UNIVERSITY OF GOTHENBURG

Research interests and infrastructures

University of Gothenburg (UGOT) – Department of radiation physics

Mats Isakson, prof.

27th of January, 2016 - Information Day on the 1st OPEN RTD CALL of the 'CONCERT-European Joint Programme for the Integration of Radiation Protection Research' under Horizon 2020

The Sahlgrenska Academy

Research interests

- Radiometrical characterization, by alpha and gamma spectrometry, for radiological risk assessment – envrionment and NORM industries.
- Reducing uncertainties in assessment of internal dose from accidental intake of radionuclides
- Measurements of radionuclides in soil at reference sites to establish time series and to study models for long-term migration in soil.

Competences, research experience and networks

- o Emergency preparedness planning
- o Cell proliferation and gene expression
- o Animal model studies
- o Alpha, beta and gamma spectrometry
- o Radioecology
- o External and internal dosimetry
- o 3 professors, 10 senior researchers, 2 post doc, about 25 PhD students, laboratory personnel
- o Collaboration with about 30 MD:s

Infrastructures – equipment and measurements 1

- External dosimetry, including personal dosimetry
- Internal dosimetry: 2 whole body counters (NaI scanning bed, plastic scintillators), thyroid uptake meter
- Stationary and mobile gamma spectrometry (HPGe): man-made radionuclides and NORM
- *In situ* gamma spectrometry
- Sample changers (NaI)
- Liquid scintillator
- Dose rate meters and handheld spectrometers
- Sampling equipment and facility for sample preparation of various environmental samples

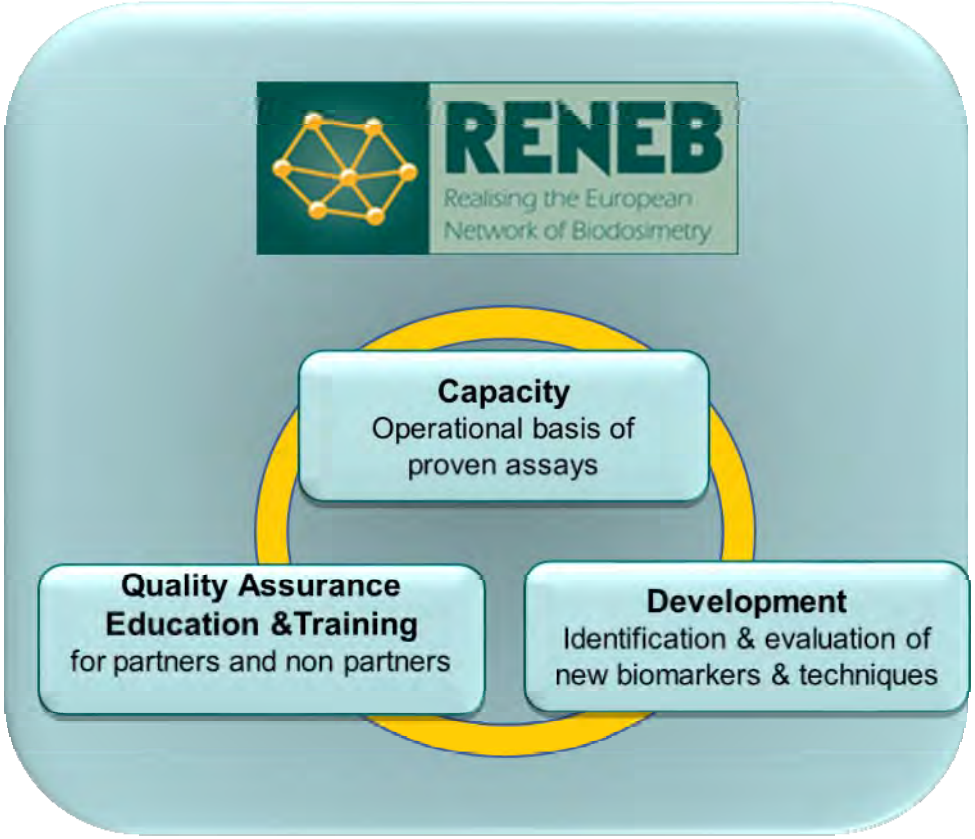
Infrastructures – equipment and measurements 2

- Alpha spectrometry with liquid/sediment/soil/organic matrices: U isotopes (238, 235, 234), Th isotopes (232, 230,228) Pu isotopes (238, 239+240), ^{241}Am and ^{210}Po.
- Animal models (mouse, rat) in specialized facilities
- Access to various cell lines and experimental equipment for cell proliferation studies and studies of gene expressions
- Various software for environmental modelling and internal dosimetry

– RENEB –

Running the European network of biological and physical retrospective dosimetry for emergency preparedness and radiation research

