

HelmholtzZentrum münchen

German Research Center for Environmental Health

EMRAS II, WG 8

The Alpine scenario

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with support by

Heinz Müller, Helmholtz Zentrum München, Germany (Standard scenario)
Gert Sdouz, ARC Seibersdorf Research, Austria (Alpine scenario)

ECOSYS – Standard approach

Contamination and dose calculation using
ECOSYS (Müller & Pröhl, 1993) and
RODOS (Müller et al., 2000)

Inhalation

Ingestion

External exposure from the plume

External exposure from deposited radionuclides (groundshine)

External exposure from skin and clothes

Müller H., Pröhl G.: ECOSYS-87: A Dynamic Model for Assessing Radiological Consequences of Nuclear Accidents. Health Physics 64(3), 232-252 (1993)

Müller H., Gering F., Pröhl G.: Model Description of the Terrestrial Food Chain and Dose Module FDMT in RODOS PV4.0, Report RODOS(WG3)-TN(99)17, Forschungszentrum Karlsruhe (2000)

ECOSYS – Alpine scenario

Customization of the parameters of the food chain and dose module ECOSYS to Austrian Conditions:

OECOSYS (Sdouz & Pachole, 2006)

Austria has been divided into three radioecological regions:




- Alpine region,
- foothills of the Alps and
- Pannonic region.

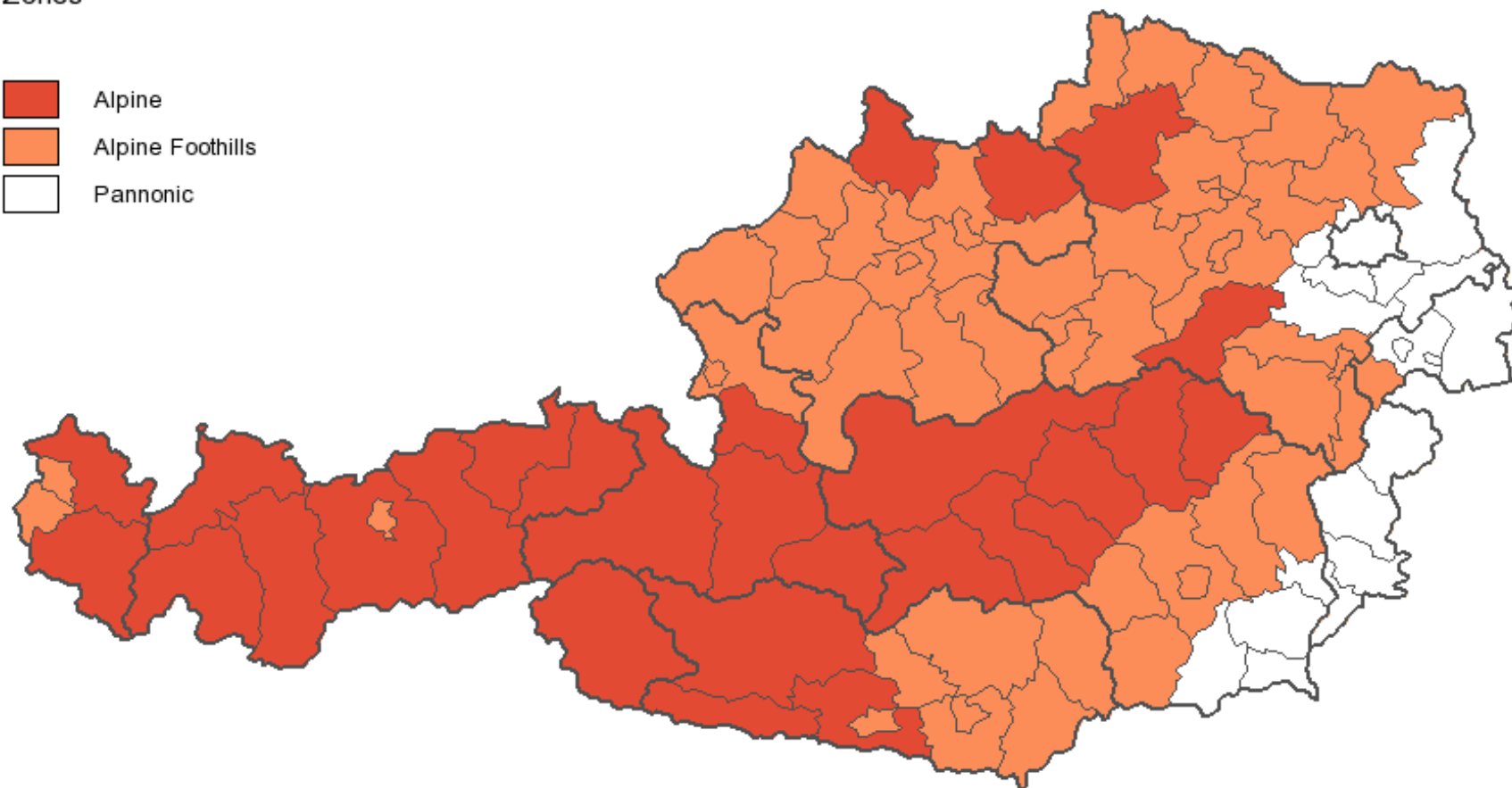
These regions define areas with relative uniform radioecological conditions for which the same set of model parameters can be used.

Gert Sdouz, Manfred Pachole: FOOD CHAIN DATA CUSTOMIZATION FOR DECISION SUPPORT SYSTEMS IN AUSTRIA. Second European IRPA Congress on Radiation Protection, 15-19 May 2006, Paris, France

Radioecological Regions of Austria

Zones

-  Alpine
-  Alpine Foothills
-  Pannonic



ECOSYS – Alpine scenario

For the model calculation, the parameter set for the Alpine region of the food chain and dose module OECOSYS was used.

Compared to the standard parameters the following changes were made:

Growing period

leaf area index (time)

Consumption habits

But : same transfer factors!

