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Regional radioecological survey: another tool for environmental monitoring

IRSN, Radioprotection and Environmental Pole
Environmental radioactivity study and monitoring department

IRSN
INSTITUT
DE RADIOPROTECTION
ET DE SÛRETÉ NUCLÉAIRE

The French legislative context

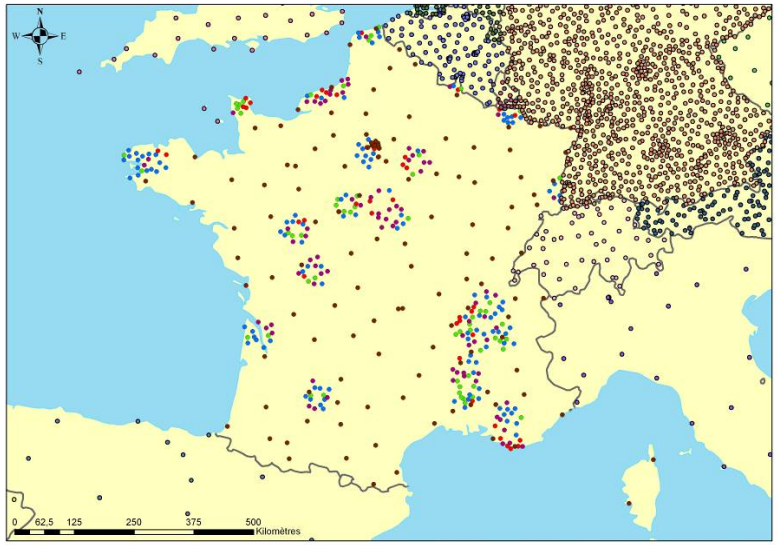
- The Euratom Treaty
  - Art 35 *« Each Member State shall establish the facilities necessary to carry out continuous monitoring of the level of radioactivity in the air, water and soil..." »*
- Surveillance by nuclear operators
  - Effectuated into the site and its nearest environment following the prescriptions of the French Safety Authority (ASN)
- Radiological Monitoring by IRSN
  - One of the fundamental missions of IRSN (into the Creation decree No. 222-254 of February 2nd 2002)
- Law « TSN » n°2006-686 of 13 June 2006 relative to the information and transparency

IRSN organisation for environmental monitoring

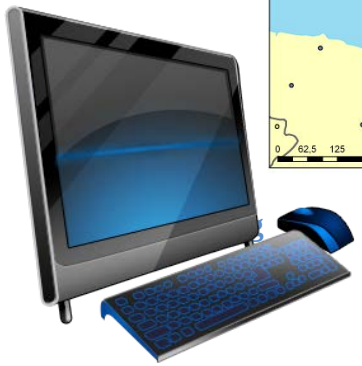
- *IRSN contribute to the knowledge of radioactive levels in the environment by 3 means :*
  - *ALERT*
  - *CONTROL*
  - *SURVEY*

- *With tools adapted to these missions*

- *Continuous measurement and real-time transmission to the IRSN supervision center (ALERT)*



Threshold exceeded: alarm sent



Archiving

Database

Publication of data

17 million ambient gamma measurements
90,000 aerosol measurements
275,000 watercourse measurements

Send an alarm to the standby person of

- *Permanent monitoring through a sampling network (CONTROL and SURVEY) :*

Evaluation on the environment, under 'normal' conditions

Regular (quarterly to yearly) sampling of air, water, foodstuffs and environmental indicators, under or not the influence of nuclear facilities