BfS	Germany
AMVRC	Italy
BIR/UULM	Germany
CEA	France
DIT	Ireland
ENEA	Italy
FZ Jülich	Germany
HMGU	Germany
PHE	United Kingdom
ICHTJ	Poland
INFN	Italy
INSP	Romania
IRBA	France
IRSN	France
ISS	Italy
ITN	Portugal
LAFE	Spain
NCRRP	Bulgaria
NCSR D	Greece
OKK-OSSKI	Hungary
NRPA	Norway
RPC	Lithuania
SCK-CEN	Belgium
SU	Sweden
UAB	Spain
UGent	Belgium
UNITUS	Italy
US	Spain
SERMAS	Spain

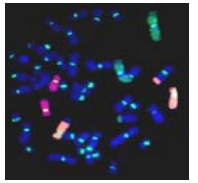


25 Partners, 17 European Countries with MoU

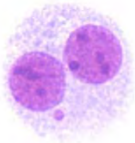
Operational Basis

“Stand by mode” of reliable and proven methods

- Dicentric Assay
- Fluorescence in situ hybridis… …SH-Assay)

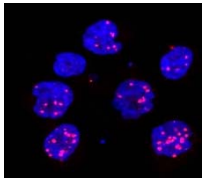


- Micr…



Biological dosimetry

- Pr…mature Chromosome Condensation (PCC)



- Gamma H2AX Foci
- Electron Paramagnetic Resonance/ Optically Stimulated Lu… (EPR/OSL) & on tooth, nails

EPR/OSL dosimetry

Electronic compo-nents

Glass

Bundesamt für Strahlenschutz

Benefits of the Network

- **Emergency preparedness and response**

  - **Individual, independent** dose estimation

    → fast classification of persons based on biological samples and/ or inert personalized devices

    → re-assurance of the „worried well“: high socio-economic impact! (**Lesson learned from former accidents)**

- **Radiation Protection Research**

  - Contribution to **large scale research projects**

    → effect of low dose

    →Radiation sensitivity

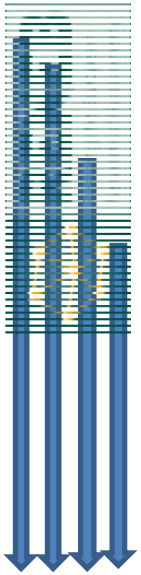
    →Non cancer disease

    →Epidemiological studies where sampling and handling of bioprobes or inert material is included

Benefits of the Network

European radiation platforms

- NERIS: focussing on emergency preparedness
- MELODI: focussing on low doses
- EURADOS: focussing on dosimetry
- ALLIANCE: focussing on radioecolody
- Medical P. focussing on medical radiation protection



Crosscutting: Infrastructure
Education & Training
Quality Assurance

EUROPEAN JOINT PROGRAMME FOR THE INTEGRATION OF RADIATION PROTECTION RESEARCH
CONCERT

The aims of the call are:

To make optimal use of research infrastructures

Bundesamt für Strahlenschutz

HELSINGIN YLIOPISTO
HELSINGFORS UNIVERSITET
UNIVERSITY OF HELSINKI

LABORATORY OF RADIOCHEMISTRY
DEPARTMENT OF CHEMISTRY
UNIVERSITY OF HELSINKI

Jukka Lehto

Professor

Head of the laboratory

LABORATORY OF RADIOCHEMISTRY

- The only general radiochemistry unit within Finnish universities
- Among the largest academic radiochemistry units world-wide
- Over 40 researchers, including 17 doctoral students
- Research areas:
  - Chemistry related to final disposal of spent nuclear fuel
  - Management of nuclear waste effluents
  - Radiopharmaceutical chemistry
  - Environmental radioactivity research

ENVIRONMENTAL RADIOACTIVITY RESEARCH

- Behavior of radionuclides from fallouts of the nuclear weapons tests and the Chernobyl accident in the environment and food chains (Cs, Sr, Pu, Am, Cm, Np)

- Behavior of natural radionuclides (U, Ra, Po, Pb) in:
  - Drinking water
  - Forest soil and edible mushrooms and berries
  - Mining mill tailings waste

RESEARCH FACILITIES

- Gamma spectrometers (3)
- Alpha spectrometers (30 chambers)
- Liquid scintillation counters (4)
- Gamma counters (2)
- Whole body counter
- ICP-MS and ICP-OES
- Access to HR-ICP-MS’s
- HPLC coupled with ICP-MS
- Beta-imagers
- Others