Herbert Lettner, Peter Bossew, Friederike Strebl: ^{137}CS UND ^{90}SR VERTEILUNG AUF ALMEN DER SALZBURGER HOHEN TAUERN UND AKTIVITÄTSKONZENTRATIONEN IN LEBENSMITTELN, Salzburg, 2003

standard - alpine scenario

	Pasture	[Ö = DPL30]	Pasture
Datum1	01. Jan	Datum1	01. Jan
Bewuchsdichte1	0.03	Bewuchsdichte1	0.01
Datum2	15. Mrz	Datum2	01. Apr
Bewuchsdichte2	0.05	Bewuchsdichte2	0.05
Datum3	16. Mai	Datum3	01. Jun
Bewuchsdichte3	1.50	Bewuchsdichte3	1.50
Datum4	31. Okt	Datum4	20. Okt
Bewuchsdichte4	1.50	Bewuchsdichte4	1.50
Datum5	01. Nov	Datum5	21. Okt
Bewuchsdichte5	0.05	Bewuchsdichte5	0.05
Datum6	31. Dez	Datum6	31. Dez
Bewuchsdichte6	0.03	Bewuchsdichte6	0.01
Datum7	31. Dez	Datum7	31. Dez
Bewuchsdichte7	0.03	Bewuchsdichte7	0.01
Datum8	31. Dez	Datum8	31. Dez
Bewuchsdichte8	0.03	Bewuchsdichte8	0.01
Datum9	31. Dez	Datum9	31. Dez
Bewuchsdichte9	0.03	Bewuchsdichte9	0.01
growth start	15. Mrz	Wachstumsbeginn	01. Apr
start	20. Apr	Ernte-Anfang	15. Mai
harvest end	10. Nov	Ernte-Ende	20. Okt

standard alpine scenario

Fütterung, Milchkuh

Ration: Gras und Heu			
Datum	Tag im Jahr	Futter1 / Index	
		Gras	Heu
		1	2
01. Jan	1	0	14
20. Apr	111	0	14
10. Mai	131	70	0
20. Okt	294	70	0
09. Nov	314	0	14
31. Dez	365	0	14

Ration: Gras und Heu			
Datum	Tag im Jahr	Futter1 / Index	
		Gras	Heu
		1	2
01. Jan	1	0	14
15. Mai	135	0	
04. Jun	155	70	0
30. Sep	273	70	0
20. Okt	293	0	14
31. Dez	365	0	14
31. Dez	365		
31. Dez	365		

standard - alpine scenario

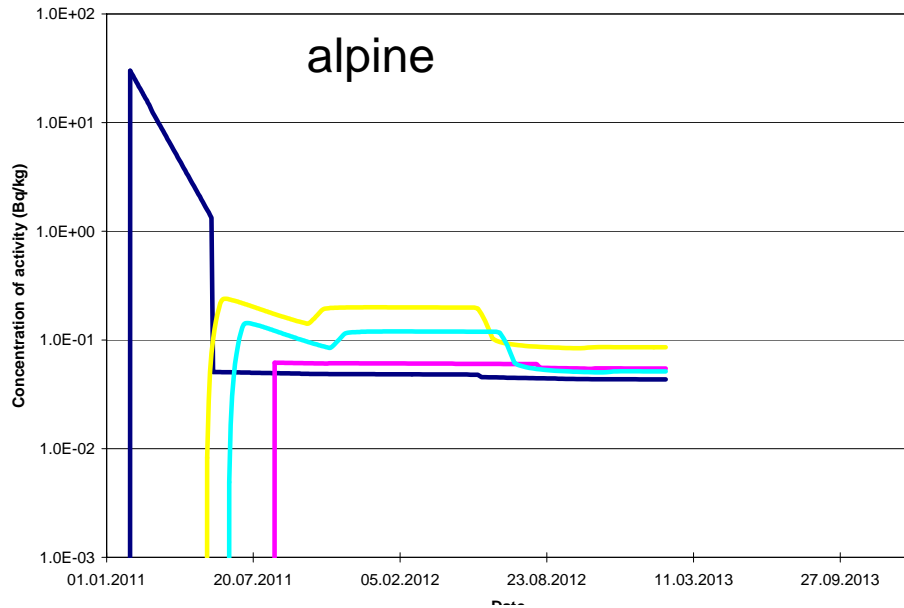
consumption habits

Age	1 a	10 a	adult
Milk standard l/a	204.4	65.7	84.0
Milk alpine l/a	175.9	99.7	130.3

