Austrian Agency for Health and Food Safety

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Tritium and Gross Alpha and Beta Measurements performed for the Official Radioactivity Monitoring in Austria

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Background

- Austrian Radiation Protection Act
  - Part 4: govenmental control of radiation level in the environment and goods as well as assessment exposure of the population
  - § 37 monitoring radioactive contamination

- Euratom Treaty
  - 2000/473/Euratom: Commission Recommendation
  - Monitoring of levels of radioactivity in the environment
  - Assessing the exposure of the population as a whole

- Danube River Protection Convention
  - surface waters and groundwater within the Danube River Basin are managed and used sustainably and equitably.

Background

Austrian Radiation Protection Act

- § 37 monitoring radioactive contamination
- The main objective is to determine even small increases of radioactivity in food (food control) and various environmental media such as air, wet deposition, soil and surface water as well as in wastewater treatment plant discharges nationwide.

Tritium	Gross(α+β)
Drinking water	Drinking water
Surface water	Surface water
Wet depositon	

Background

2000/473/Euratom

Media	Measurement category	
	Dense network	Sparse network
Airborne particulates	Cs-137, gross beta	Cs-137, Be-7
Air	Ambient gamma dose rate	Ambient gamma dose rate
Surface water	Cs-137, residual beta	Cs-137
Drinking water	Tritium, Sr-90, Cs-137 Natural radionuclides as monitored in compliance with Council Directive 98/83/EC	Tritium, Sr-90, Cs-137 Natural radionuclides as monitored in compliance with Council Directive 98/83/EC
Milk	Cs-137, Sr-90	Cs-137, Sr-90, K-40
Mixed diet	Cs-137, Sr-90	Cs-137, Sr-90, C-14

Background

2000/473/Euratom

Reporting levels

Uniform reporting levels have been defined on the basis of their significance from an exposure point of view, irrespective of the detection limits applied by the different laboratories.

Sample type	Radionuclide category	Reporting level
Air	Gross beta (based on Sr-90)	5 E-03 Bq/m³
	Cs-137	3 E-02 Bq/m³
Surface water	Residual beta (based on Sr-90)	6 E-01 Bq/l
	Cs-137	1 E+00 Bq/l
Drinking water	H-3	1 E+02 Bq/l
	Sr-90	6 E-02 Bq/l
	Cs-137	1 E-01 Bq/l

Method

Sample Preparation

- ^{3}H determination via LSC
  - 10 ml water sample
  - 10 ml Ultima Gold™ uLLT
  - measured with a Quantulus 1220™
  - 480 min counting time

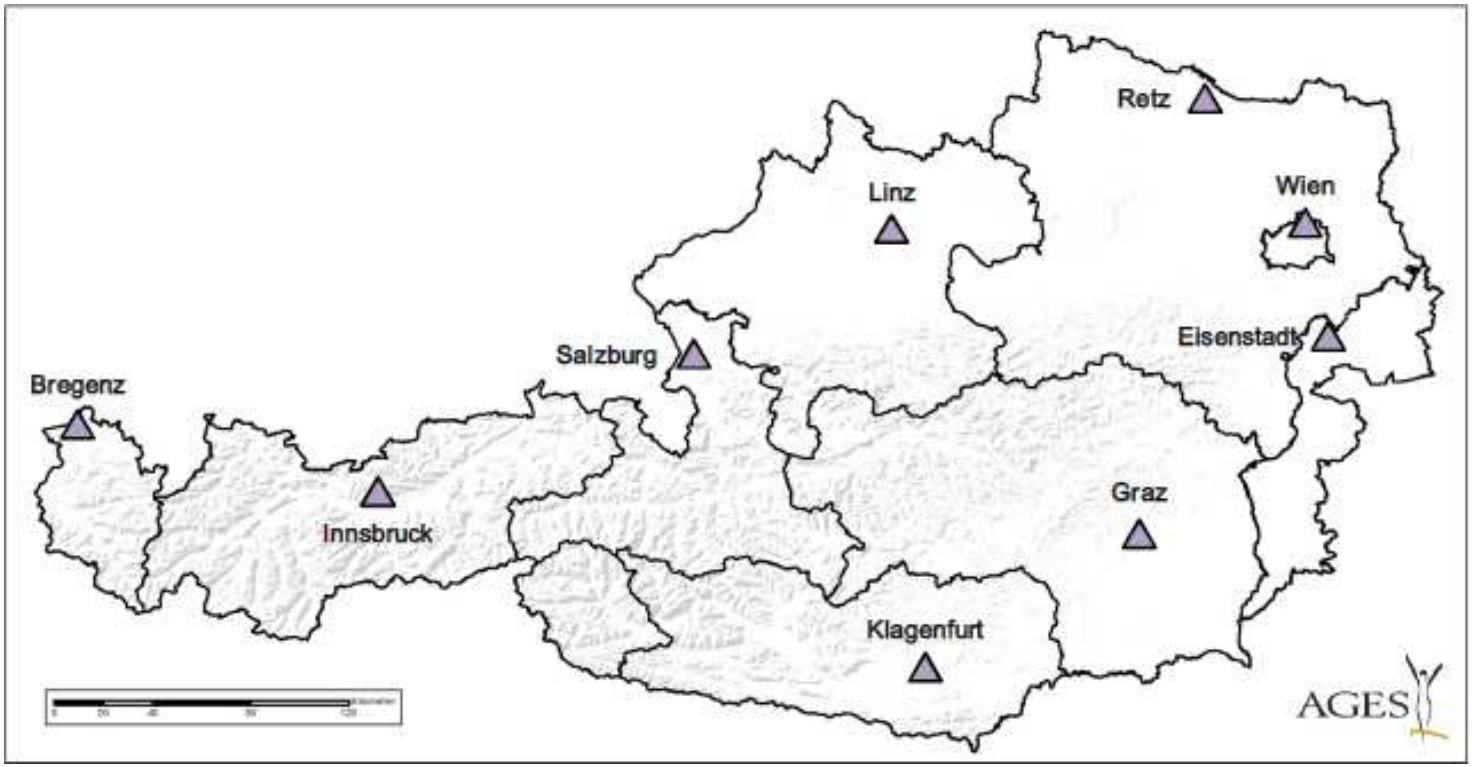
- Gross(α+β) determination via LSC
  - 10 ml water sample
  - 10 ml Ultima Gold™ uLLT
  - measured with a Quantulus 1220™
  - 480 min counting time