50th anniversary party in 2013

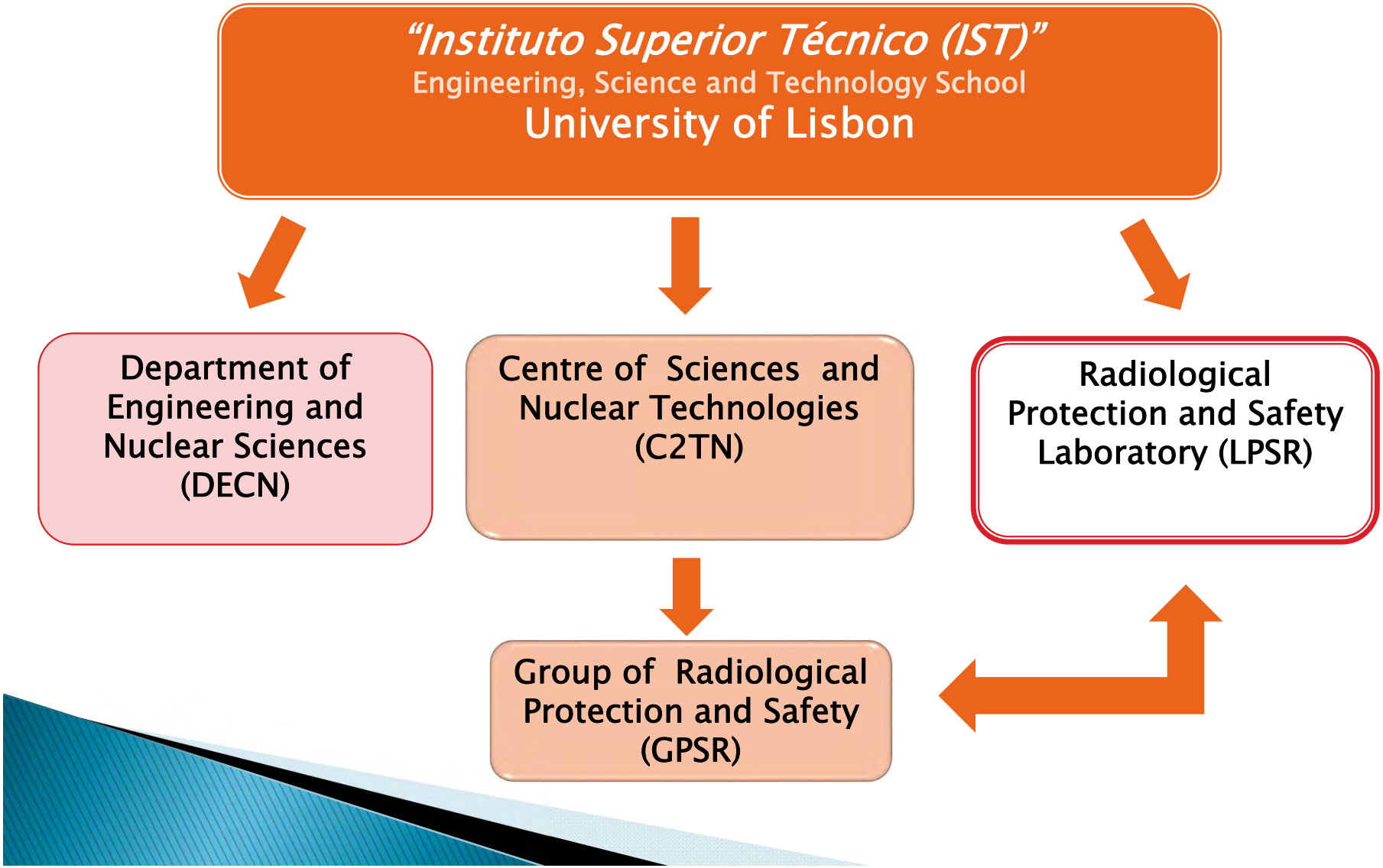
Instituto Superior Técnico (IST)
University of Lisbon, Portugal

Maria José Madruga
madruga@ctn.tecnico.ulisboa.pt

Campus Tecnológico e Nuclear, E.N. 10, 2695-066 Bobadela, LRS, Portugal

CONCERT Info Day, *Munich, 27th January 2016*

Organigram


"Instituto Superior Técnico (IST)"
Engineering, Science and Technology School
University of Lisbon
Department of Engineering and Nuclear Sciences (DECN)
Centre of Sciences and Nuclear Technologies (C2TN)
Radiological Protection and Safety Laboratory (LPSR)
Group of Radiological Protection and Safety (GPSR)

TÉCNICO LISBOA

Research Areas in Radiation Protection

- Environmental Radioactivity and Radioecology
- Dosimetry and Radiobiology
- Metrology of Ionizing Radiation
- Emergency Preparedness and Management of Radiological & Nuclear Accidents
- Radioactive Waste Management

Other Activities in Radiation Protection

- Participation in R&D projects funded by the European Union (EU) HORIZON 2020, by the Portuguese Foundation for Science and Technology, by organizations such as EURADOS (European Radiation Dosimetry Group) and EURAMET (European Association of National Metrology Institutes), in collaboration with CERN and other research centers in European countries

- Participation in the activities of the European Technology Platforms, Associations and Groups, such as MELODI, Alliance, NERIS, IGD-TP, EURADOS and EURAMET

- Participation in IAEA WG and technical cooperation projects (RER)

- Education & Training

- Legal obligations

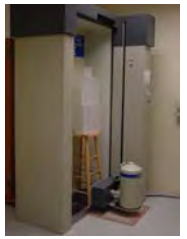
Laboratory Infrastructures and Equipments

- Laboratory of Gamma Spectrometry
- Laboratory of Alpha Spectrometry
- Laboratory of Total Counting (gas proportional and liquid scintillation counters)
- Laboratory of Indoor Radon
- Laboratory of Radioecology
- Laboratory of Metrology of Ionizing Radiation
- Laboratory of Cytogenetic
- Laboratory of Biochemistry
- Laboratory of Whole Body Counter
- Laboratory of Environmental and Individual Dosimetry
- Laboratory of Fluorescence
- Laboratory of Optic Microscopic
- Laboratory of Radioactive Wastes
- HiVol Aerosol Monitoring Stations
- Gamma Monitoring Network (GAMMANET)
- Etc.