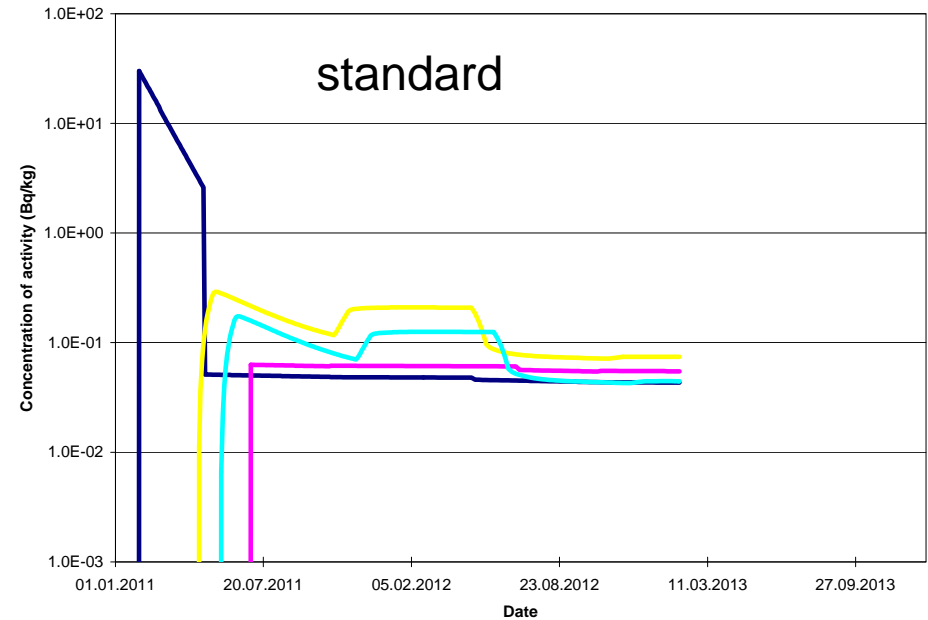
Contamination

Cs-137, 1 Februar, wet

Activity concentration in foodstuffs

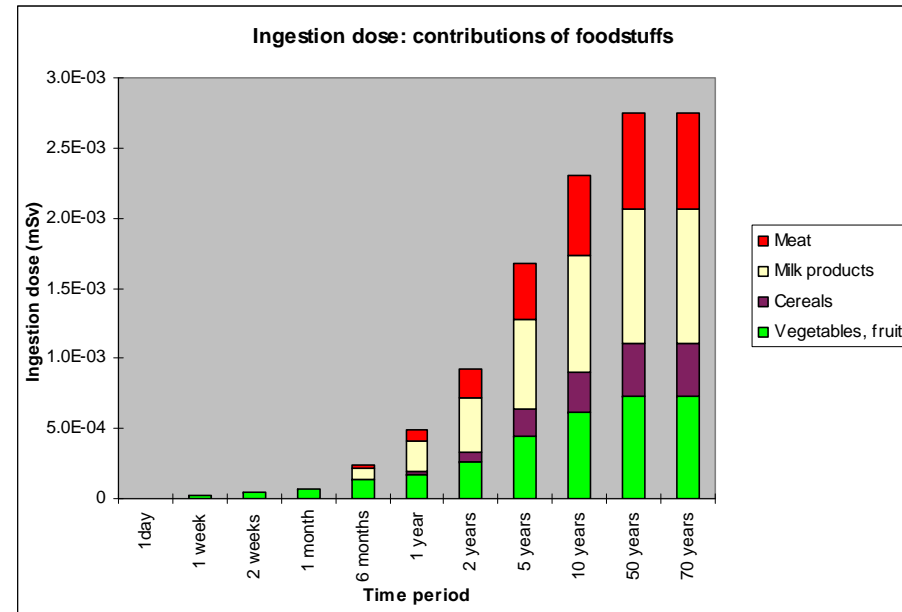
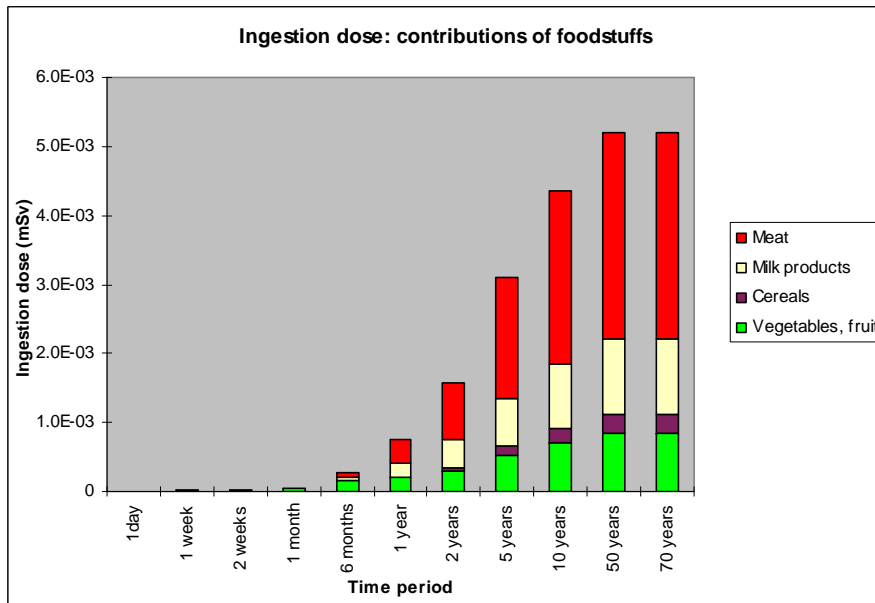


