

Monitoring and countermeasures in the Czech Republic after the Chernobyl Accident

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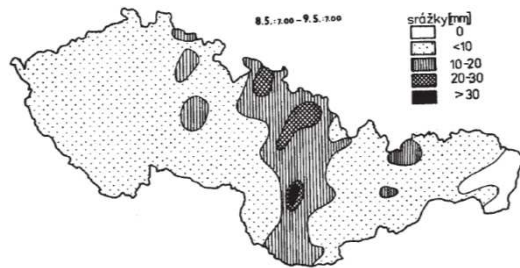
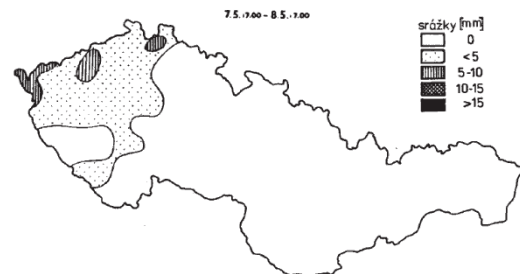
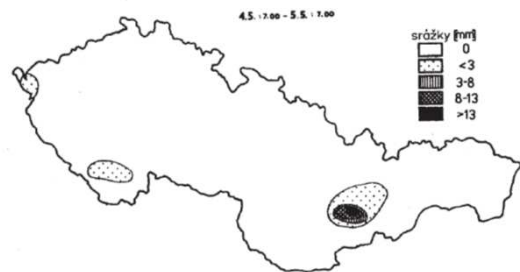
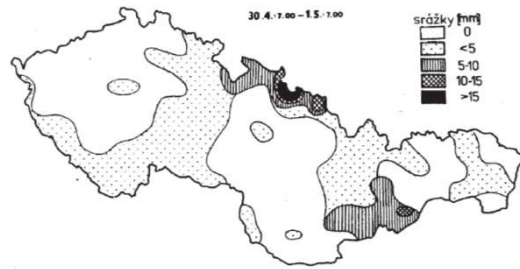
National Radiation Protection Institute,
Prague,

18 October 2017

Ground depositions of ^{137}Cs



Radioactive fallout after Chernobyl accident

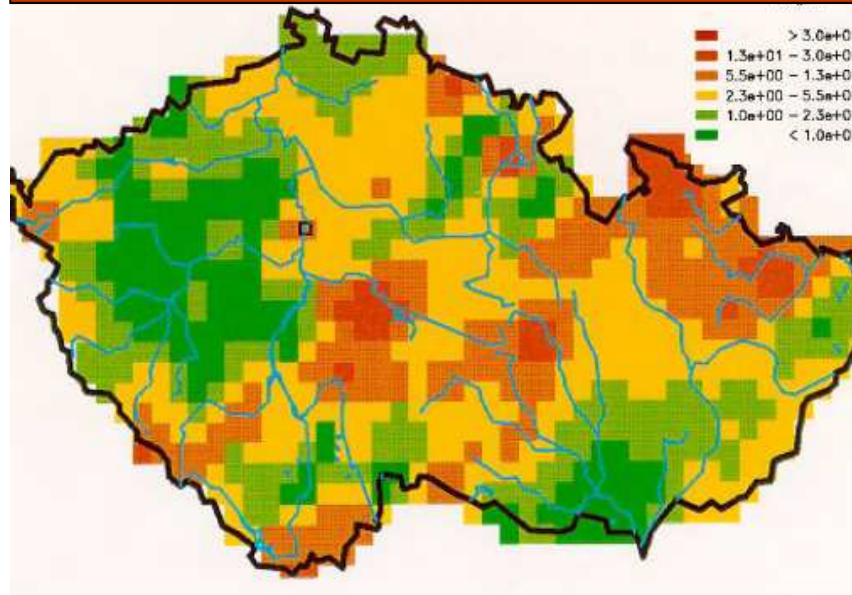
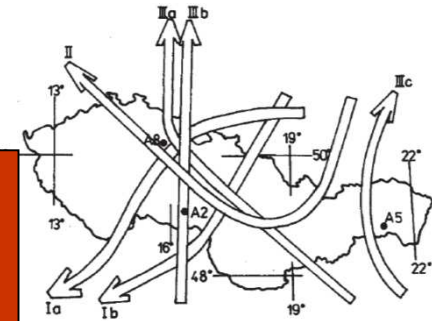