TÉCNICO LISBOA

Activities in Environmental Radioactivity and Radioecology

- Metrology for processing materials with high natural radioactivity–MetroNORM;
- Radiological and Compositional Assessment of a Phosphogypsum Stock Pile Area;
- Innovative integrative tools and platforms to be prepared for radiological emergencies and post-accident response in Europe–PREPARE;
- Development of a Terrestrial Robotic System as a Tool for Radiological and Heavy Metal Monitoring in Estuarine Environments– ROBOSAMPLER;
- Study of the adsorption mechanisms and kinetics in geomaterials and their structural charaterisation: implications for processes of natural attenuation of heavy metal contamination and radioactive wastes confinement–KADRWaste;
- Environmentally friendly and efficient methods for extraction of rare earths elements from secondary sources–ENVIREE;
- Legal obligations (ex. Determination and Control of the Environmental Radioactivity Levels in Portugal, under Art. 35–36 Euratom Treaty);
- Maintain the accreditation of radioanalytical techniques, according to the ISO/IEC 17025.

Main Research Interests

- Environmental availabiliy and impact of radionuclides in terrestrial and freshwater ecosystems (including human food chain) and their interactions with atmosphere incorporating physical, chemical and or biological processes. Validated process based model parameterisation, characterisation of variability and uncertainty, and guidance for fit-for-purpose models (ALLIANCE P#1):

  - ***To contribute to the development of regional parameters through the compilation of regional specific parameters (set up of a database) on climate, agriculture, dietary habits and transfer factors in order to allow the customization of the food-chain models used in DSS for south (Mediterranean) European conditions;***
  - ***To contribute to the mechanistic and dynamic transfer studies through the evaluation of the long-term dynamics of soil-to-plant transfers for long-lived radionuclides (ex. Cs-137, Sr-90).***

TÉCNICO LISBOA

Main Research Interests

- Development of models tools and datasets for their calibration and validation guidance to select and evaluate the effectiveness of different remediation strategies in long-lasting exposure situations (e.g. nuclear accidents and or NORM/TENORM) (ALLIANCE P#2):
  - ***To contribute to setup sampling strategies and methods, for the chemical, physical and radiological characterization of NORM samples (past Zn, Cu and U mining activities and historical phosphogypsum -PG tailings);***
  - ***To evaluate the PG tailings influence in the surrounding environments (soils, sediments, water, salt marsh plants, estuarine seaweeds and bivalves);***
  - ***To study the soil-plant radionuclides transfer in different PG/soils ratios and, the identification of the vegetal species that can act as bioindicators for trace metals and radionuclides;***
  - ***To develop new methodologies and measurement devices for measurement of natural radionuclides.***