Activity concentration in foodstuffs



Dose by foodstuff

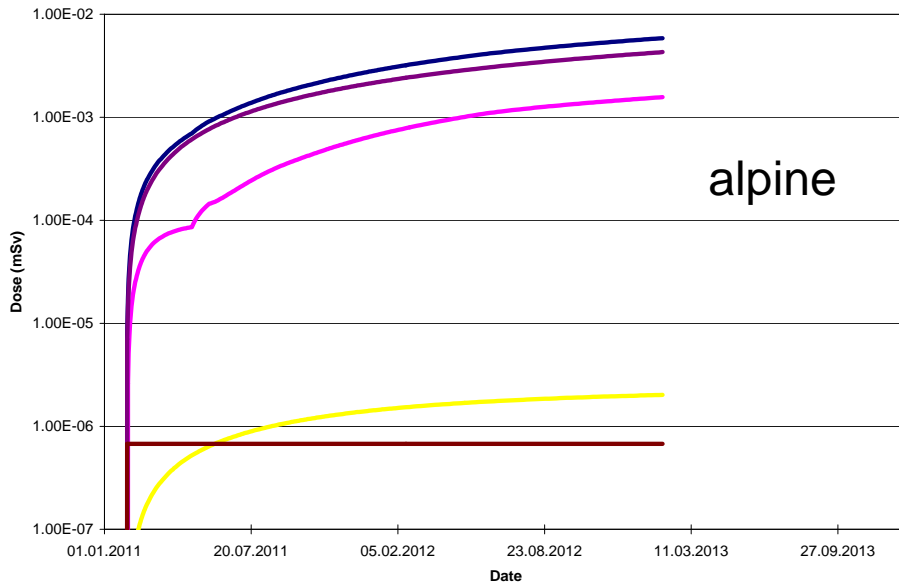
Cs-137, 1 Februar, wet



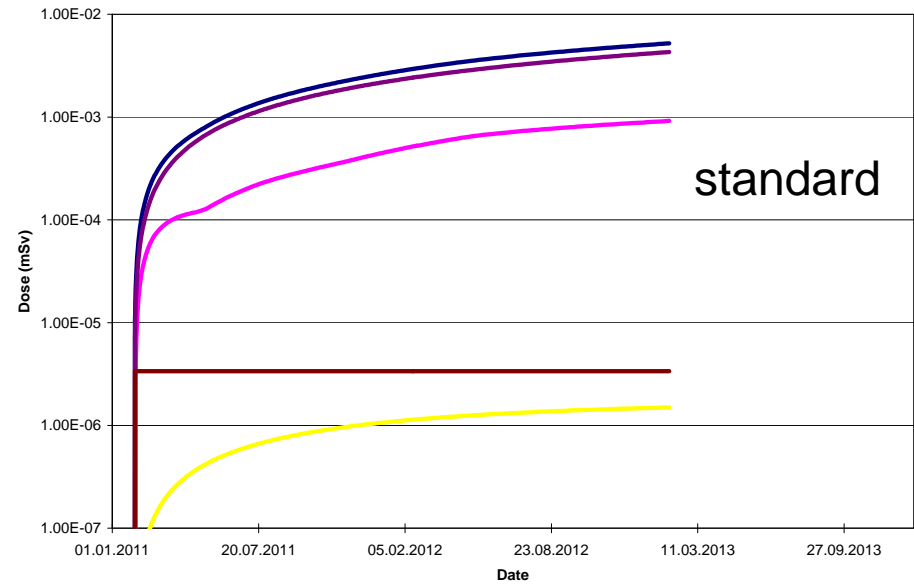
Dose

Cs-137, 1 Februar, wet, adult

Comparison of all exposure pathways



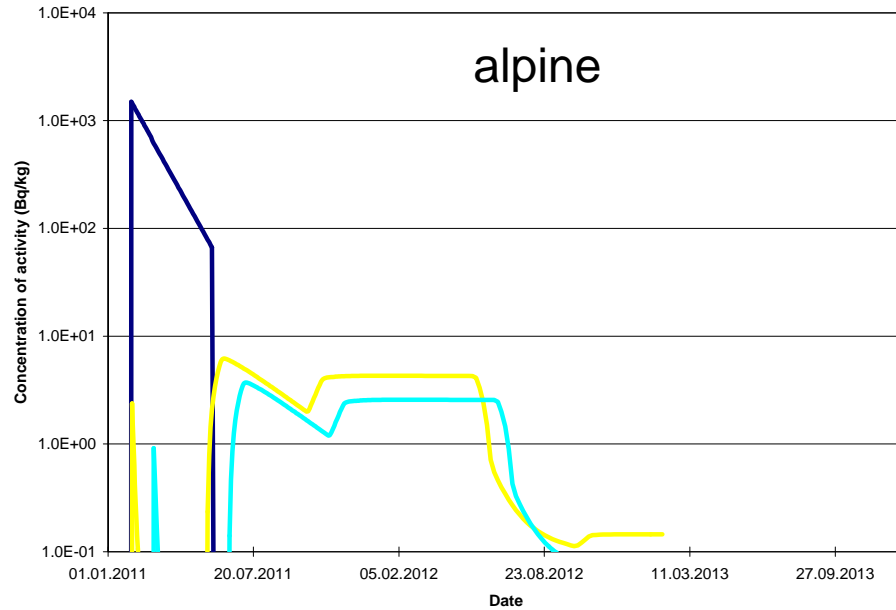
Comparison of all exposure pathways



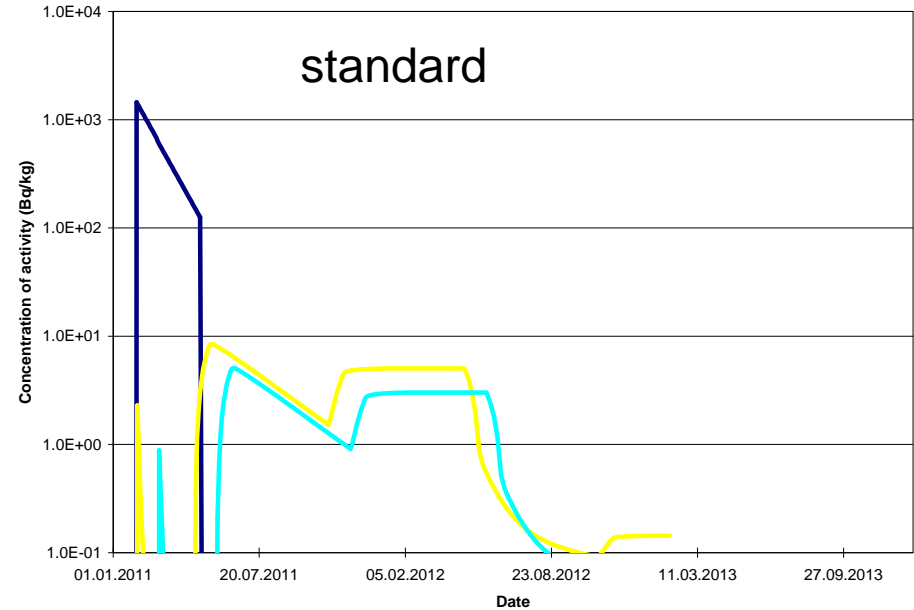
Contamination

Cs-137, 1 Februar, dry