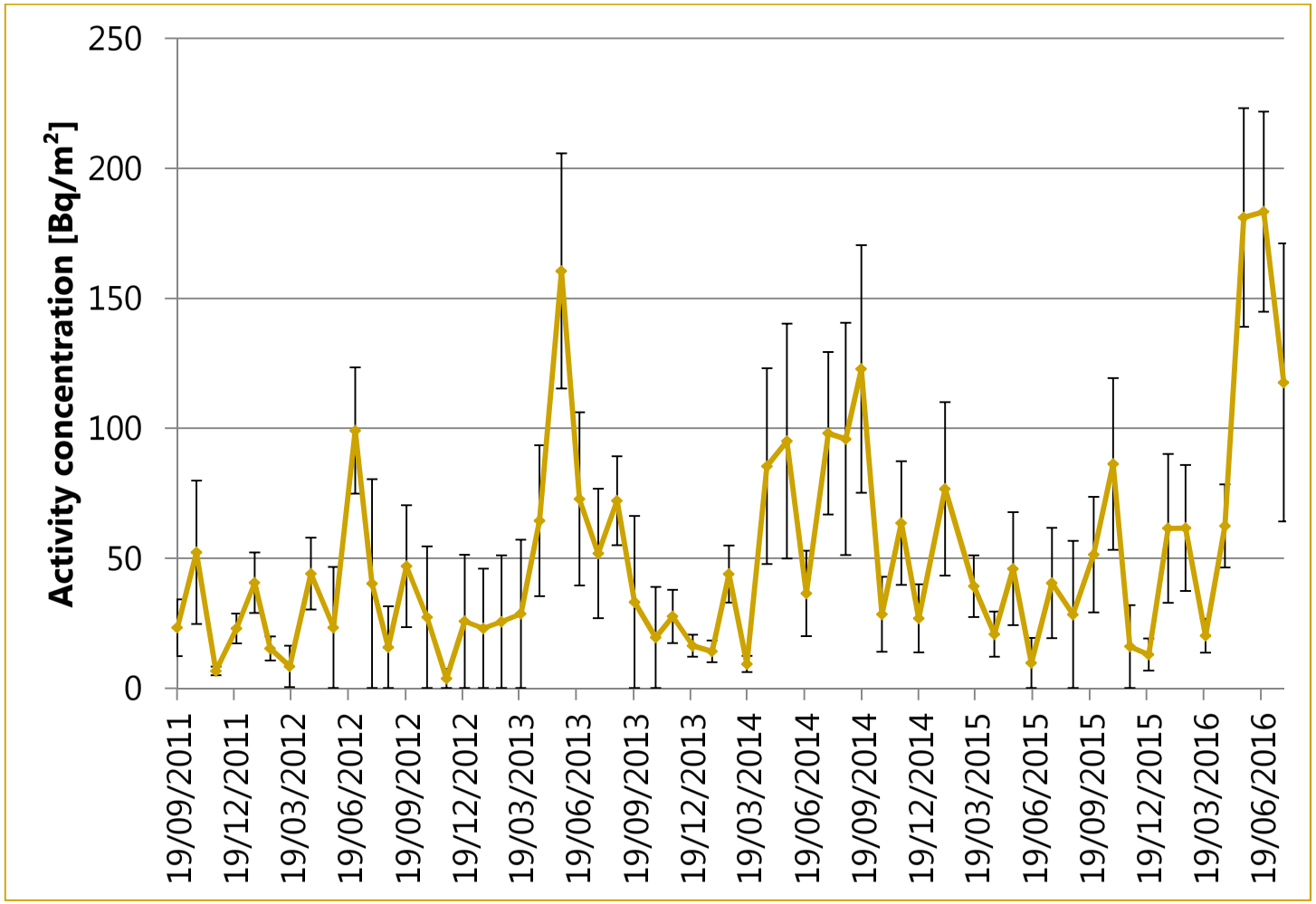
Difficulties encountered

- Various cocktail composition
  - Quicksafe 400™ has various K-40 contents
  - Background variation and LLDs above the reporting level for surface water (0,6 Bq/L residual beta)
  - Had to change to Ultima Gold™ uLLT
- Ventilation conditions in the lab
  - Tritium Background raised when the ventillation was malfunction
  - Higher temperatures in the summer
  - Natural radionuclides that concentrate in the room