^{137}Cs

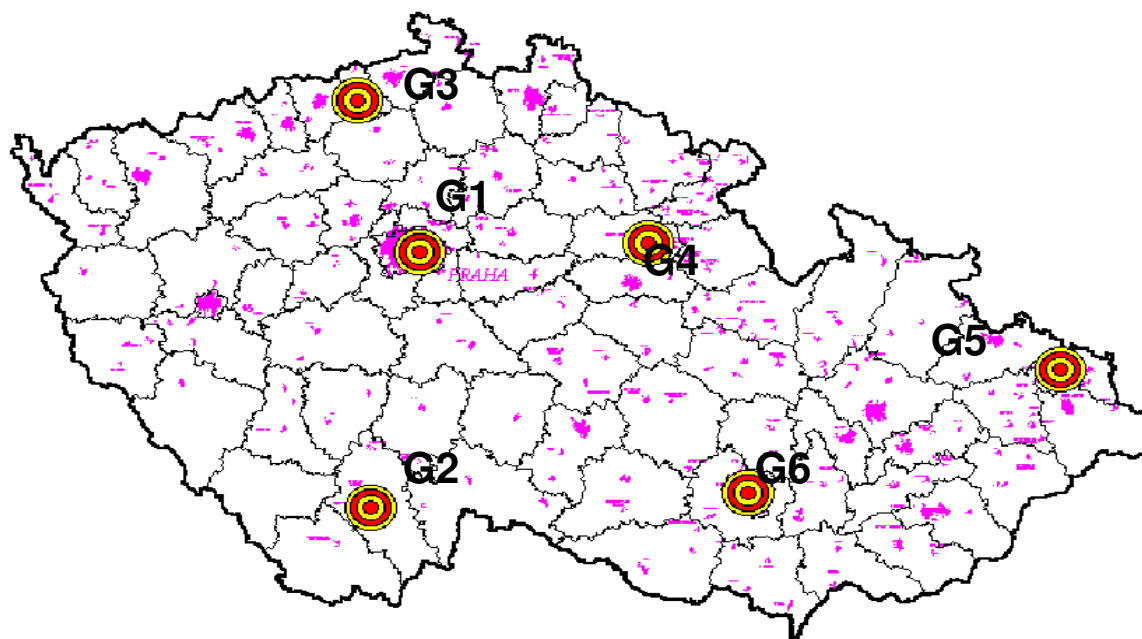
$a = 5,7 \text{ kBq/m}^2$

0,1 - 40 kBq/m²

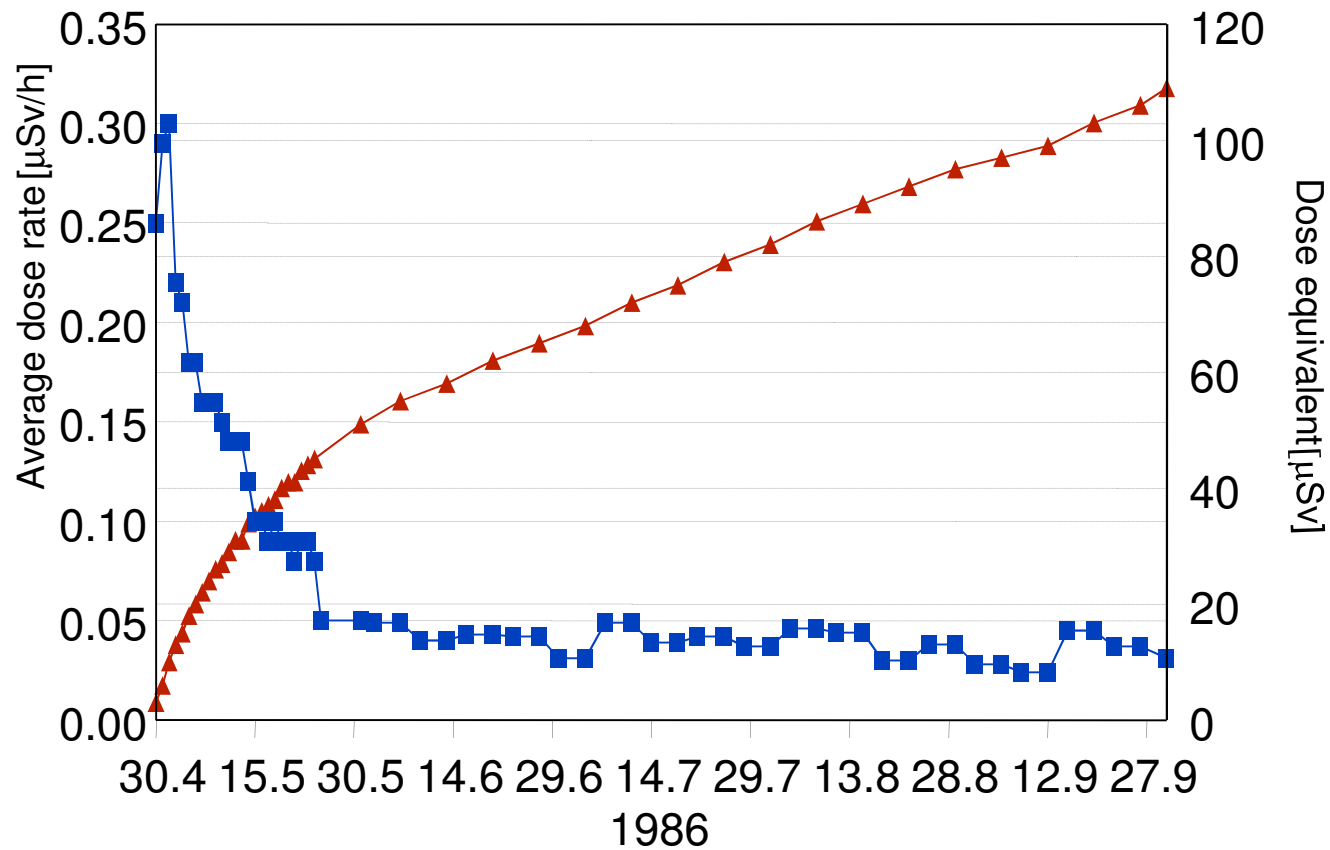
(95% confidence interval):



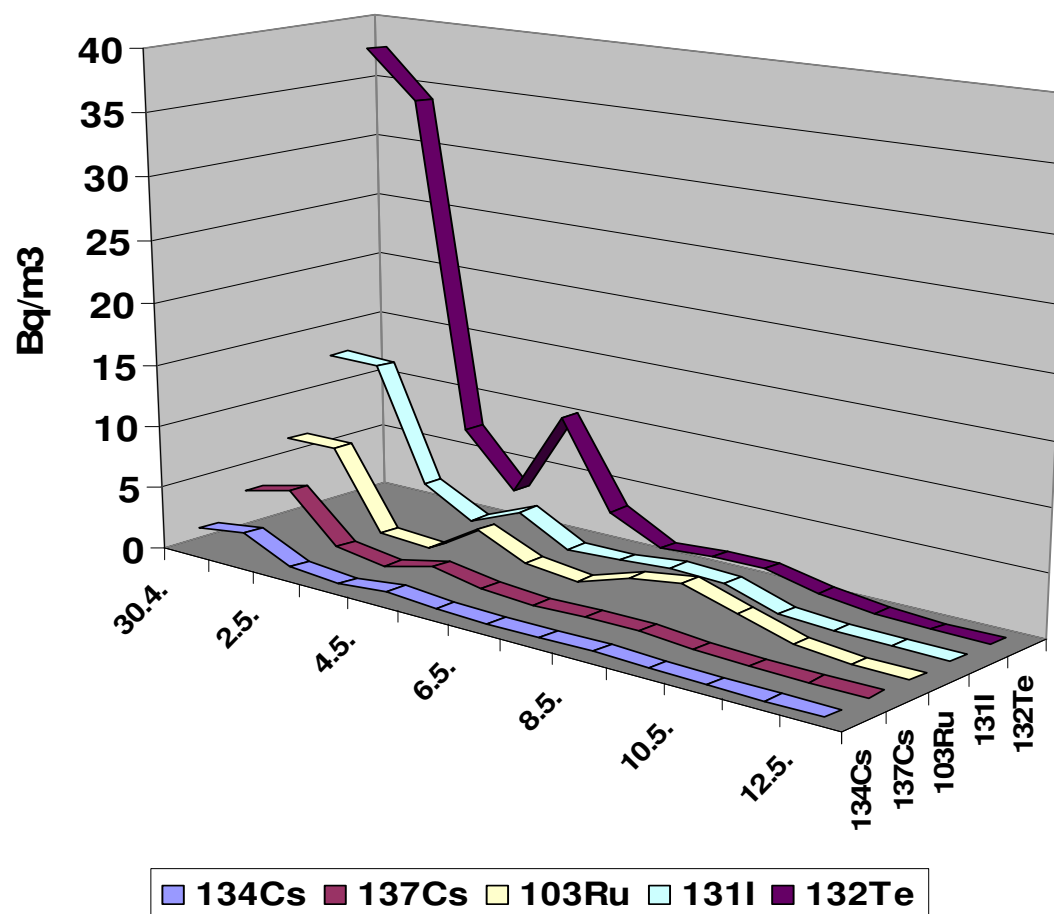
Measurement of dose rate after the Chernobyl accident