Activity concentration in foodstuffs



Activity concentration in foodstuffs



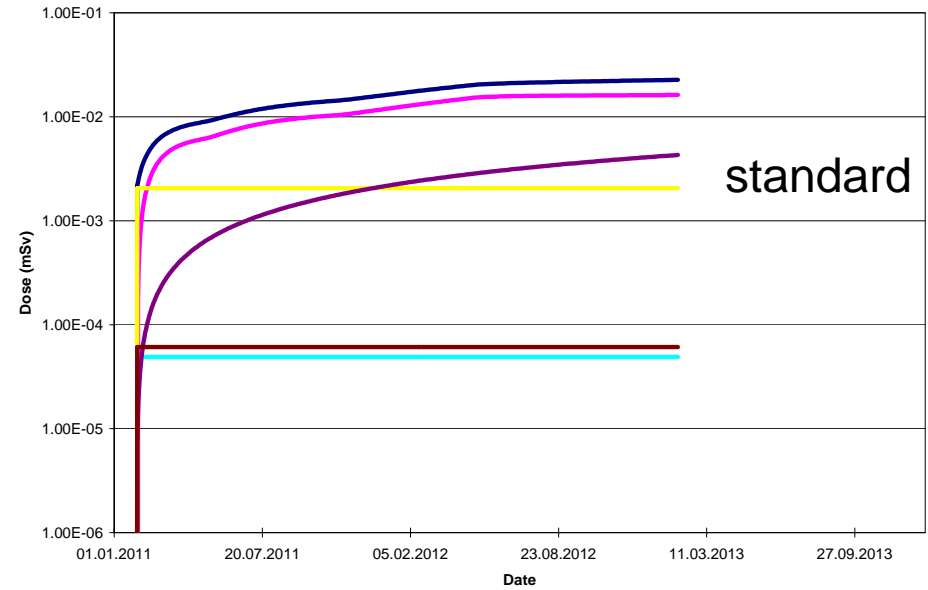
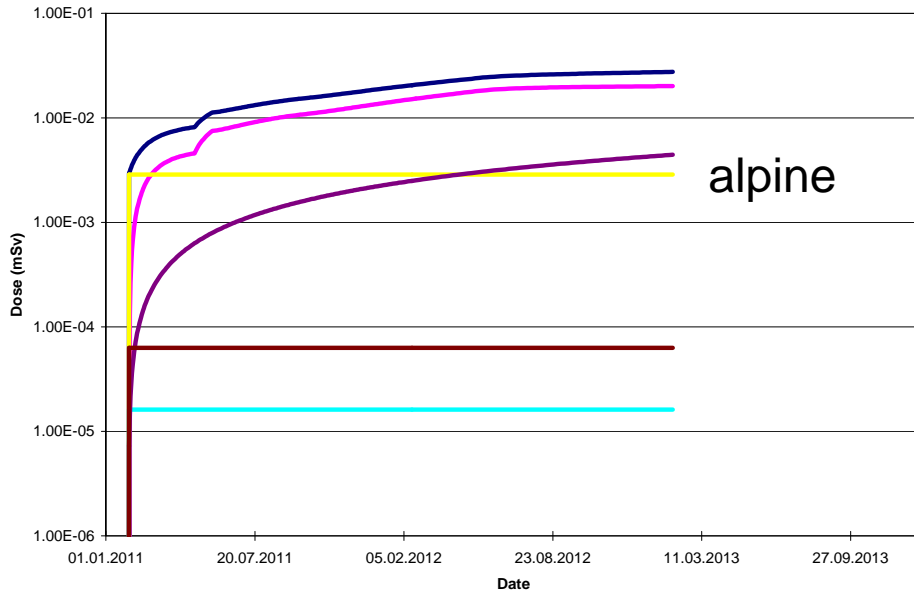
- Leafy vegetables
- Berries
- Cow's milk
- Cheese (rennit)

Dose

Cs-137, 1 Februar, dry, adult

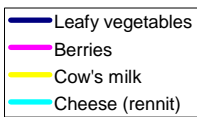
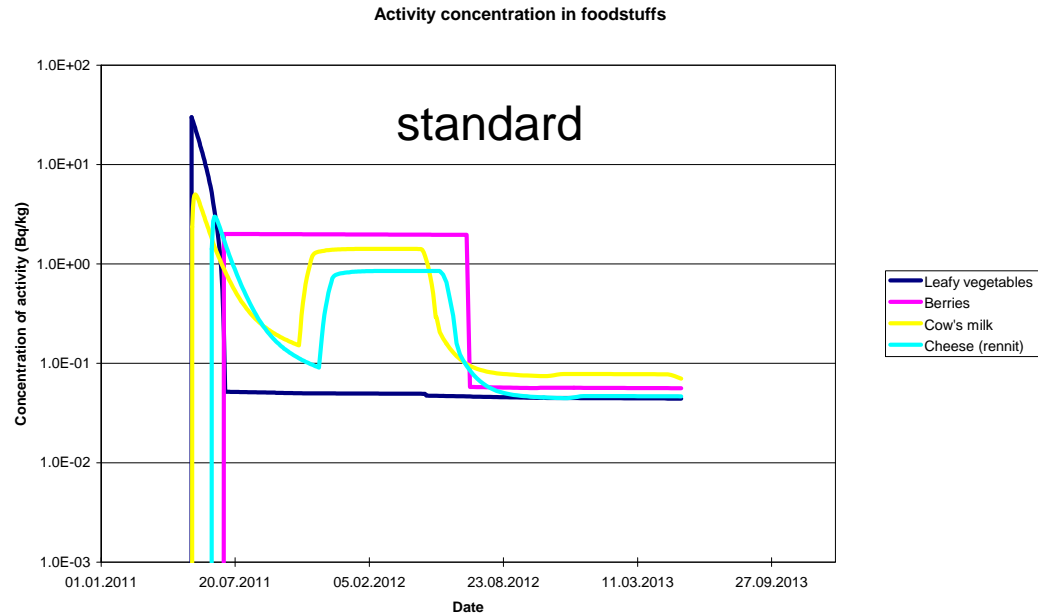
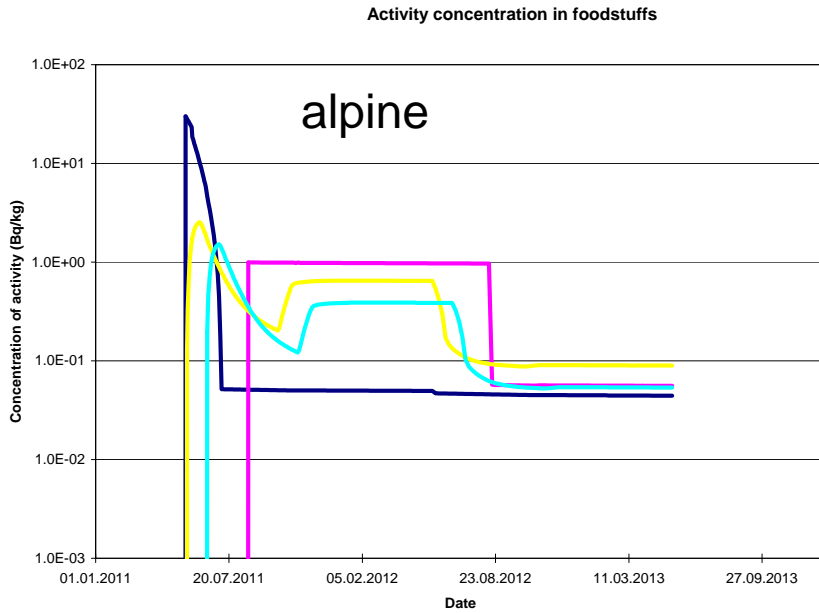
Comparison of all exposure pathways