Deposition Samplers

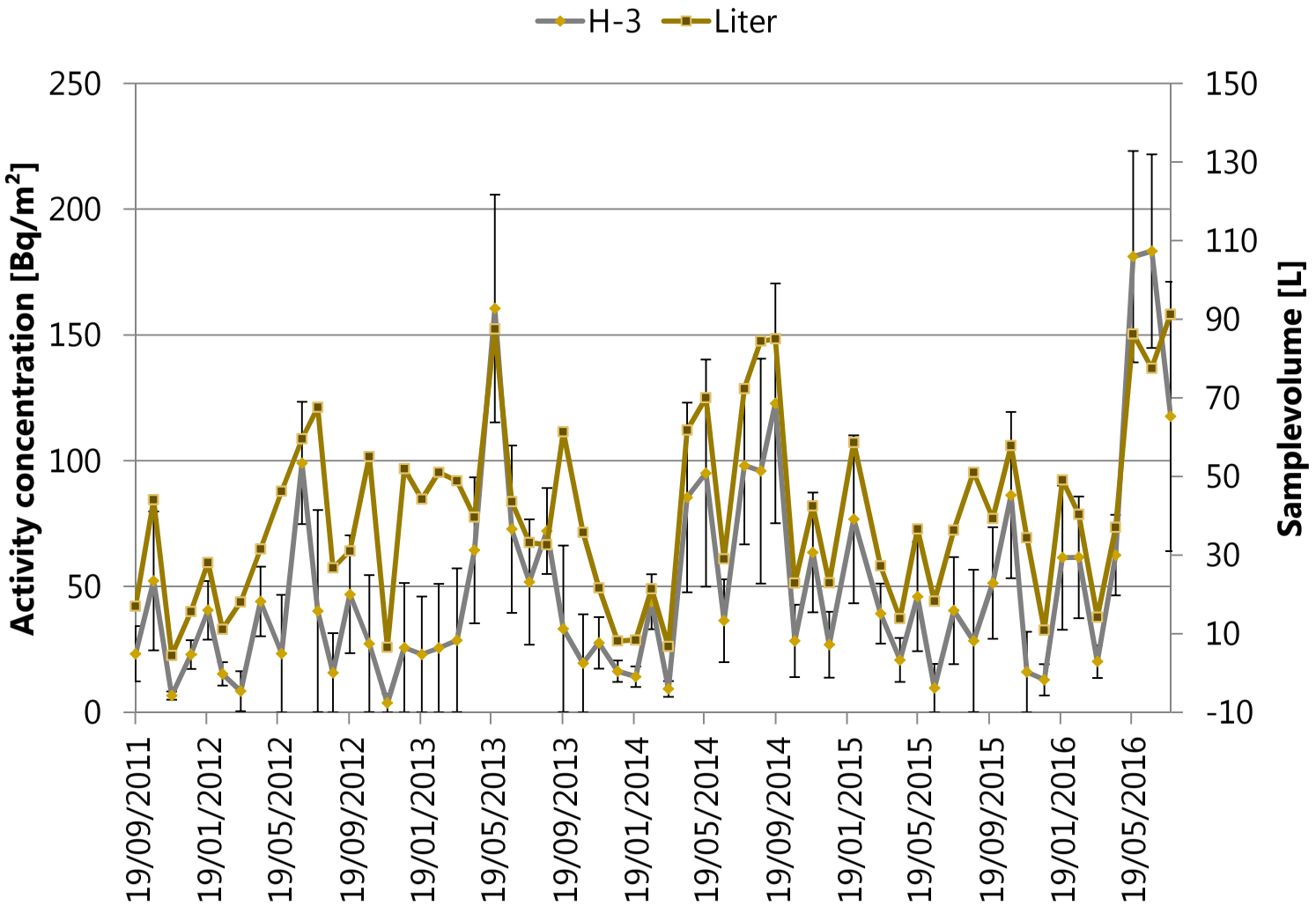
- 9 sampling stations (1.000 cm^2 - 10.000 cm^2)
- Measured monthly
- 108 samples per year