GIG

GŁÓWNY INSTYTUT GÓRNICTWA

/CENTRAL MINING INSTITUTE/

Katowice, POLAND

Silesian Centre for Environmental Radioactivity

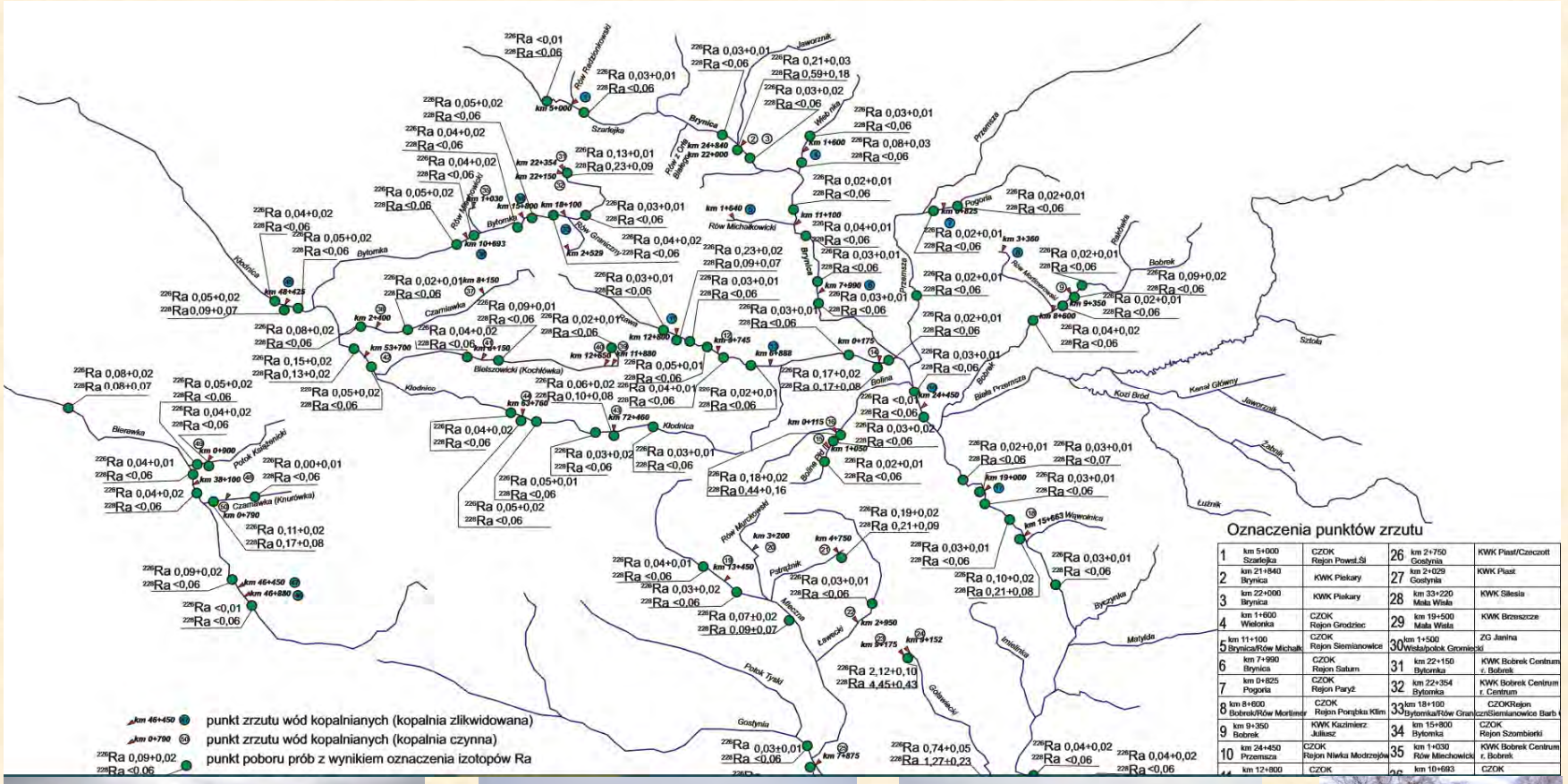
Boguslaw Michalik

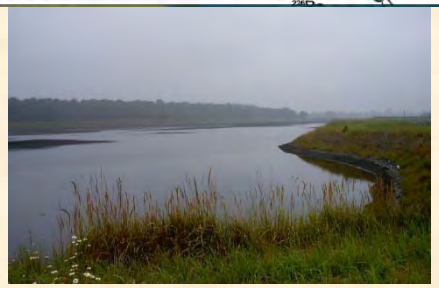
bmichalik@gig.eu

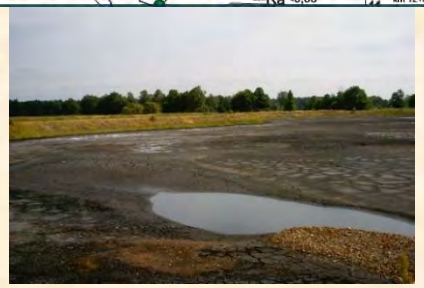
Radioprotection | Radioecology | Natural Radioactivity (NORM)| Environmental radioactivity

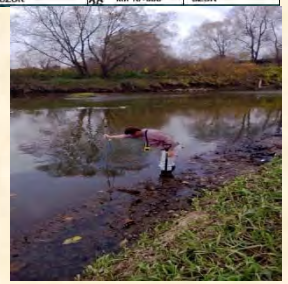
Coal mining area, Upper Silesia POLAND

the observatory site affected by radium rich brines discharge









The main fields of interest….

Well scientifically justified recommendations for:

- NORM waste/residues classification (A> 1Bq/g);
- NORM treatment and final disposal;
- NORM waste repository construction;
- NORM impact on environment mitigation.

Use of NORM affected sites as a source of valuable data for:

- Post accidents long term effects assessment;
- Nuclear waste final repository long term forecast preparation;
- RN migration and transfers models verification.

Recent activity:

- contaminated water purification

The main goal is to check the capability of zeolites to remove natural radionuclides from water and construct installation for radium removal from mine waters in order to:

- estimate the efficiency of radium removal fromdifferent mine waters,
- assess the influence of contact time of water with zeolite on the removal efficiency,
- perform experiments at technological scale for different types of zeolite,
- optimise of zeolite bed composition for field experiments,
- prepare the project of underground installation.