**Time course of average dose – rate from 30.4 1986 to 27.9.1986 and time course of cumulative dose equivalent after subtraction of natural background
(Arrival of contaminated air masses from Chernobyl 30 April to 15 May 1986)**



Volume activity of radionuclides in the air of the Czech Republic – April – May 1986



Average effective doses for the Czech population

mSv	1986	1986-1991	1986-1995	1986-2005	1986-2055
external	0,05	0,15	0,17	0,22	0,28
internal	0,15	0,22	0,23	0,23	0,26
total	0,2	0,37	0,4	0,4	0,54

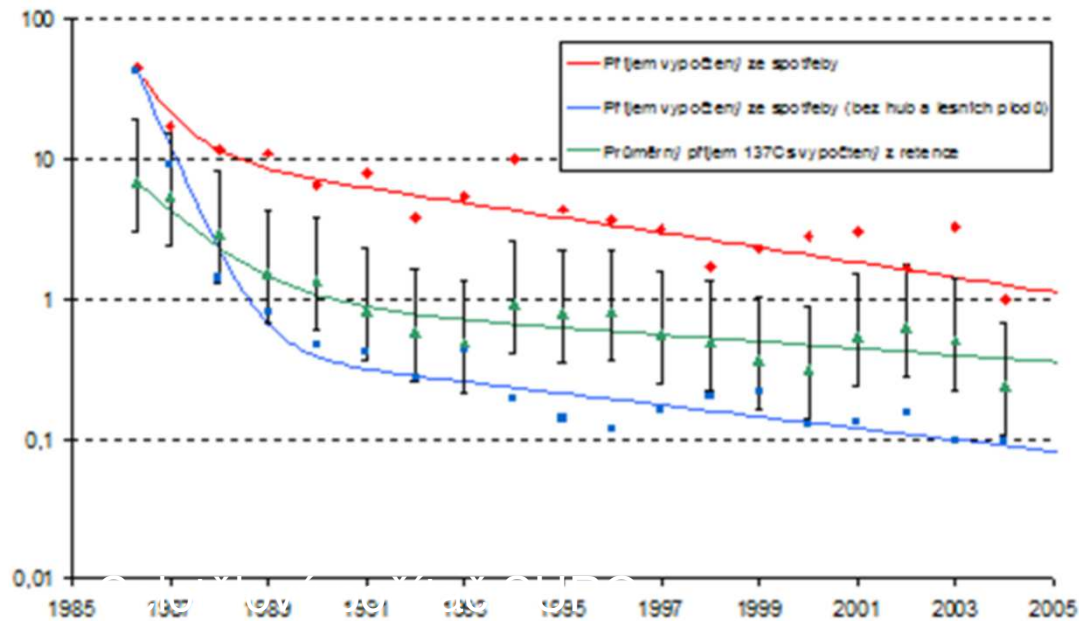
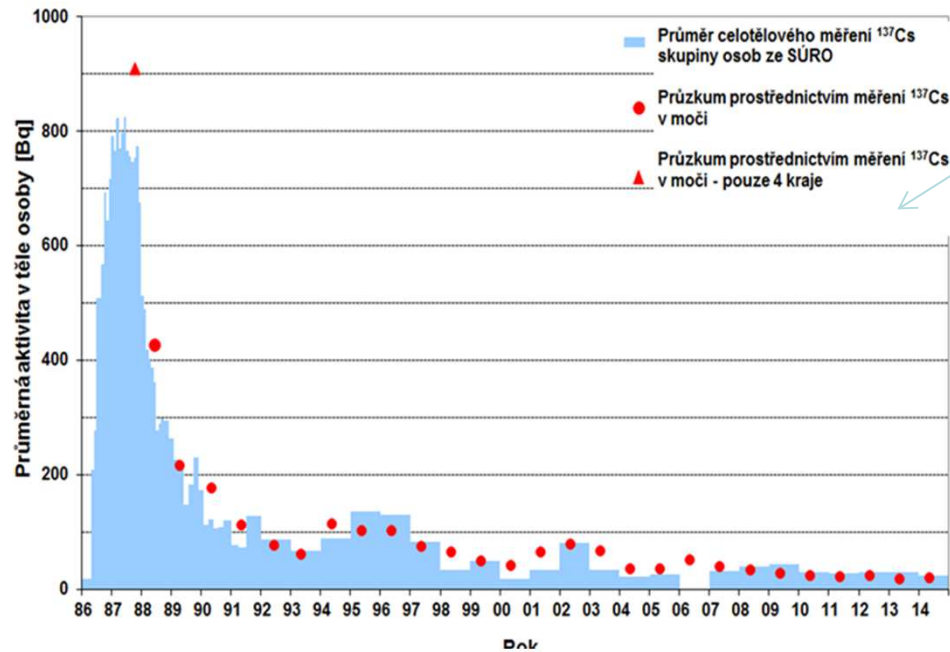
The role of in vivo measurement – to verify the prediction of doses from inhalation and ingestion

