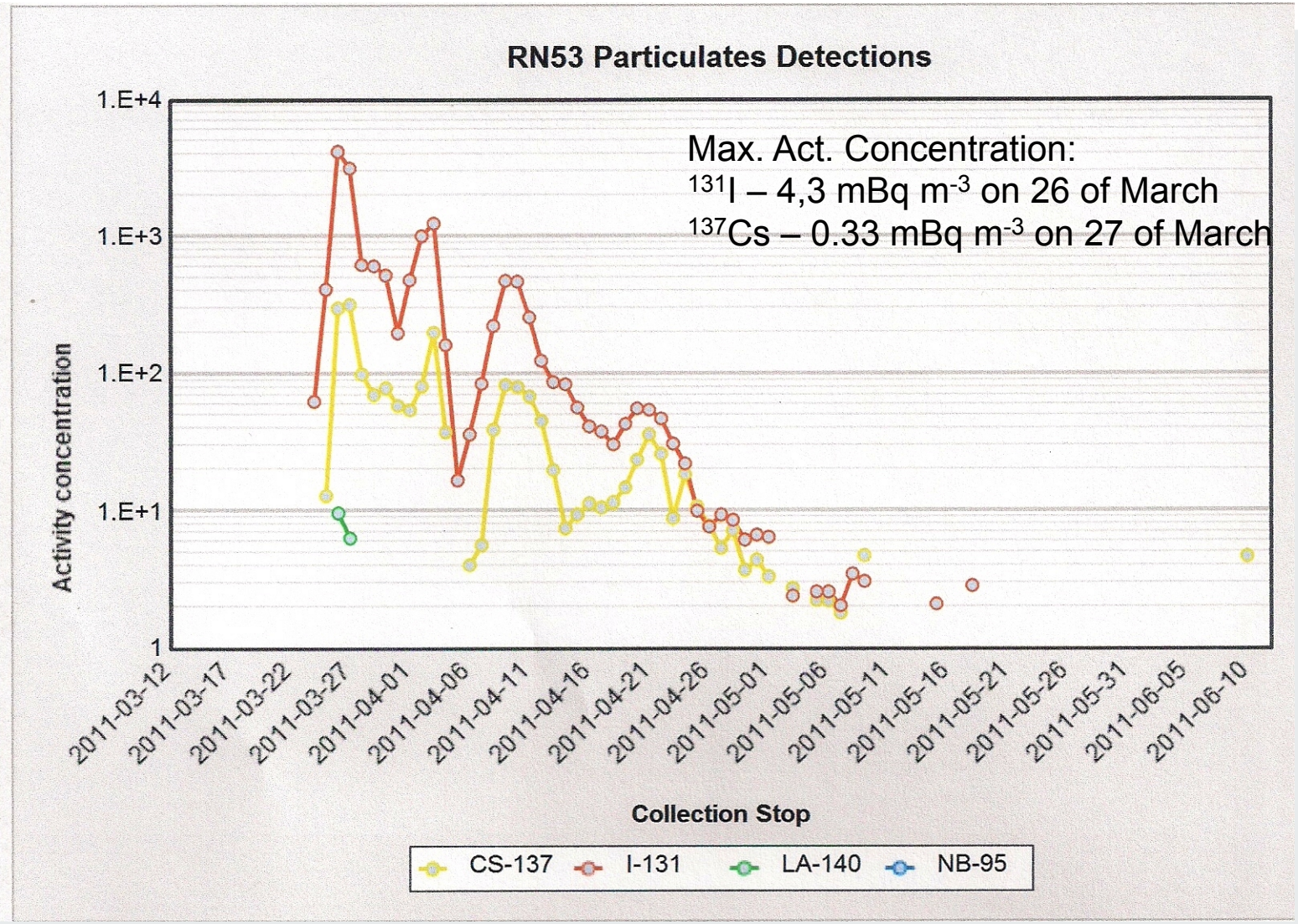
Activity ratios

- Proportions of released radionuclides are variable according to the caracteristics of the accident (“signature”);
- Comparing the ratios of the activities measured in Fukushima (by AIST) and in Sacavém (by IST) we could have an indication if the detected isotopes were originated from the same source