- RAMSES Project: Monitoring of **RA**dium and Thallium in the vicinity of **M**ining **S**it**ES**

Laboratory infrastructure

- Gamma/alpha spectrometry
- Radiochemistry and LSC
- TLD gamma/radon progeny dosimetry
- Big radon/climatic chamber - radon measurements
- Fine aerosols (nm) generation and spectrometry
- X/gamma/beta/neutrons irradiation facility
- ISO 17025 certification

Radiobiology and Radiation Biophysics

Physics Department, UniPv, Pavia, Italy

Andrea Ottolenghi, Physicist
Giorgio Baiocco, Physicist
Gabriele Babini, Physicist
Jacopo Morini, Biologist
Daniele Alloni, Physicist
Vere Smyth, Physicist

Sofia Barbieri, PhD student, Physics
Mattia Siragusa, visiting PhD student, Physics

...and in collaboration with the Biology Departments, UniPv

The group carries on experimental and theoretical studies on ionizing radiation effects (particularly after low doses), with applications in the clinical use of radiation for diagnostics and therapy (including the risk of complications and secondary tumours) and radiation protection:

* investigation and modeling of mechanisms of radiation action on biological structures from the sub cellular to the systemic level

* use of radiation as a probe to test the response of biological systems to perturbing agents

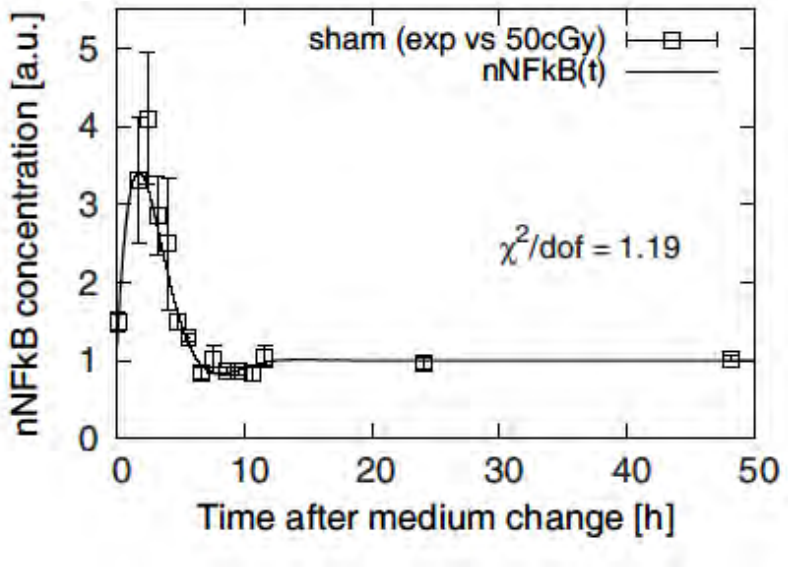
Involvement of the group in Research and Training EURATOM Programmes in the 7th Framework and in HORIZON 2020

Local (UniPV) scientific management of the EURATOM projects CONCERT (with coordination of the WP on E&T), OPERRA, EUTEMPE-RX, ANNETTE, DoReMi (with coordination of the WP on E&T), EPIRADBIO.

EU coordination of ANDANTE, ALLEGRO.

Examples of research topics and activities
(with selected recent publications)

Intra- / Extra-cellular signalling pathways (*e.g.* NF-kB, cytokines)



G. Babini *et al.*, *In vitro γ-ray-induced inflammatory response is dominated by culturing conditions rather than radiation exposures.*
Scientific Reports 5, Art. no.: 9343 doi:10.1038/srep09343, pp 1-7 (2015).
http://www.nature.com/srep/2015/150320/srep09343/pdf/srep09343.pdf

Individual radiosensitivity (e.g. radiosensitivity in rare diseases)

J. Morini *et al.*, *Radiosensitivity in lymphoblastoid cell ines derived from Shwachman-Diamond Syondrome Patients*
Radiation Protection Dosimetry (2015), Vol. 166, No. 1–4, pp. 95–100

Examples of research topics and activities
(with selected recent publications)

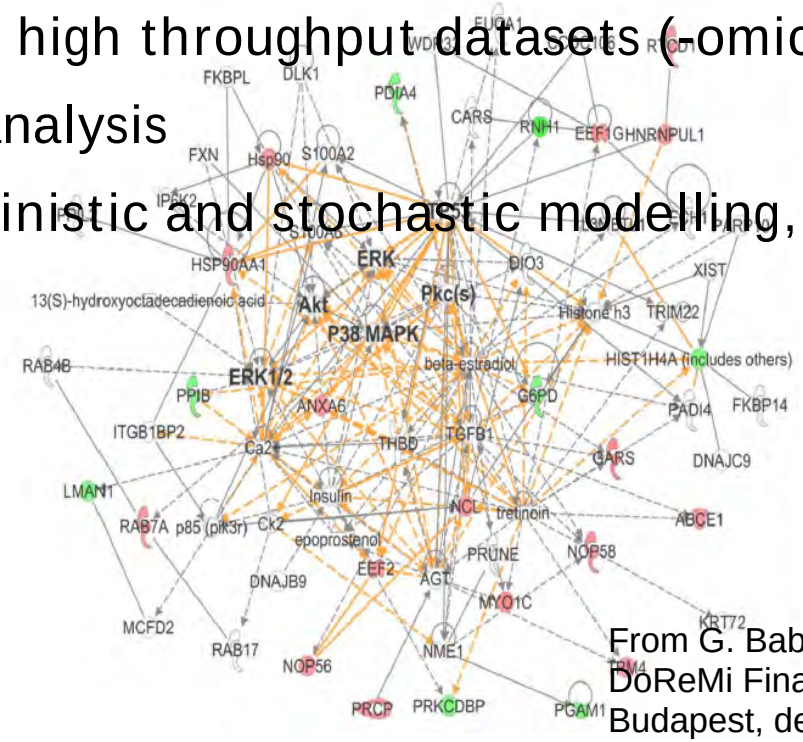
DNA damage & repair

L. Mariotti *et al. Use of the γ-H2AX Assay to Investigate DNA Repair Dynamics Following Multiple Radiation Exposures.* PLoS ONE 8 (11): e79541. doi:10.1371/journal.pone.0079541 (2013).