Includes unknown factors that could not be taken into account

- composition of radioiodine (aerosol, gases)
- the time of arrival of contaminated air masses
- countermeasures to reduce the dose
- uncertainty of the food basket
- reduced inhalation while staying in buildings

Retention of ^{137}Cs in the body – measured on WBC

Daily intake of ^{137}Cs (Bq/d), calculated from retention (WBC) and from ingestion intake (food basket)



Use of the results of the after Chernobyl monitoring from the Czech Republic in IAEA programmes for model validation

- VAMP (Validation of models predictions TECDOC– 795 Validation of models using Chernobyl fallout data from Central Bohemia region of the Czech Republic – Scenario CB
- EMRAS I (Environmental Modelling for Radiation Safety) - Testing environmental transfer models) – Prague Scenario ^{131}I (especially aimed at milk contamination)

Review of countermeasures in the Czech Republic after Chernobyl accidents - introduction

- Even according to conservative estimates, action levels at which the countermeasures are implemented have not been reached in the early phase.
- an equivalent dose of 50 - 500 mSv to the thyroid gland, an effective dose of 5 - 50 mSv (hiding and iodine prophylaxis)
- In the middle phase an effective dose of 5 to 50 mSv (food regulation)
- In the Czech Republic, conservative estimates of external and internal doses - less than 1 mSv
- ALARA principle introduced

Review of countermeasures in the Czech Republic after Chernobyl accidents

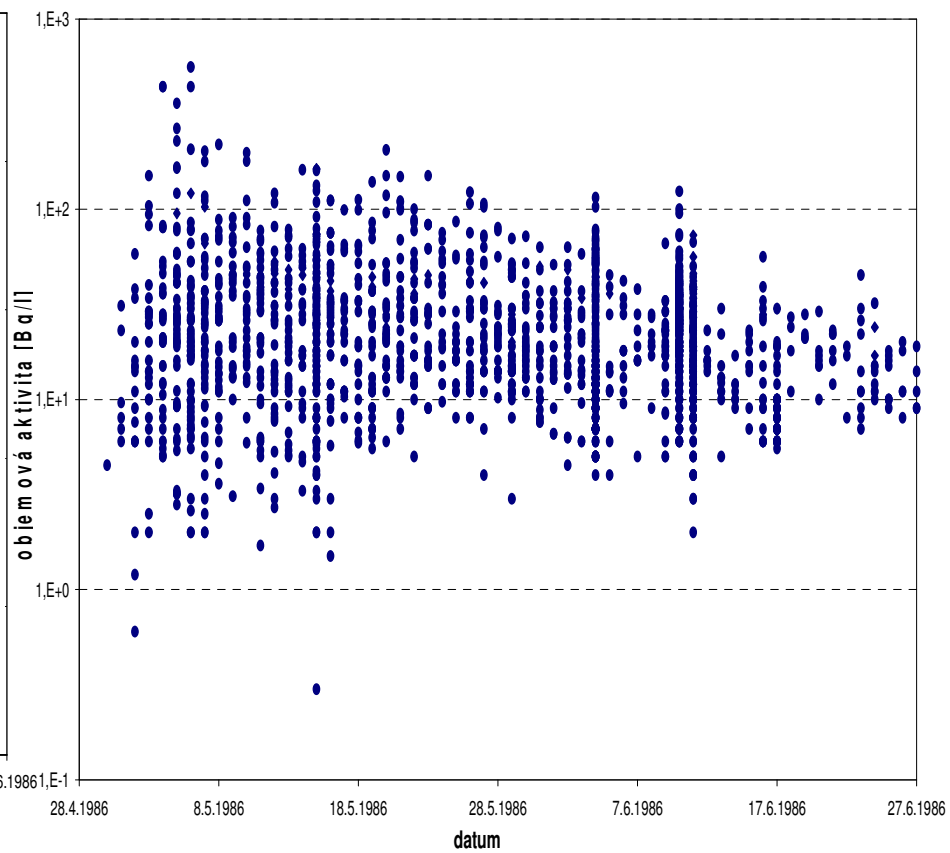
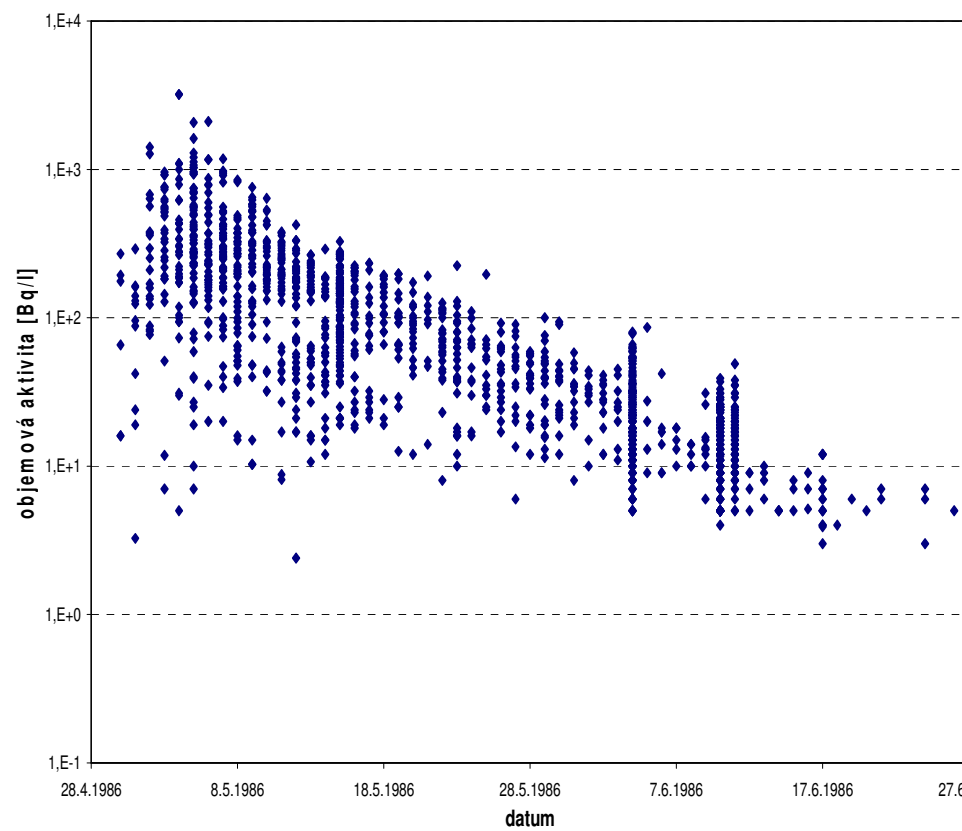
Only such counter-measures were introduced that did not interfere with people's lives and demanded minimal financial costs