Ratios	Sacavém (IST)	Fukushima (AIST)
$^{137}Cs/^{134}Cs$	1,3	1,0
$^{137}Cs/^{131}I$	0,036	0,032
$^{137}Cs/^{132}Te$	0,2	0,2

- AIST - Advanced Industrial Science and Tecnology from Japan


RN53 Particulates Detections
Max. Act. Concentration:
^{131}I – 4,3 mBq m^{-3} on 26 of March
^{137}Cs – 0.33 mBq m^{-3} on 27 of March
Activity concentration
1.E+4
1.E+3
1.E+2
1.E+1
1
2011-03-12
2011-03-17
2011-03-22
2011-03-27
2011-04-01
2011-04-06
2011-04-11
2011-04-16
2011-04-21
2011-04-26
2011-05-01
2011-05-06
2011-05-11
2011-05-16
2011-05-21
2011-05-26
2011-05-31
2011-06-05
2011-06-10
Collection Stop
CS-137
I-131
LA-140
NB-95

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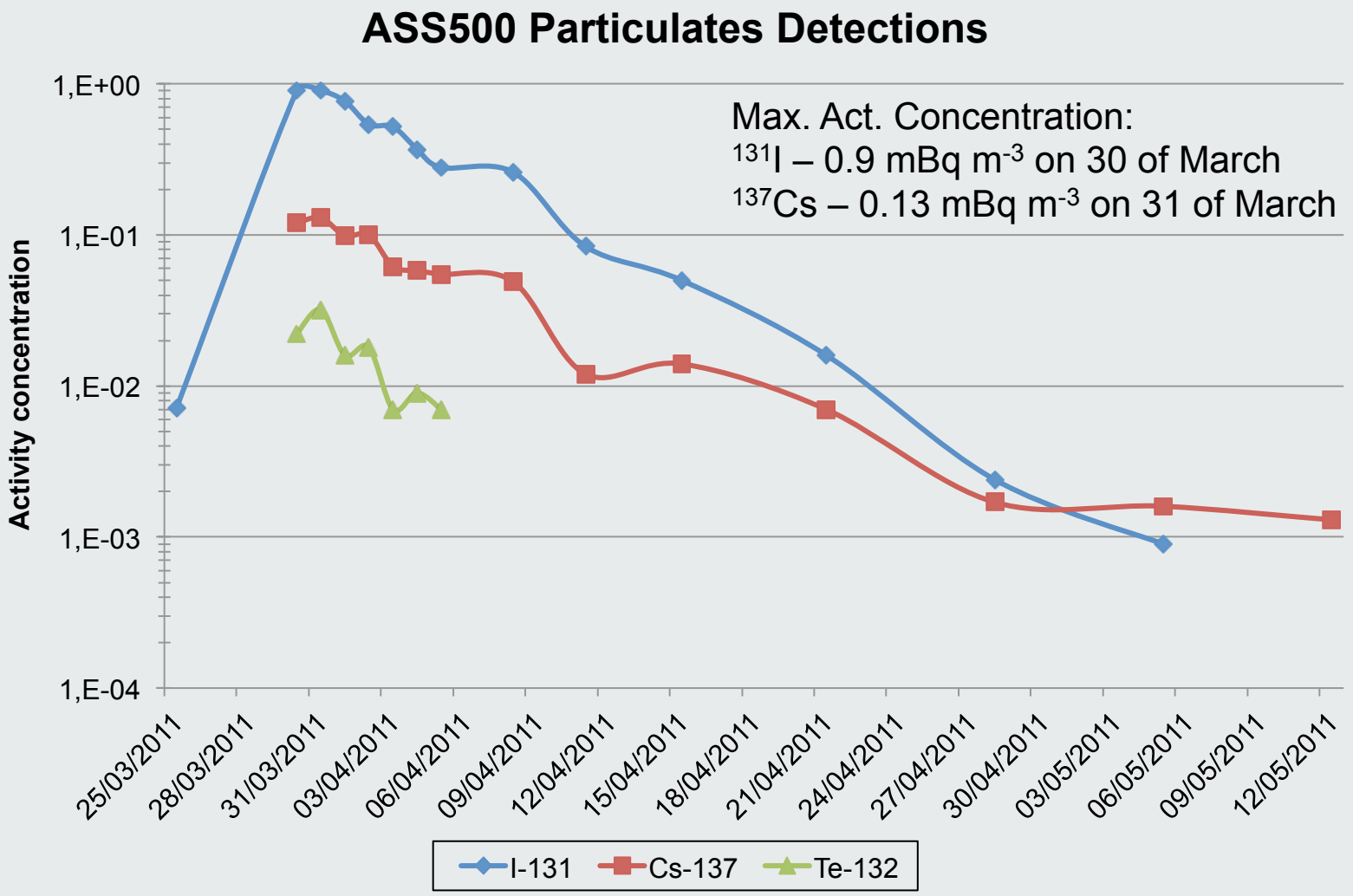