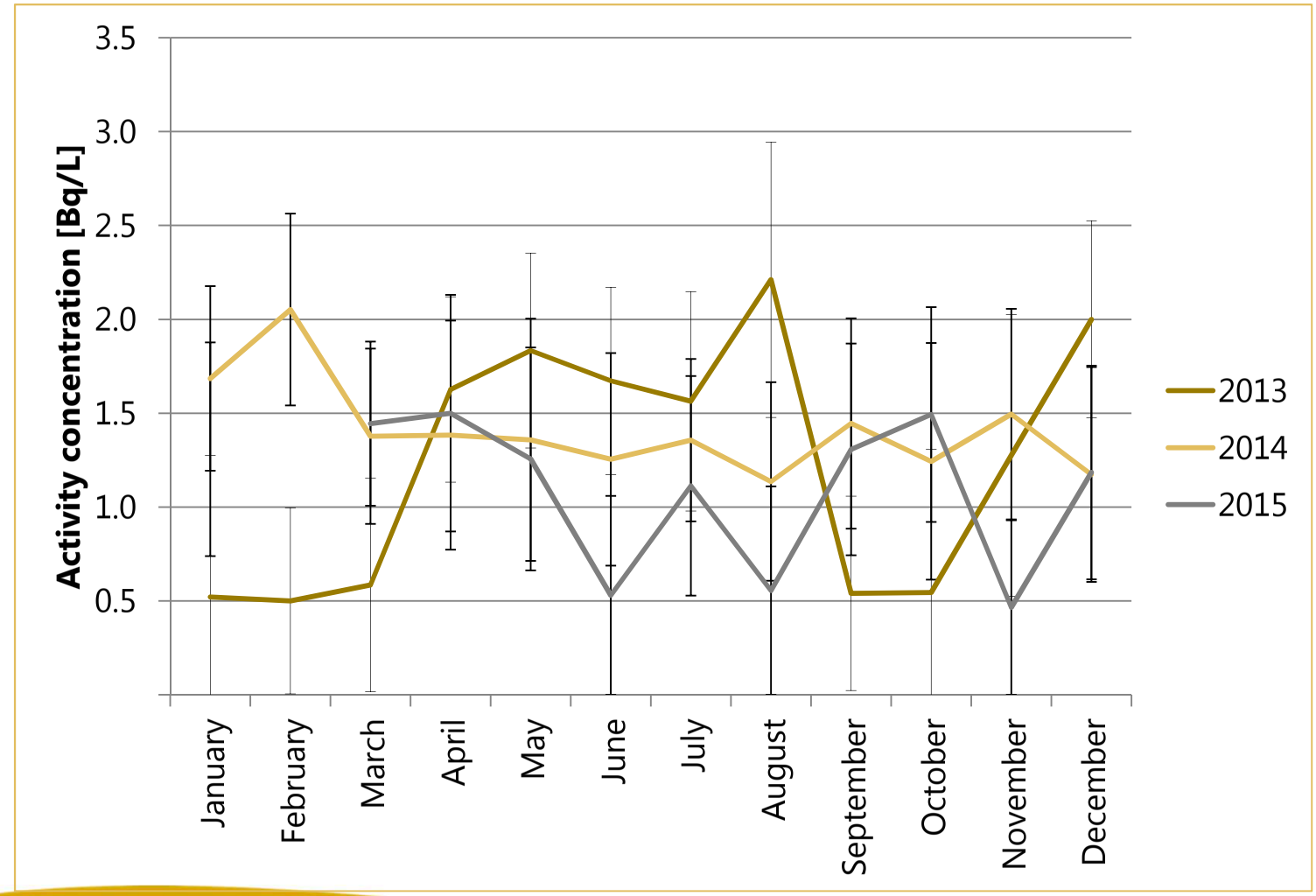
Tritium in wet deposition

Vienna



Tritium wet deposition

Vienna



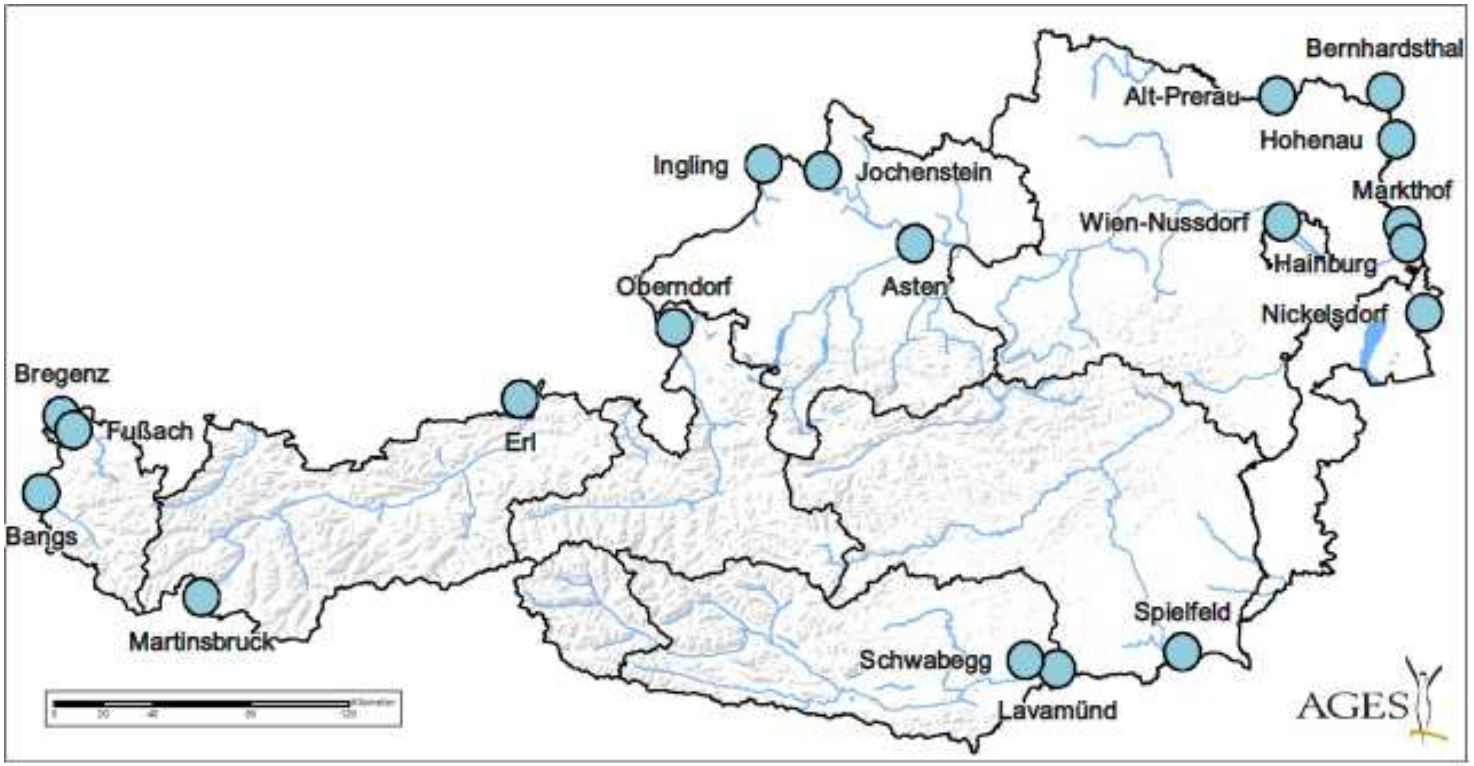
Tritium Wet Deposition

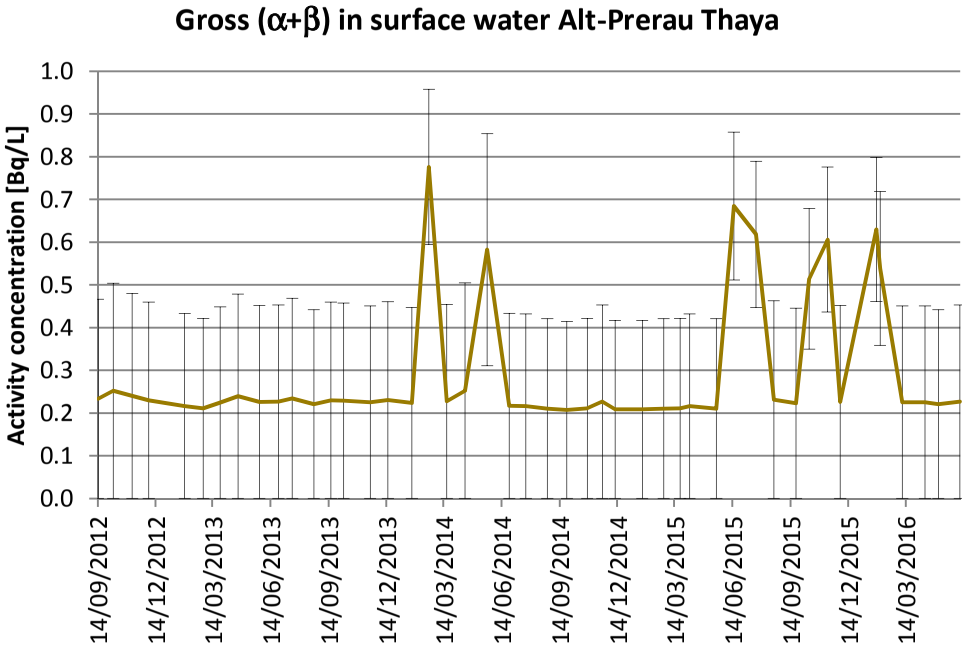
Vienna

- Origin of Tritium
  - Natural sources
  - Nuclear weapons testing 50s or 60s.
- No seasonal variations
- The resulting exposure from these tritium activities in wet depostion is irrelevant.
- If an incident occurs, values are taken for the calculation in exposition scenario