Surface water

Rain water

Underground water

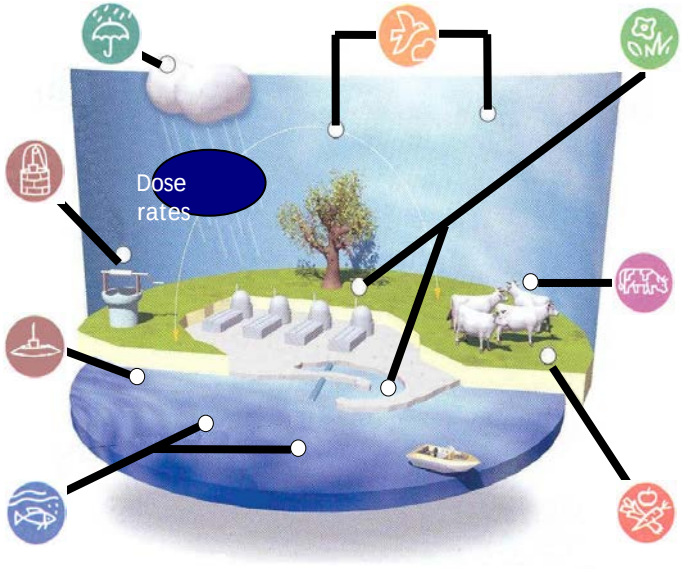
Air, Aerosols

Terrestrial and aquatic vegetation

Agricultural production

Milk

Sediments

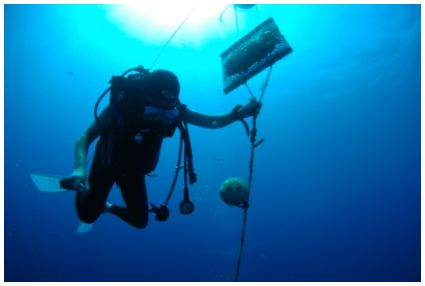


- *Specific studies for environmental monitoring at large scale (SURVEY) :*

Regional radioecological survey

- To qualify and quantify ‘baseline’ activity levels in different environment (continental, aquatic, marine) influenced or not by effluent releases in order to :

- Update radioactive background and remnant levels due to Chernobyl accident and atmospheric weapons test fallouts,
- Highlight local influence of current releases of the nuclear industry,
- Give a global overview of the radioecological state at the French scale




Methodological approach

3 main steps :

- Bibliographic analysis including geographical and radioecological settings,

- Field campaigns with 2 aspects :
  - Prospection for verifying and adjusting the strategy developed in step 1
  - Exchange with stakeholders : local nuclear committee, mayors, administrative bodies…

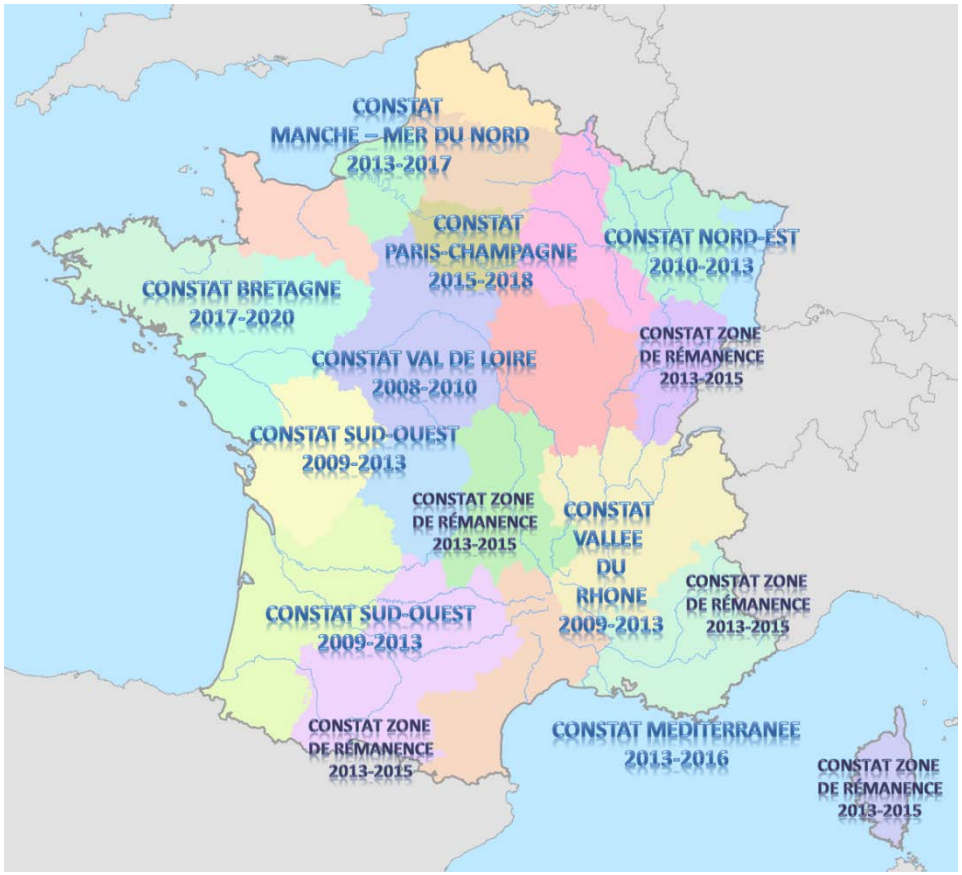
- Sampling, metrology and results diffusion
  - Low-level analyses adapted to the radionuclides activities measured in the environment for ^{14}C, ^{3}H, gamma emitters, ^{90}Sr, alpha emitters, U isotopes…