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Atmospheric deposition on vegetation

^{137}Cs: <0.5 Bq m^{-2} – 2.3 Bq m^{-2}

^{134}Cs: <0.4 Bq m^{-2} – 2.2 Bq m^{-2}

^{131}I: <0.8 Bq m^{-2} – 6.1 Bq m^{-2}

Milk

^{137}Cs: <0.1 Bq L^{-1} – 0.2 Bq L^{-1}

^{131}I: <0.1 Bq L^{-1} – 0.3 Bq L^{-1}

- Leafy vegetables

  ^{137}Cs: <0.2 Bq kg^{-1}

  ^{131}I: <0.2 Bq kg^{-1} – 0.8 Bq kg^{-1}

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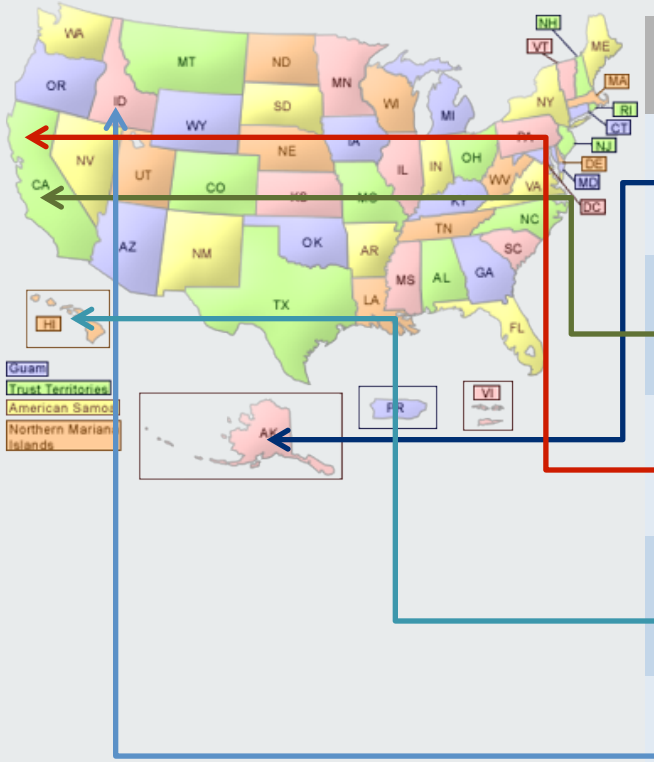
Environmental Protection Agency (EPA), EUA