Comparison of all exposure pathways



Contamination

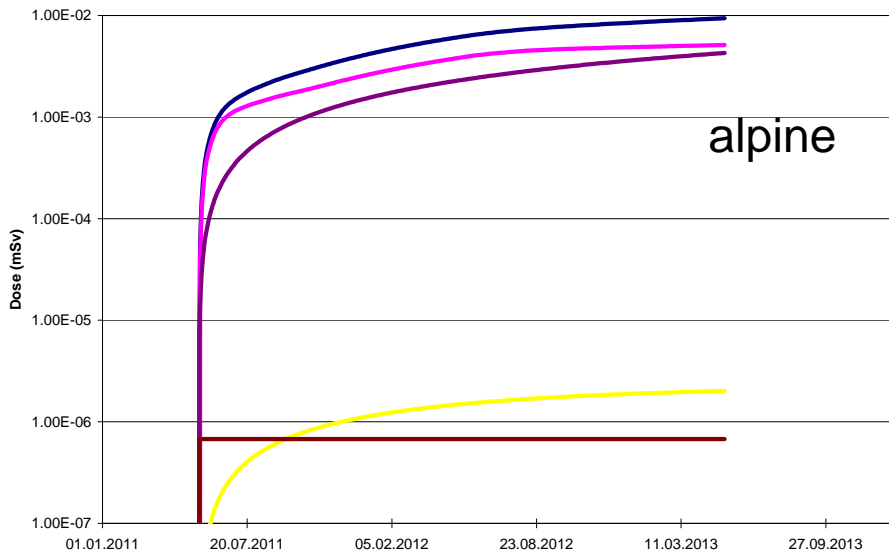
Cs-137, 15 May, wet



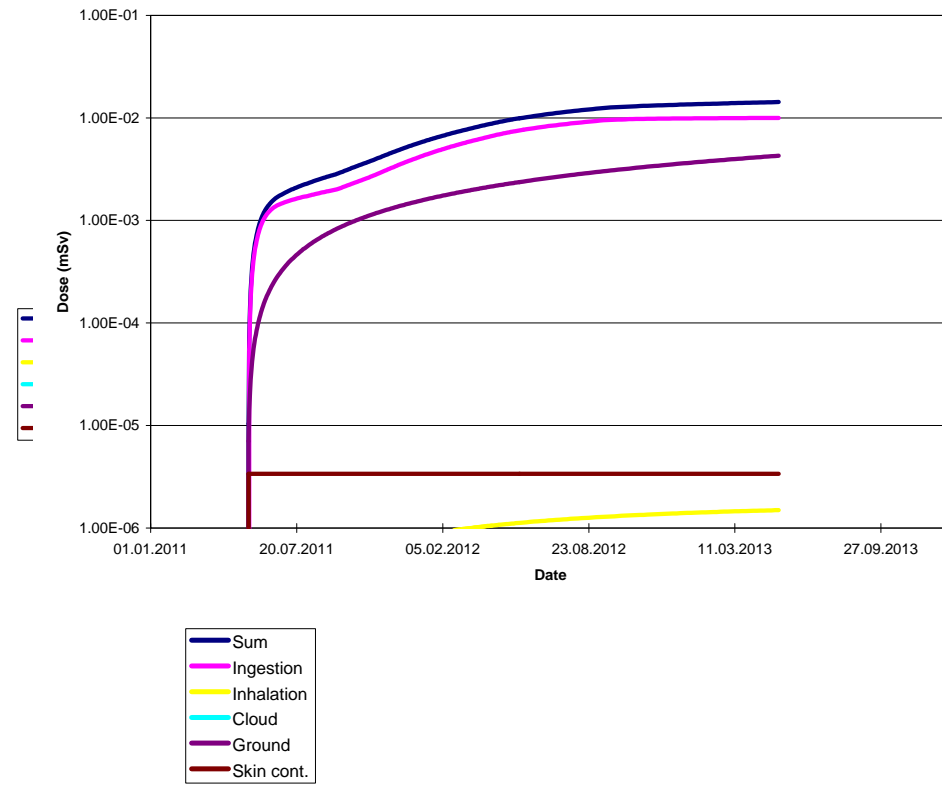
Dose

Cs-137, 15 May, wet, adult

Comparison of all exposure pathways



Comparison of all exposure pathways



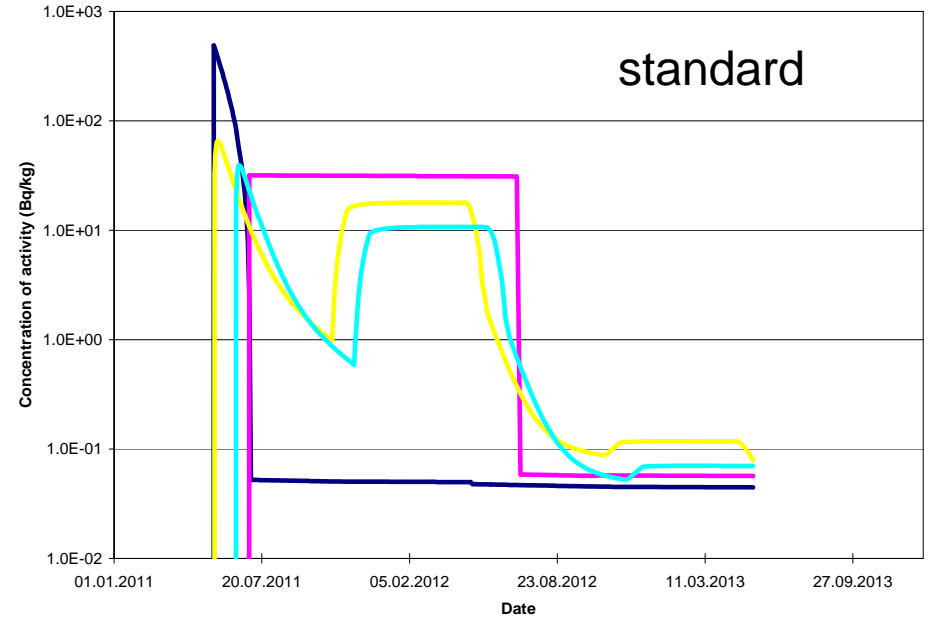
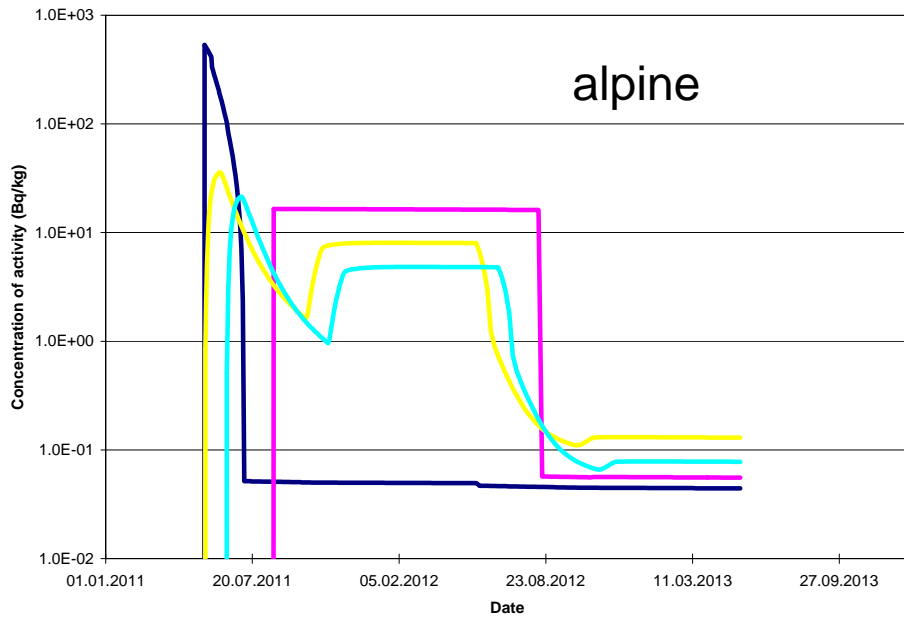
s, 27-28 September 2011