Overview of the regional radioecological surveys

Large area
Various pre-existing context

A sampling strategy adapted to each case

For a regional study we use :
30 to 50 documents (publications, reports, studies, statistics…)
10 to 20 field campaigns and 100 to 300 samples
250 to 500 results with low-level analyses



Strategy for continental (agricultural) environment

- identification of representative data

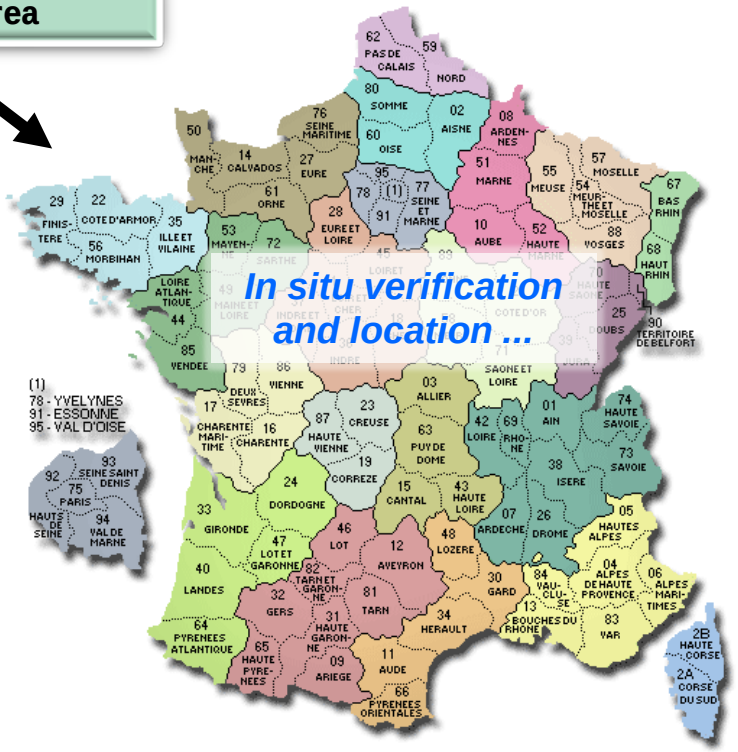
Selection of the most valuable regional production : value (% of the national production, in €)

Identification of species (by district)

Theoretical importance by municipality and by production : surfaces (ha) or size (livestock)