Station	Date	Radionuclides (mBq m^{-3})				
		^{131}I	^{137}Cs	^{134}Cs	^{132}Te	^{132}I
Dutch Harbor	19-Mar	24,4	1,96	1,37	7,03	6,29
	20-Mar	7,40	0,52	0,36	1,04	1,26
	22-Mar	2,89	3,26	2,55	4,44	2,92
Anaheim	20-Mar	4,81	0,30	0,30	0,81	0,67
	21-Mar	5,55	0,78	0,63	1,15	0,81
	22-Mar	2,96	0,06			
San Bernadino	20-Mar	6,29	0,52	0,44	1,15	1,00
	22-Mar	4,07	0,67	0,48	1,00	0,67
	23-Mar	3,44				
Oahu	20-Mar	5,18	1,33	1,04	1,07	0,74
	21-Mar	23,7	3,40	2,81	2,33	1,92
	23-Mar	1,96	0,59	0,48	0,33	
Boise	21-Mar	4,07	0,63	0,44	0,37	
	22-Mar	3,63	0,36	0,31	0,19	
	23-Mar	2,04				

AK – Alaska
CA – California
ID – Idaho
HI - Hawaii

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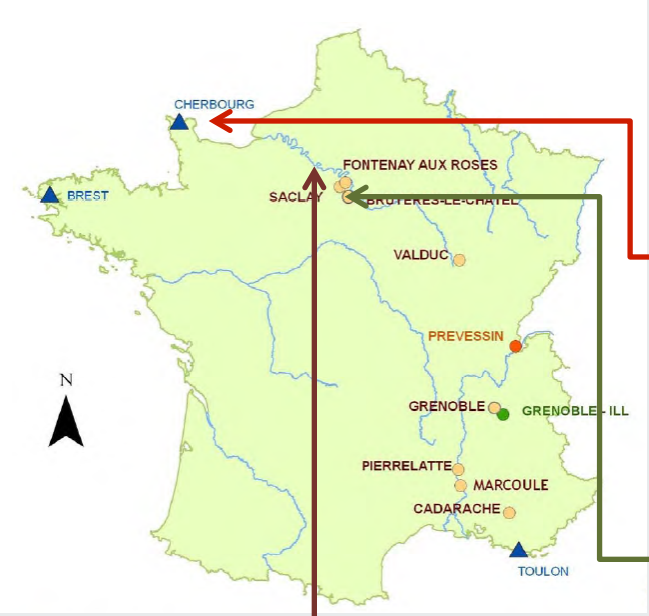
Institut de Radioprotection et Sûreté Nucléaire (IRSN), France



Station	Date	Radionuclides (mBq m^{-3})			
		^{131}I	^{137}Cs	^{134}Cs	^{132}Te
Cherbourg	25-Mar	0,067			
	28-Mar	0,41			
	31-Mar	0,75			
	01-Apr	0,097			
Orsay	26-Mar	0,06			
	27-Mar	0,35			
	28-Mar	0,36	0,008	0,008	
	29-Mar	0,52	0,058	0,049	0,013
	30-Mar	0,52	0,04	0,03	0,01
	31-Mar	0,6	0,08	0,07	
	01-Apr	0,34			
	02-Apr	0,13			
Vésinet	27-Mar	0,227			
	28-Mar	0,522			
	30-Mar	0,76			
	31-Mar	1,05			

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Communication with the public

- Even though the radioactivity levels were very low, some concerns were raised among the public;
- Information are available from different sources and with different degrees of confidence;
- The communication to the public needs to be carefully coordinated between all the authorities in order to provide non conflicting information;
- Confidence in authorities is very easy to lose but very difficult to build up again.

Communication with the public

- In the framework of the PREPARE project (WP3 on management of contaminated foodstuffs/feedstuffs and other goods) National panels with the relevant Stakeholders were organized, resulting in very interesting conclusions:

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Communication with the public

- Communication paths must be clear, to avoid confusion and contradictory messages;
- To ensure that information is quickly provided, generic and easy to understand key messages should be prepared in advance;
- All relevant stakeholders should be involved in the communication plans as well as in emergency exercises;
- Information to the public should be clear, concise and complete;

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Communication with the public

- There is a general need for more education and training across all stakeholders, including the media;
- Many similarities between stakeholders sensibilities in NPP countries and non-NPP countries;
- With slight variations, concerns raised in Portugal were shared in other countries.

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Thank you for your attention