Contamination

Cs-137, 15 May, dry

Activity concentration in foodstuffs

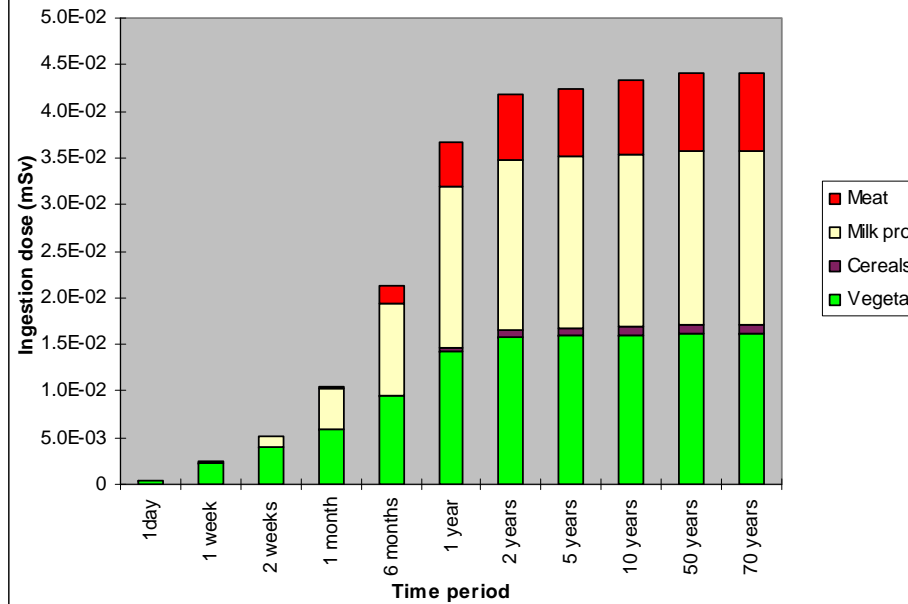
Activity concentration in foodstuffs



Dose

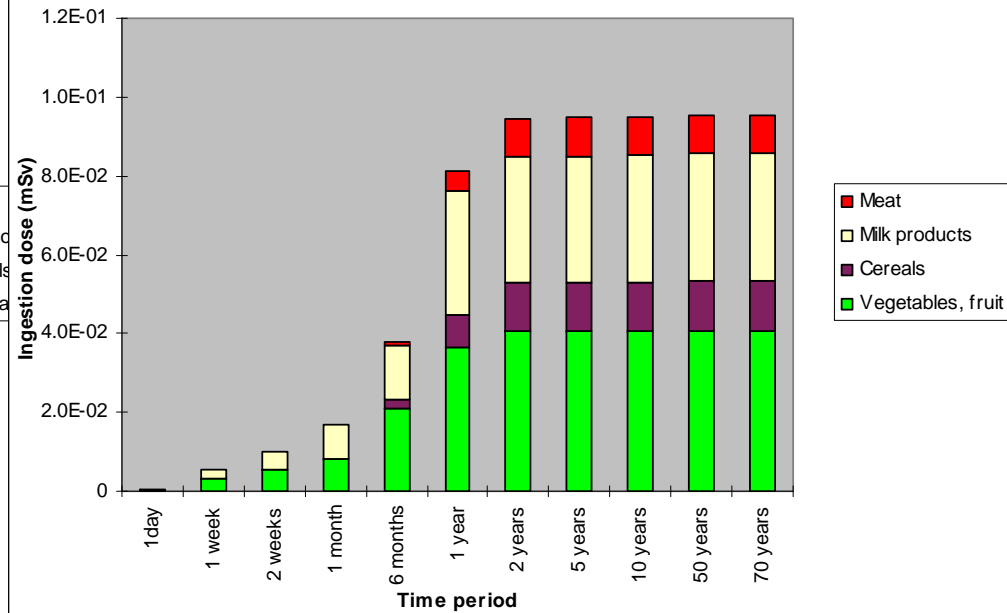
Cs-137, 15 May, dry, 1a

Ingestion dose: contributions of foodstuffs



alpine

Ingestion dose: contributions of foodstuffs



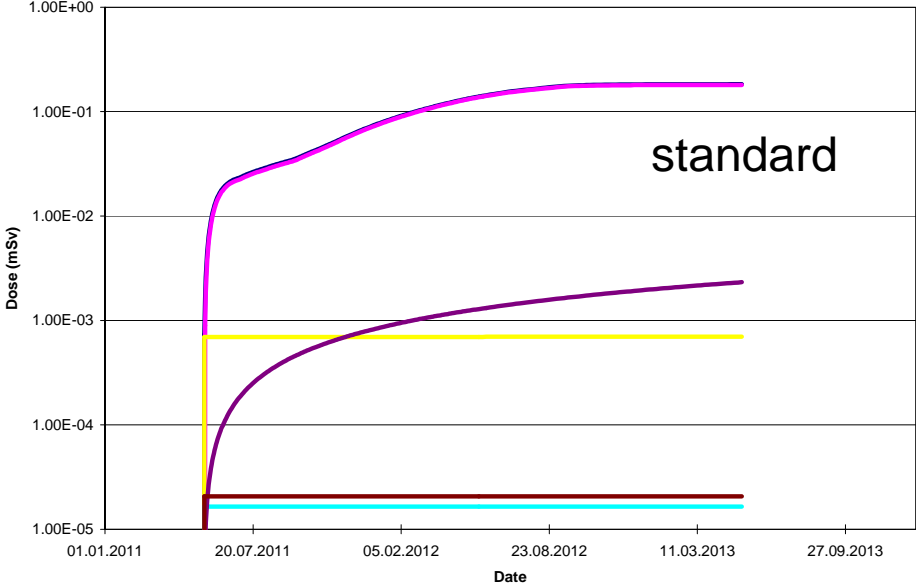
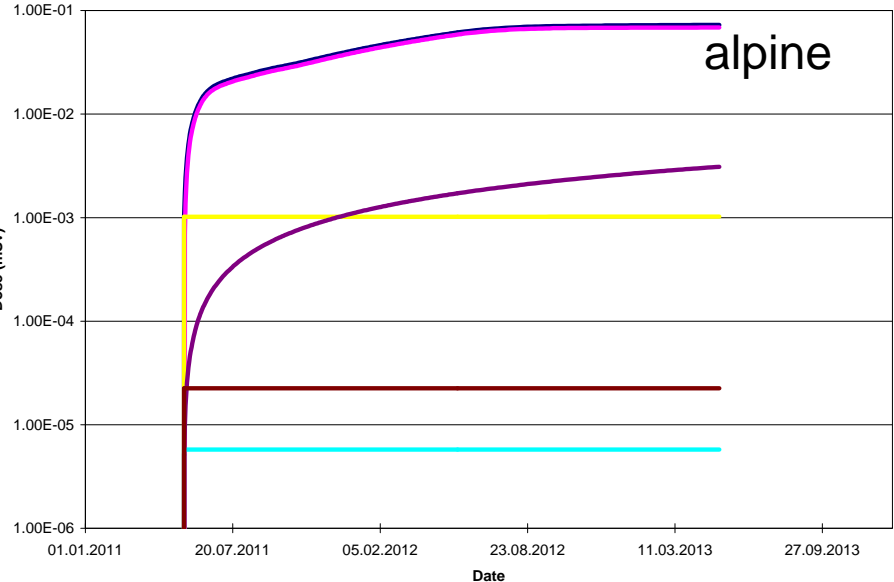
standard

Dose

Cs-137, 15 May, dry, adult

Comparison of all exposure pathways

Comparison of all exposure pathways



- Sum
- Ingestion
- Inhalation
- Cloud
- Ground
- Skin cont.

1000 Bq/m² deposition of Cs-137

resulting total dose in mSv

alpine	wet	1 a	10 a	adult
1 February	1st year	3.5E-03	3.1E-03	3.1E-03
	2nd year	2.8E-03	2.8E-03	2.8E-03
15 May	1st year	5.5E-03	5.4E-03	6.2E-03
	2nd year	2.9E-03	3.0E-03	3.2E-03
1 August	1st year	9.2E-03	9.8E-03	1.5E-02
	2nd year	3.0E-03	3.3E-03	3.9E-03
1 November	1st year			
	2nd year			

1000 Bq/m² deposition of Cs-137

resulting total dose in mSv