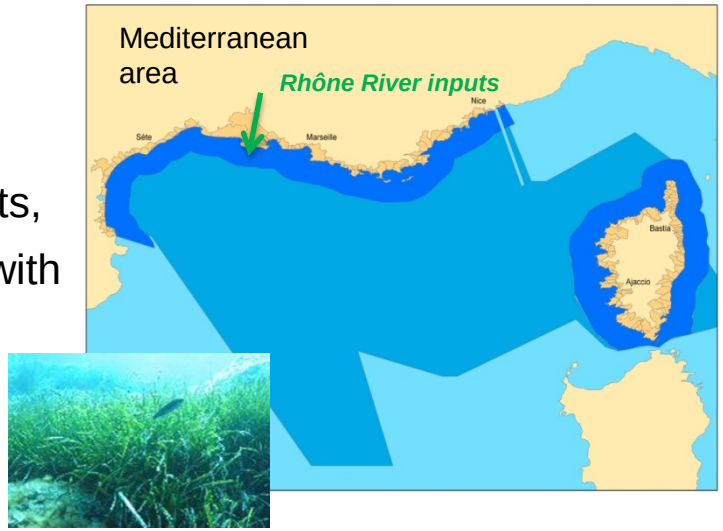
Identification of local area

+
Identification of special product (organic farming, traditional products or regional origin)



Exemple of particularities for specific regional survey

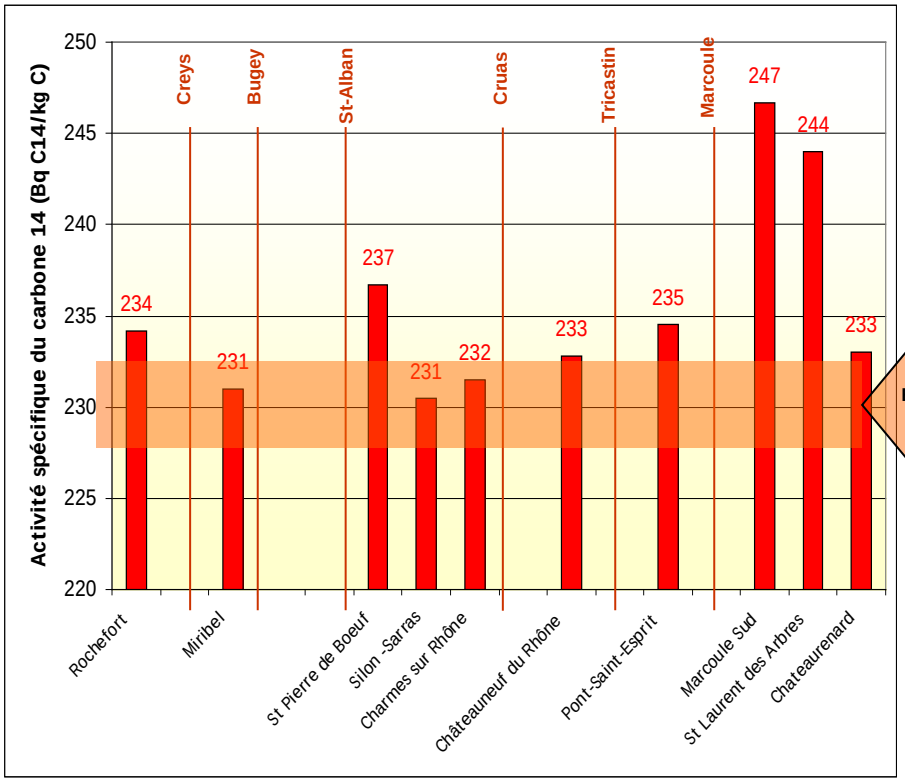
- In marine environment:
  - Fishes statistics are not complete
  - Radioactivity is more diffuse and diluted by currents,
  - Samples are more difficult to obtain (cooperation with small-scale fisherman, Ifremer…)



- In remnant zone:
  - Mix between common (soil, grass, milk) and unusual matrixes (berries, mushrooms, meat of wild boar), in poorly studied area until now
  - Undefined stakeholders