- it was recommended to keep milking cows in the stables on dry feedstuff – if feasible
- Milk with an activity of ^{131}I greater than 1000Bq /L (WHO Recommendation - exclude milk with an activity greater than 2000Bq /L) was excluded from consumption
- Stock of dried and condensed milk was released to shops
- The production of baby milk formula was temporarily transferred from the Opočno and Zábřeh plants with higher ^{137}Cs fall out to the Nový Bydžov plant with lower fall - out
- Iodine prophylaxis introduced in Slovakia for sheep - herders due to the high activity of ^{131}I in sheep's milk
- It was recommended to increase road sprinkling in cities
- Temporary ban of the production of fresh bovine thyroid medicines

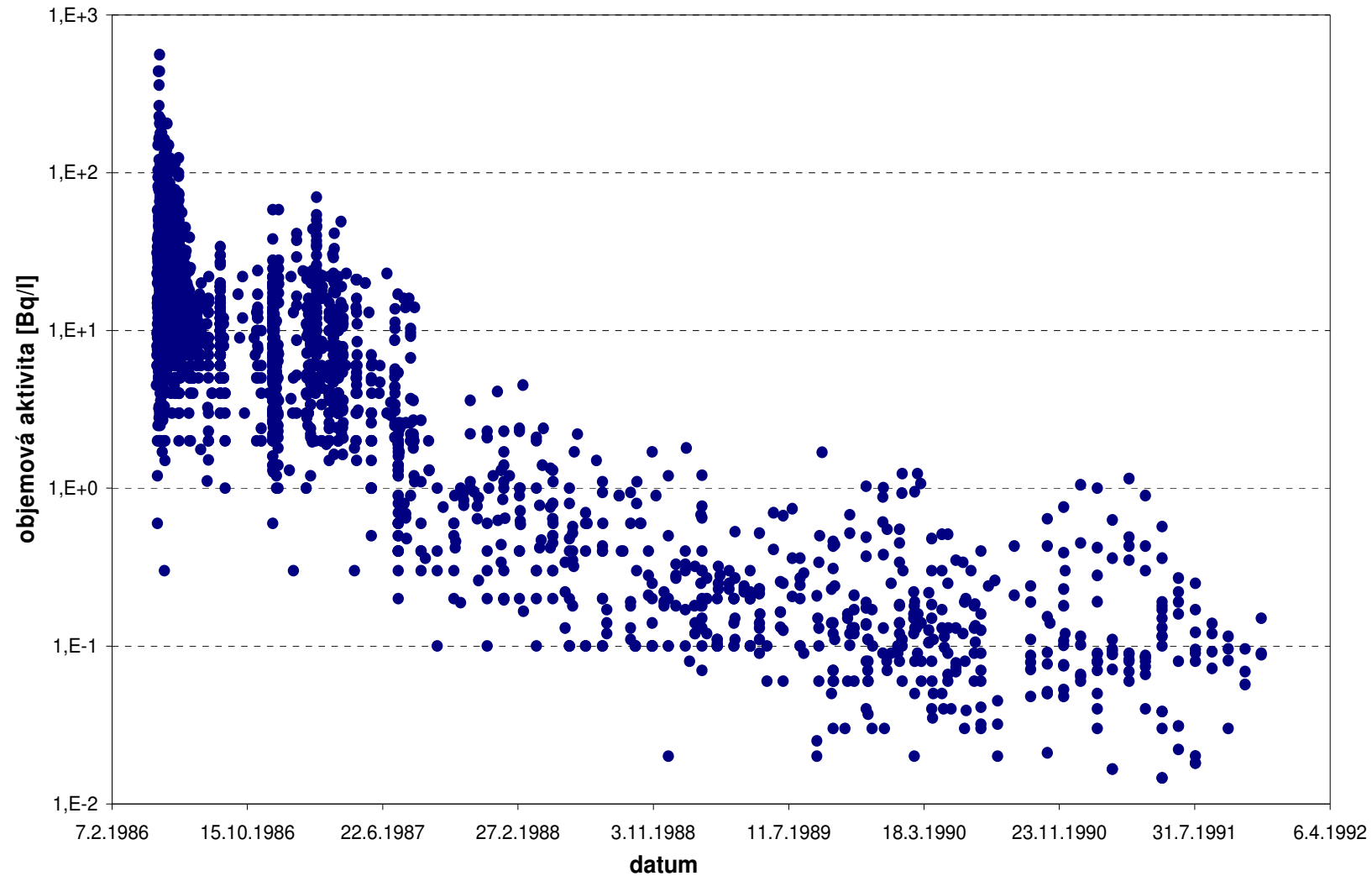
Volume activity in milk , 1986

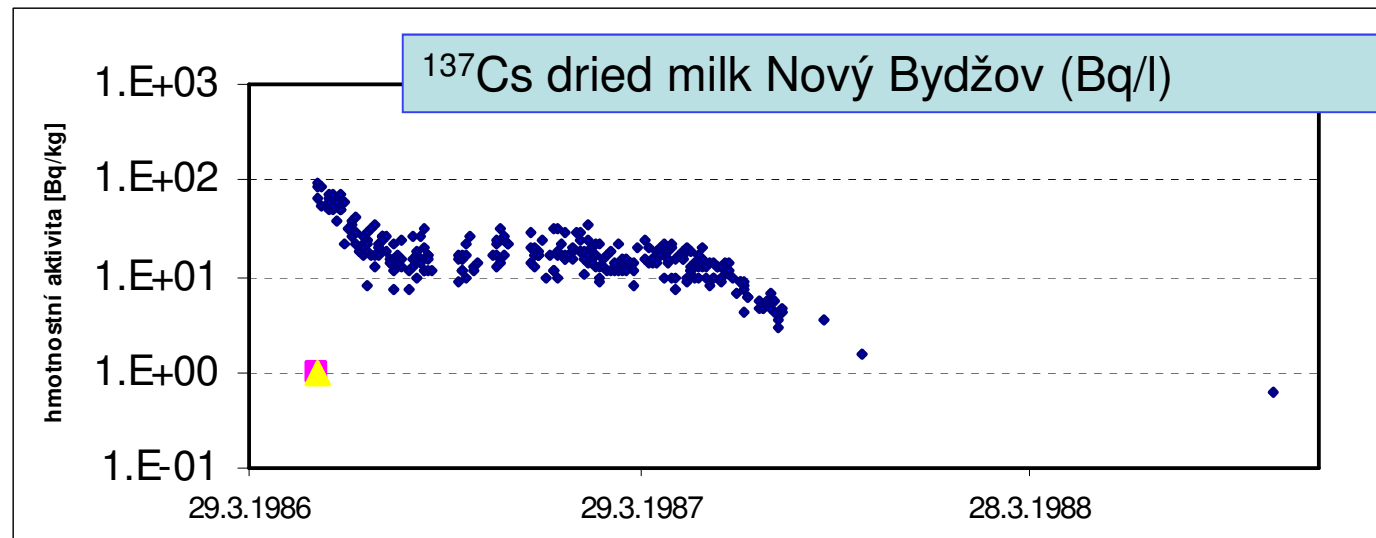
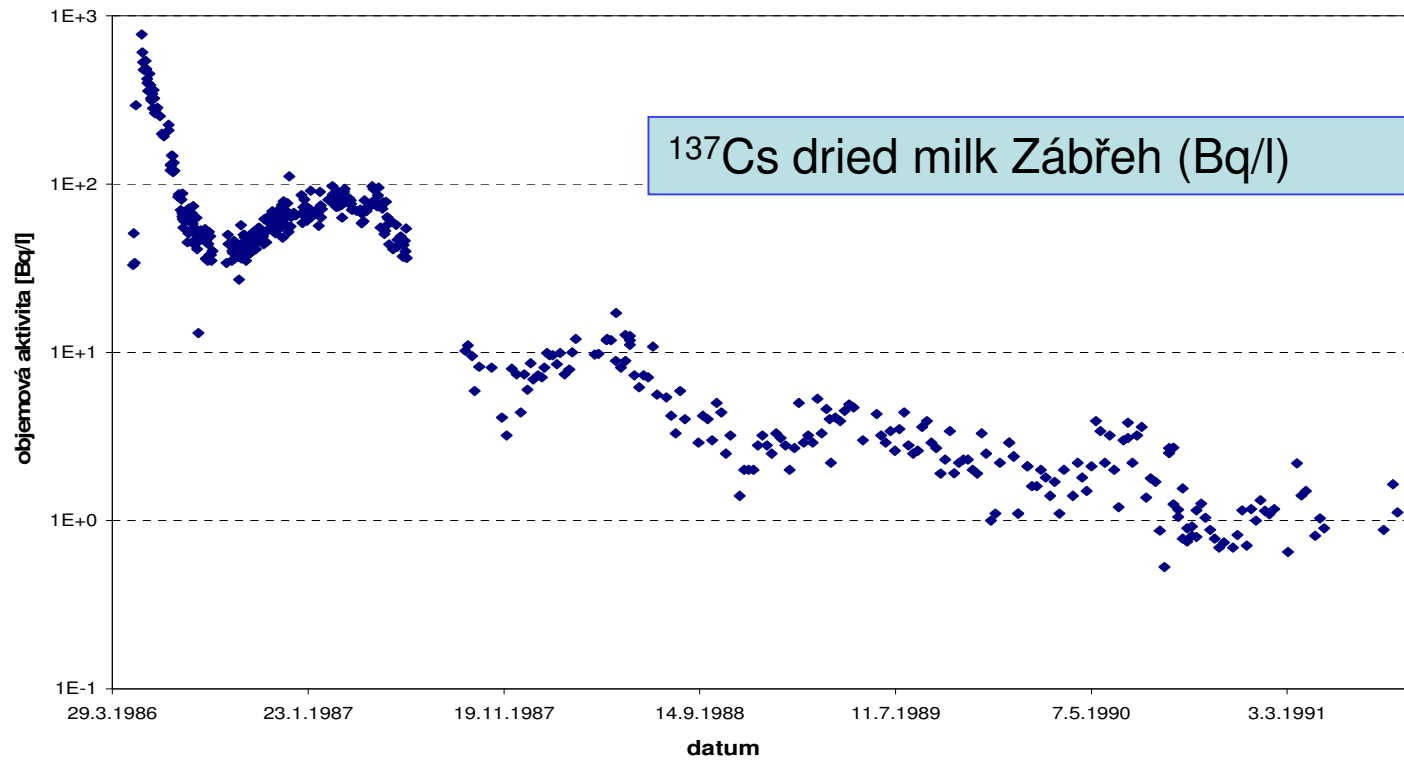
131I

137Cs



Volume activity of ^{137}Cs in milk in the Czech Republic (1986 – 1992)