alpine	dry	1 a	10 a	adult
1 February	1st year	1.4E-02	1.5E-02	2.0E-02
	2nd year	6.7E-03	8.0E-03	7.6E-03
15 May	1st year	3.9E-02	4.4E-02	6.1E-02
	2nd year	6.7E-03	9.9E-03	1.2E-02
1 August	1st year	1.4E-01	1.5E-01	2.8E-01
	2nd year	8.8E-03	1.8E-02	2.7E-02
1 November	1st year			
	2nd year			

1000 Bq/m² deposition of Cs-137

resulting total dose in mSv

standard	dry	1 a	10 a	adult
1 February	1st year	1.5E-02	1.2E-02	1.7E-02
	2nd year	5.4E-03	4.3E-03	5.5E-03
15 May	1st year	8.2E-02	8.2E-02	1.4E-01
	2nd year	2.8E-02	2.8E-02	4.6E-02
1 August	1st year	1.3E-01	1.2E-01	2.2E-01
	2nd year	4.6E-03	8.9E-03	1.7E-02
1 November	1st year			
	2nd year			

1000 Bq/m² deposition of Cs-137

resulting total dose in mSv

standard	wet	1 a	10 a	adult
1 February	1st year	3.5E-03	2.8E-03	2.8E-03
	2nd year	2.7E-03	2.3E-03	2.4E-03
15 May	1st year	7.7E-03	6.9E-03	9.8E-03
	2nd year	3.2E-03	3.6E-03	4.5E-03
1 August	1st year	8.0E-03	8.0E-03	1.3E-02
	2nd year	2.6E-03	2.6E-03	3.1E-03
1 November	1st year			
	2nd year			

Thank you for your attention!