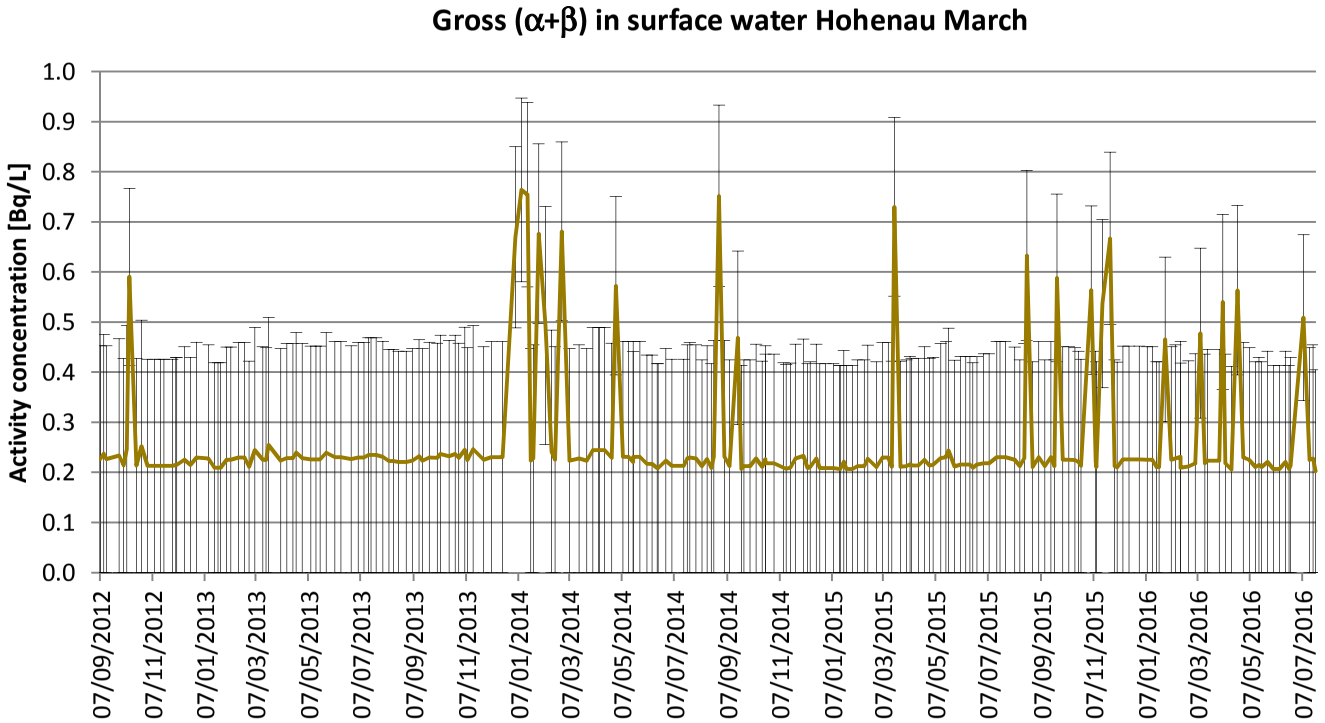
Surface Water Sampling

- 19 sampling points
- Grab sample, measured monthly
- 228 samples per year



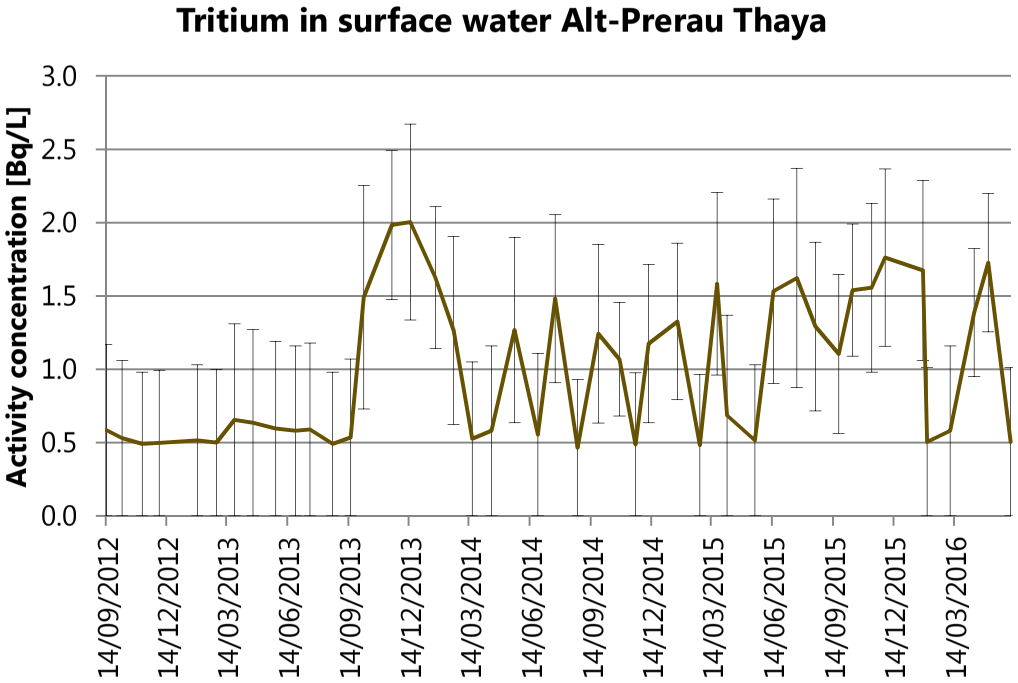


Gross(α+β) Determination



Gross (α+β) Measurements

- Just a few measurements showed values above the LLD (0,5 Bq/L). The highest values were about 1 ,0 Bq/L.
- Natural radionuclides like K-40 and radionuclides from the uranium-radium and thorium decay chain.
- During the occurrence of floodwaters resuspension of sediments can lead to higher K-40 concentrations.