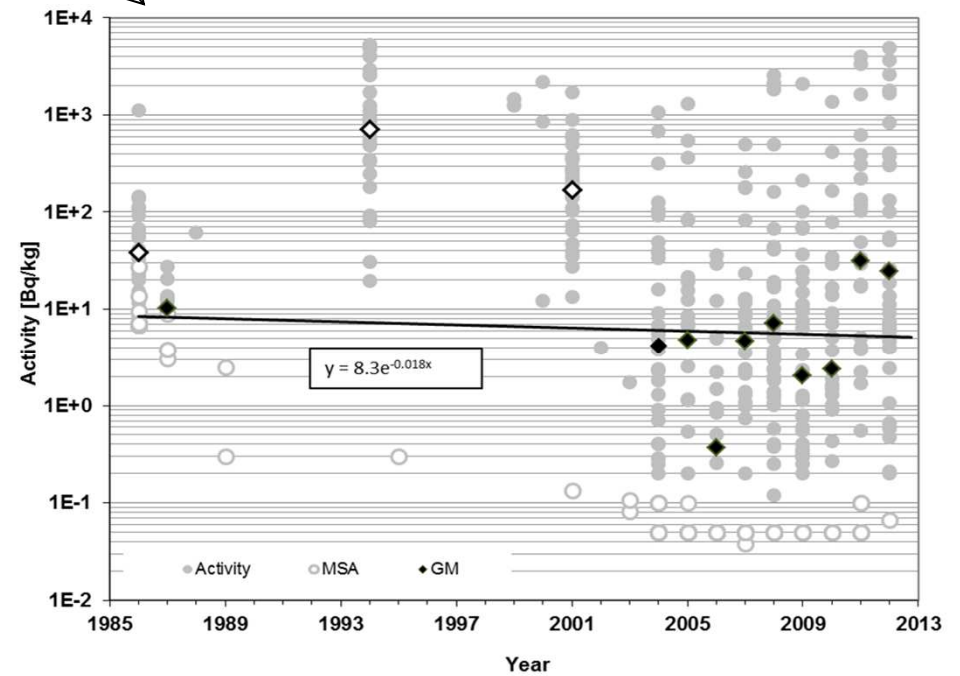
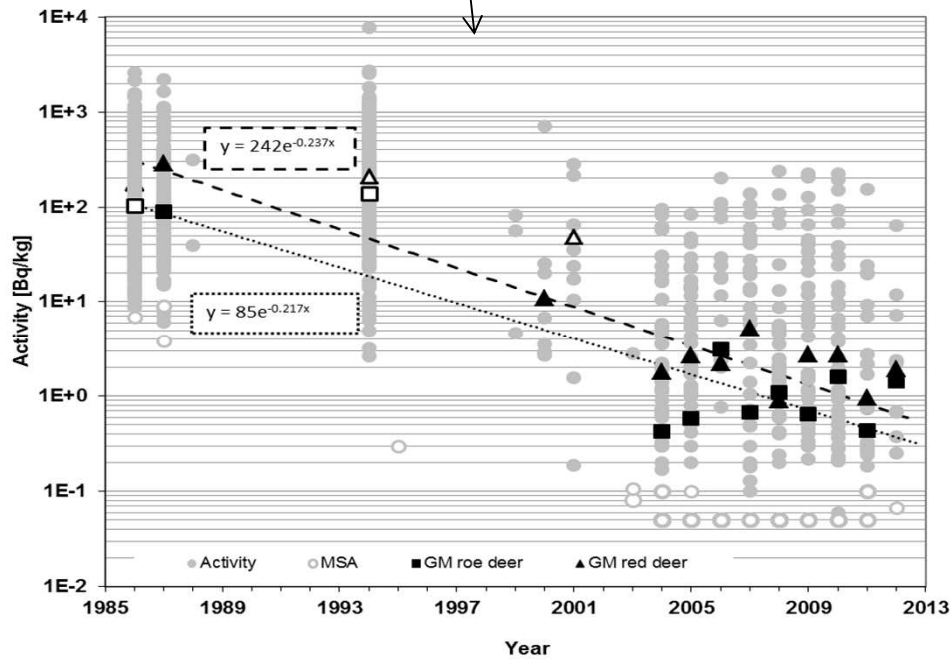




Natural ecosystem – Czech republic

game – deer, roe deer, wild boar

source of data: Radiation Monitoring Network



Activity of ^{137}Cs in dried mushroom (Bq/kg)