Bioinformatic analysis of high throughput datasets (-omics)

High throughput image analysis

Systems biology (deterministic and stochastic modelling, integration of datasets, etc.)



From G. Babini's presentation at the DoReMi Final Meeting, Budapest, december 2015

Examples of research topics and activities
(with selected recent publications)

Early and late health risks to normal/healthy tissues including secondary tumors

K Trott, W Doerr , A Facoetti, J Hopewell, J Langendijk, P van Luijk, A Ottolenghi and V Smyth
Biological mechanisms of normal tissue damage: importance for the design of NTCP models
Radiotherapy and Oncology Radiotherapy and Oncology 105 79–85 (2012)

Simulation of the action of different radiation qualities at different scales - from the macroscopic scale with transport calculations to cellular and sub cellular scale with track structure simulation and evaluation of damage to cellular targets as DNA

e.g. cellular damage induction by secondary neutrons produced in particle therapy and evaluation of their biological effectiveness as a function of energy

A. Ottolenghi, V. Smyth, K. Trott. *Assessment of cancer risk from neutron exposure - the ANDANTE project.*
Radiation Measurements 57, 68-73 (2013)

G. Baiocco *et al.*, *Reaction Mechanism interplay in determining the biological effectiveness of neutrons as a function of energy,* Radiation Protection Dosimetry (2015), Vol. 166, No. 1–4, pp. 316–319

e.g. cellular damage induction by radionuclide intake dependent on cellular localization of the emitting source

D. Alloni *et al. Modelling dose deposition and DNA damage due to low energy β emitters.*
Radiation Research, 182, 322–330 (2014)

INFRASTRUCTURES & EQUIPMENTS

Radiobiology LAB in the Physics Department

and easy connection and access to Labs of UniPv Departments and research facilities, including *CENTRO GRANDI STRUMENTI*

WB, ELISA, Fluorescence microscopy, Flow cytometry, qRT-PCR, EMSA

NGS, Confocal microscopy, GC-MS

Close facilities:

X-rays facility (LINAC 6MV, in collaboration with IRCCS S. Maugeri)

C ions facility (CNAO, *Centro Nazionale di Adroterapia Oncologica*)

Laboratory of Applied Nuclear Energy (*LENA*) - TRIGA Mark II Research Nuclear Reactor, UniPv

Thünen Institute of Fisheries Ecology

Research Interests and Infrastructures

Nogueira, Pedro; Aust, Marc-Oliver

Thünen Institute of Fisheries Ecology

München

27 Januar 2016

Thünen Institute of Fisheries Ecology

Biodiversity and migratory fish

- Factors for the population development and how to enable sustainable fisheries?

Aquaculture

- Sustainability and Environmental Impact?