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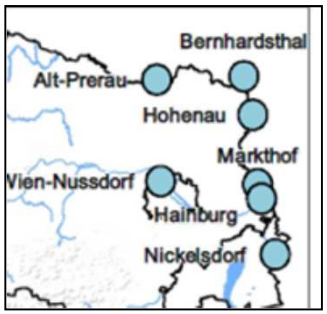
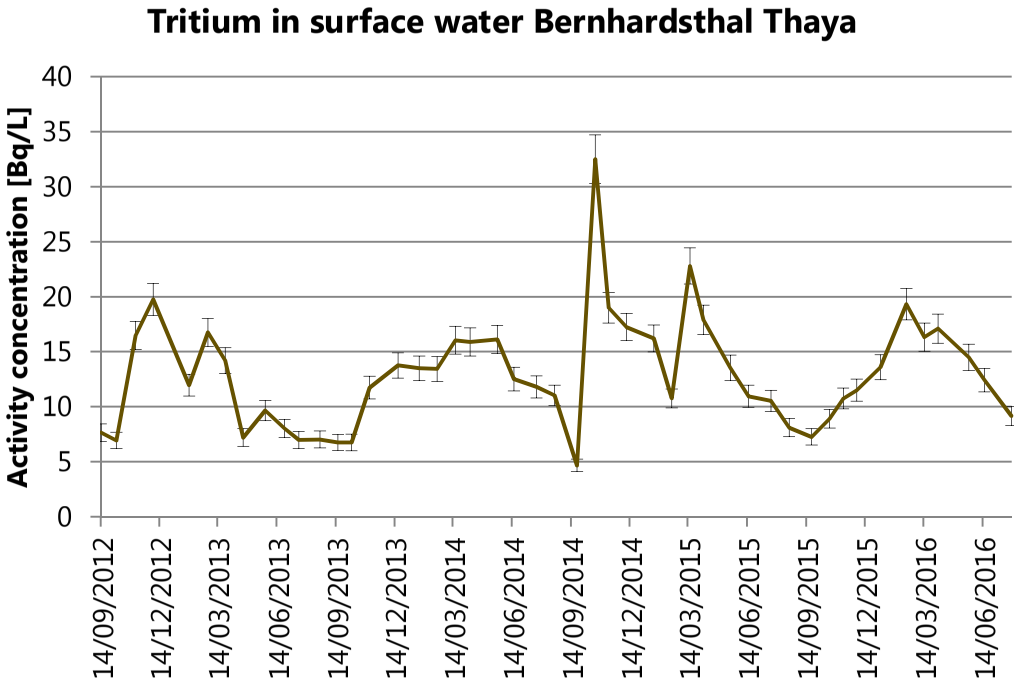
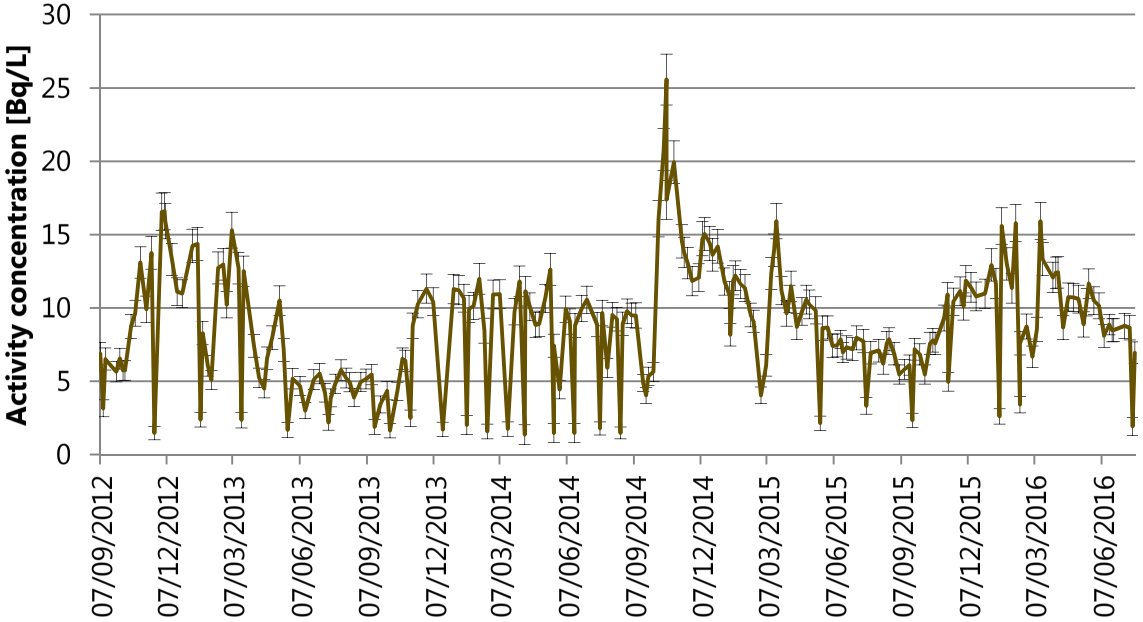
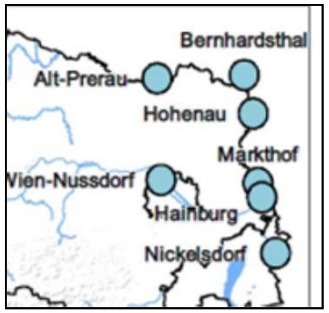
Tritium Determination
Detection of emissions (NPP Dukovany, CZ)