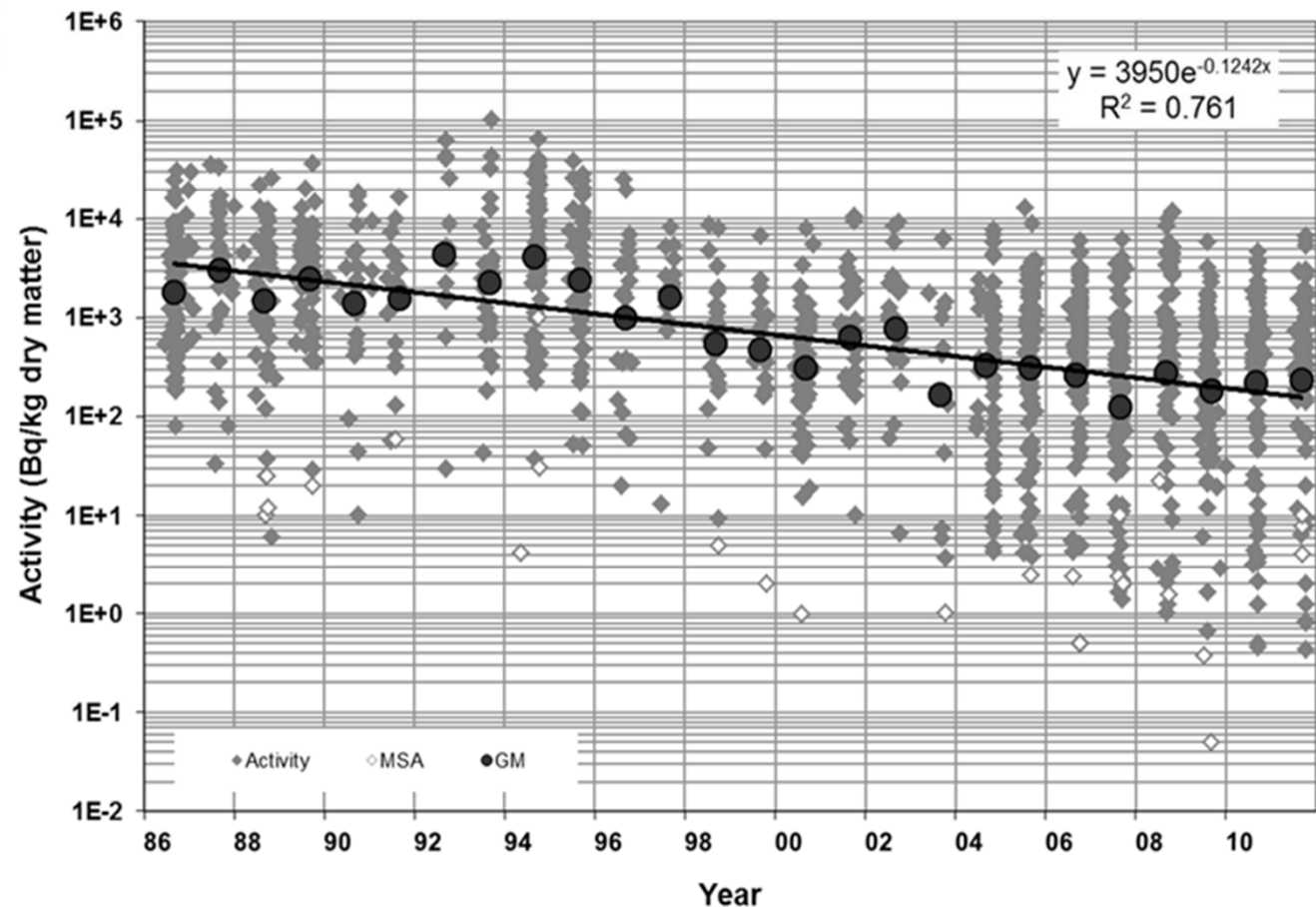


Average adult person consumes annually 0.3 kg of game, 2.4 kg of fresh mushroom, 1.5 kg of wild berries

Some hunters, loggers, forresters consume in average: 14.7 kg of game, 3.4 kg fresh mushroom, 2.8 kg of wild berries

Average adult citizen could be exposed additional dose up to 0.1 mSv/ year, hunter about 0.3 mSv/year.

Natural background is about 1 mSv/year



CZ regulatory attitude (up to now)

> 600 Bq/kg – not for export and market

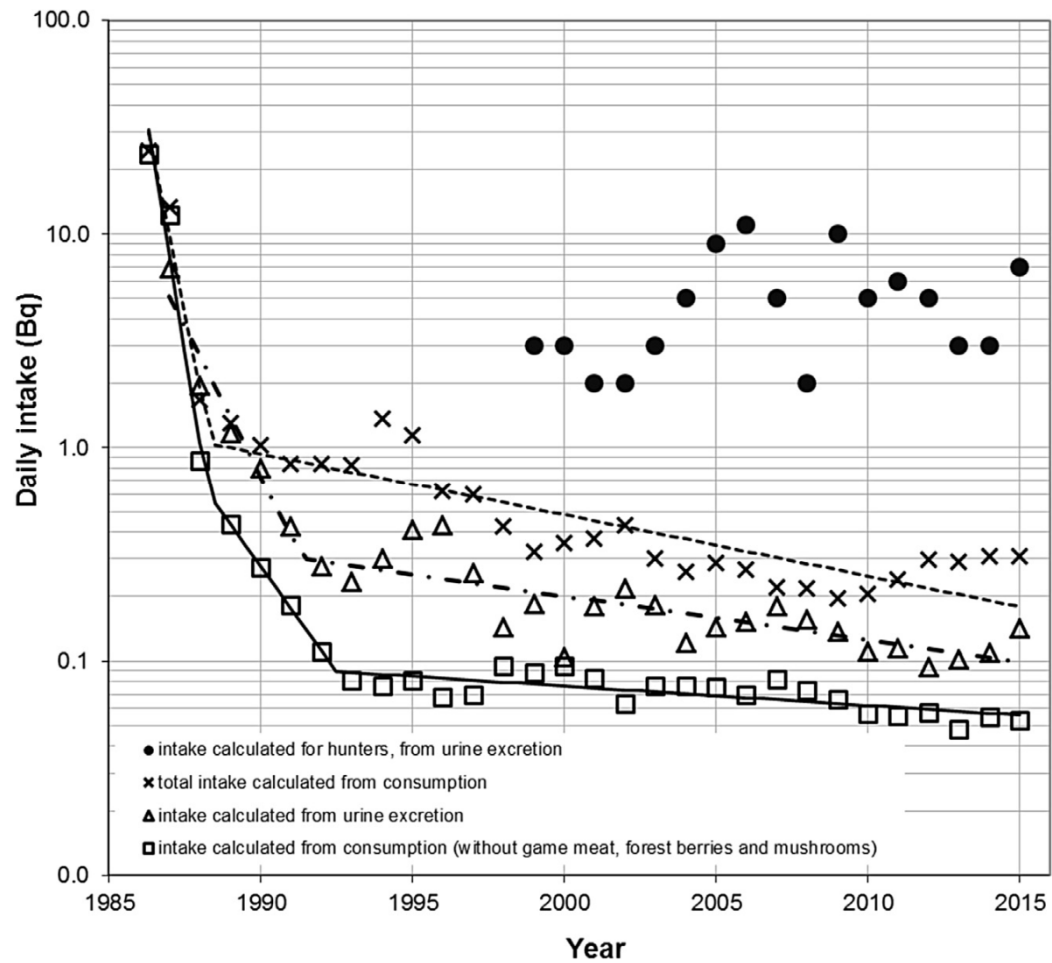
No special regulation for individuals !

Only education/awareness campaign for „critical group“

based on:

- annually - internal cont.measurement in Jeseniky and Sumava *Cs-137 in vivo (and urine)*
- measurements Cs-137 in deer and wild boar meat (up 10 kBq/kg)
- survey of game consumption (some hunters eat up 80 kg/year of game)
- doses evaluation from WBC and urine analysis
- explanation of exposure and risk (stakeholders)

Daily intake of ^{137}Cs calculated from urine excretion and food basket



Thank you for your attention