Example of results

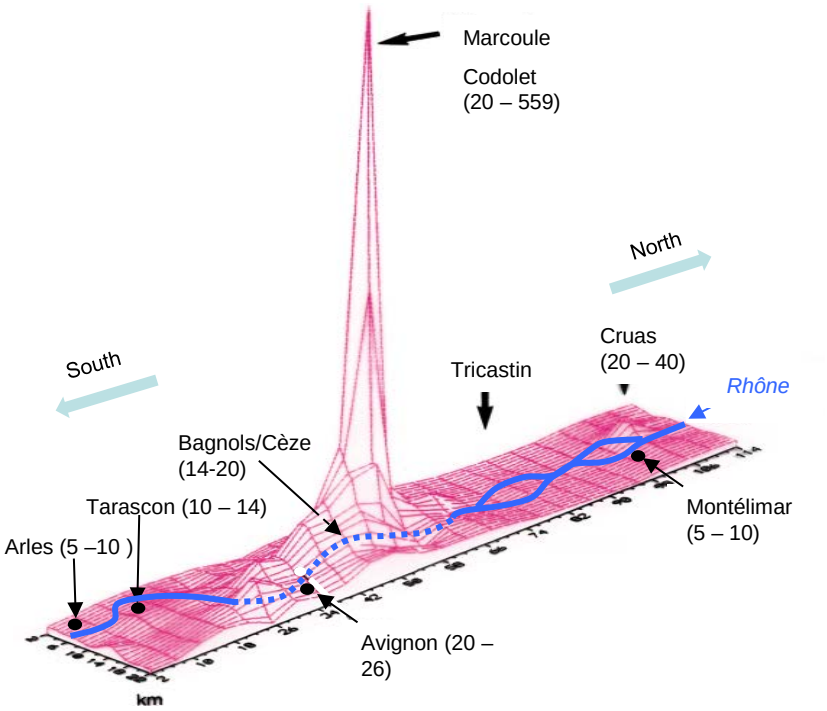
- ^{14}C in tree leaves (Bq/kg sec) sampled in 2011



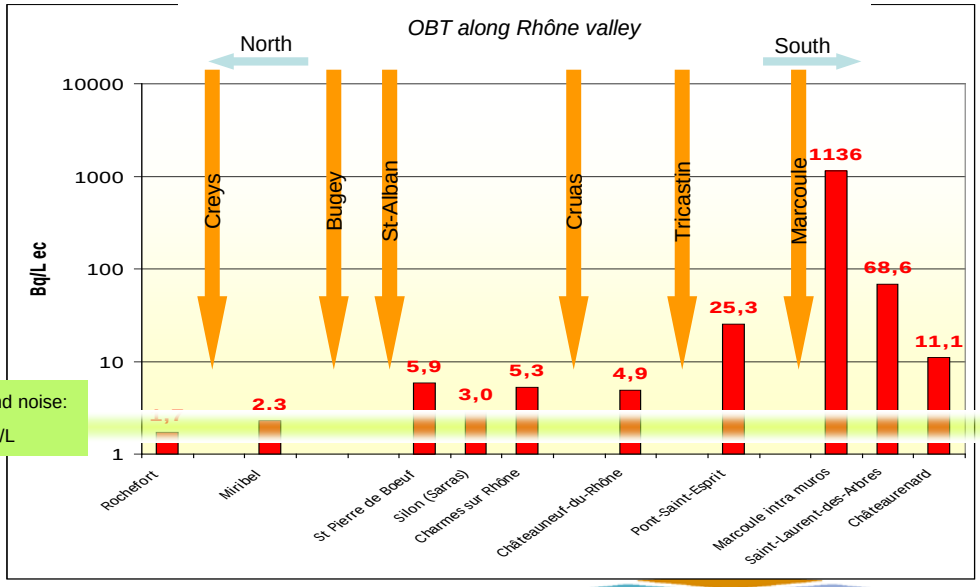
Results confirm past data and theoretical evolution of ^{14}C activities in terrestrial environment

Example of results

- OBT in oak leaves (Bq/kg sec) sampled in 1991-1992



Update of data in 2011-2012



Background noise:
< 1 à 3 Bq/L

Conclusion

- Limits…

- A relatively long time to realise the study (3 to 4 years) due to methodological approach and low-level analyses

- Effort on communication towards stakeholders…but, in general, relatively few interactions with the public

- And benefits

- Firsts regional surveys led on Loire and Rhône valley complement the regular environmental monitoring. They confirm the expected values, often close to the background noise or detection limits, and also confirm slight contamination around nuclear sites

- Opportunity to acquire new data on less known environment (forest, near mining area…), using new material (in situ gamma spectrometer, aerosol sampling station…) or improved metrology (ICP-MS, SMA,…)

Thanks for your attention