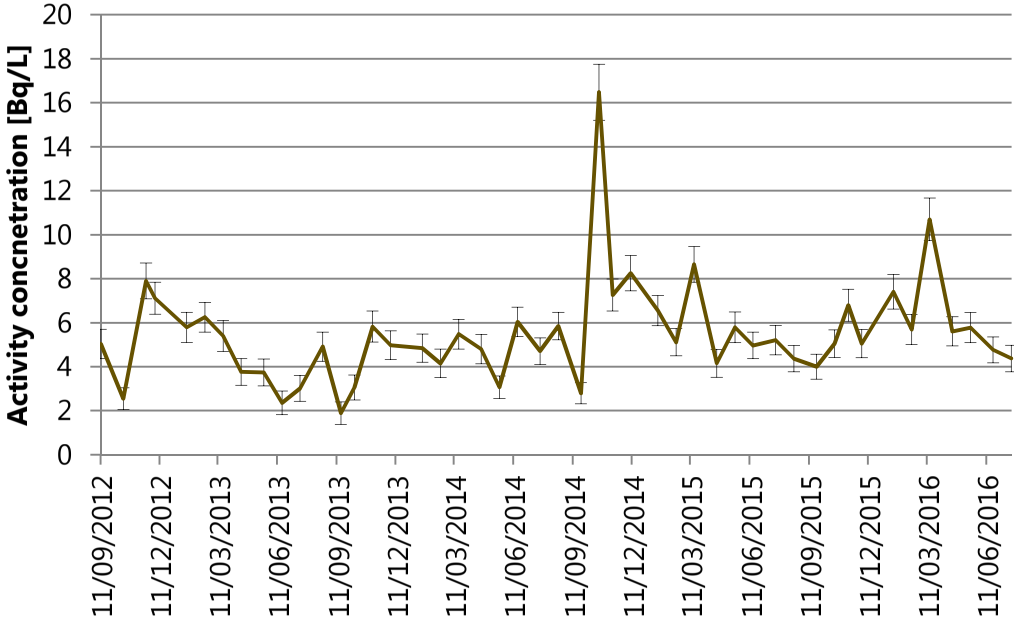


Tritium in surface water Hohenau March

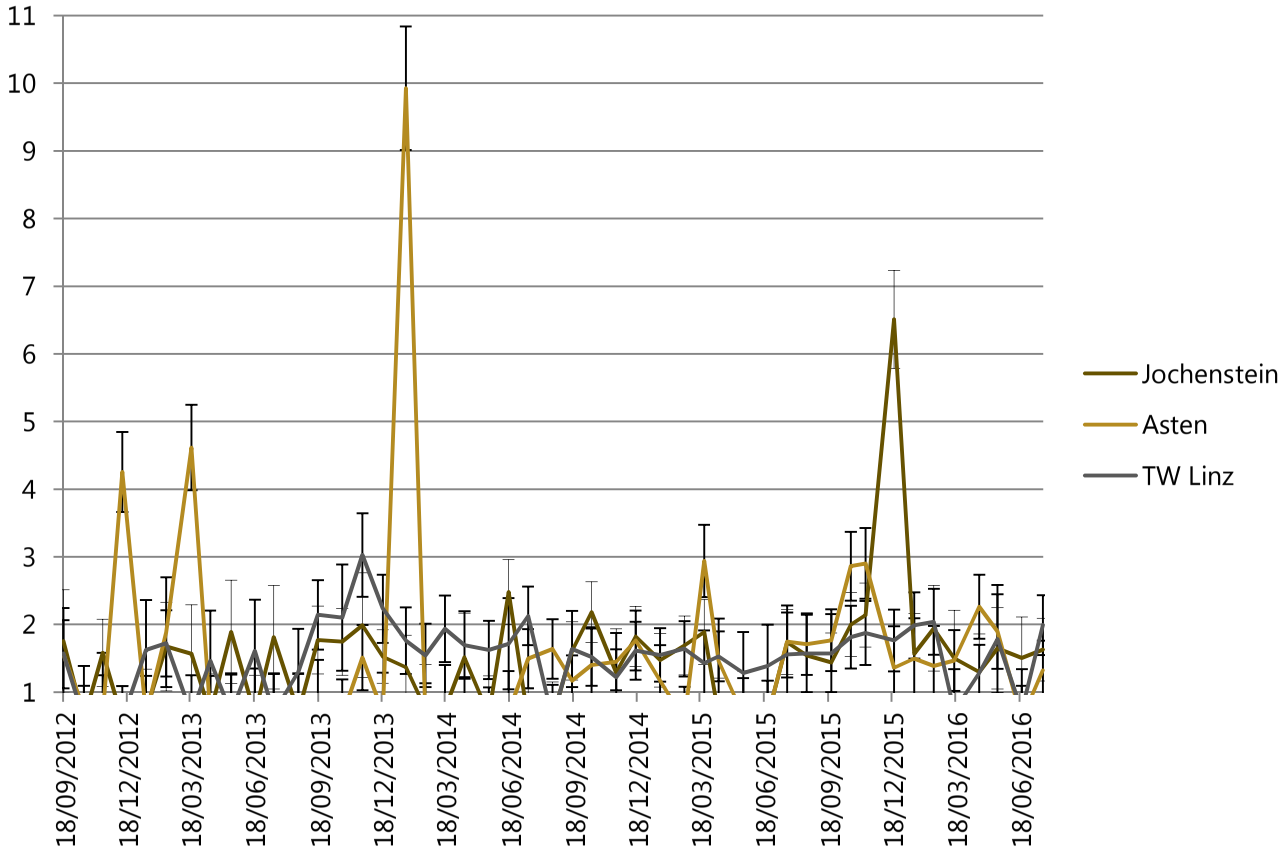




Tritium in surface water Markthof March



Tritium in the Danube



Drinking Water

Tritium Activity Concentration Bq/L

	Minimum = LLD	Maximum
Bregenz	< 0.89 Bq/L	1.86 Bq/L
Eisenstadt	< 0.89 Bq/L	1.78 Bq/L
Graz	< 0.89 Bq/L	1.91 Bq/L
Innsbruck	< 0.89 Bq/L	1.92 Bq/L
Klagenfurt	< 0.89 Bq/L	1.82 Bq/L
Linz	< 0.89 Bq/L	2.93 Bq/L
Salzburg	< 0.89 Bq/L	1.89 Bq/L
St. Pölten	< 0.89 Bq/L	1.80 Bq/L
Vienna	< 0.89 Bq/L	2.28 Bq/L

Gross α+β

- Just used for monitoring, radionuclide specific determinations are conducted for the calculation of the indicative dose
- K-40 equivalent
- Drinking Water: LLD 0,40 Bq/L

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