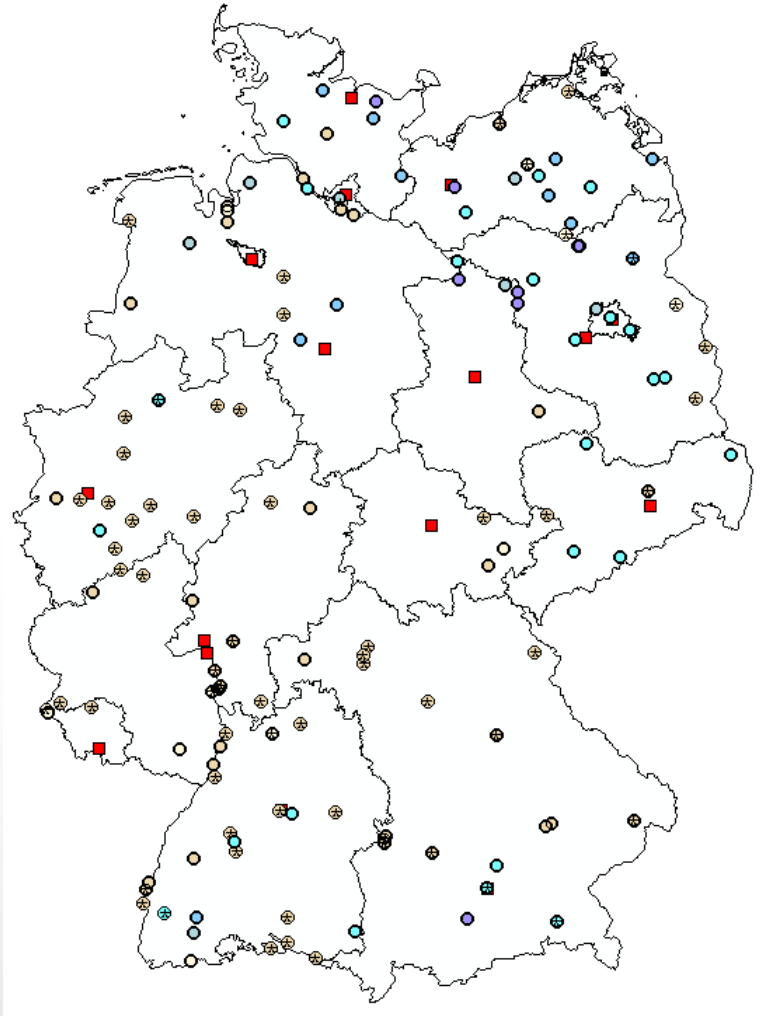
Marine Environment

- Radionuclides and Contaminants concentrations and their effects on fish?

Federal coordinating office for environmental radioactivity in fish

IMIS Network (Integrated Measuring and Information System)

- > 60 laboratories
- 1800 ODL measurement stations
- Continually measurement of air, soil, water and food



Research Interests

Identification of low dose effects and radiation biomarkers in fish

- Laboratory experiments exposing fishes to ionizing radiation and other stressors.
- Field experiments and measurements

Computational modelling

- Use of Monte Carlo methods to improve dosimetry (eg. MCNPX)
- Development of animal computational and Biokinetic models
- Improve and develop models for radionuclide transport and transfer calculations in the Aquatic environment and the transference into the human food chain. Experience in Box compartment modelling.

Fish simple voxel model

Infrastructures

Alfa, Beta and Gamma low level spectrometers, environmental samples.

Radiochemical laboratory for radionuclides chemical separation and sample preparation.

Ultra-trace analysis for organic and inorganic anthropogenic pollutants (e.g. heavy metals, TNT, etc.).

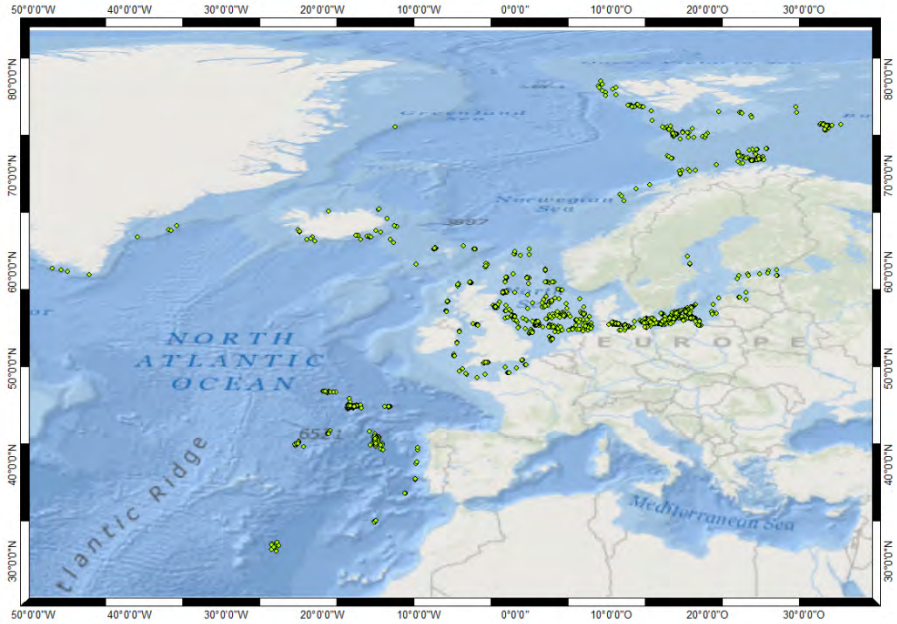
Genotoxic analysis (COMET Assay and Micronuclei).

Facilities for fish breading and maintenance of several hundred zebrafish embryos, for the production of fish.

Flow facility for maintenance and exposure of marine fish.

3 Research Vessels

Technical Data	Walther Herwig III
Vessel type	Stern trawler
Length	64.5 m
Beam	15.22 m
Ship‘s crew	21 persons
Scientific crew	12 person
Laboratories	7



I look forward to work with you!

CONCERT Information Day. 27 January 2016. Munich

CIEMAT

Research Activities in Radiation Protection

Almudena Real
almudena.real@ciemat.es

Radiation Protection activities in CIEMAT

- Radiation protection of the public and the environment in planned, existing and emergency exposure situations.
- Radiation dosimetry.
- Environmental radioactivity and radiation surveillance.

RP of the Public and the Environment

- Radiological impact of artificial and natural radiation sources, including NORM industries.
- Development, implementation and validation of tools and models for dose estimation in humans and biota, under planned and existing exposure situations (CROM, ERICA).
- Development of new conceptual and mathematical models to study the behaviour of radionuclides, studying processes and parameters for modelling transport of pollutants by environmental components (terrestrial and aquatic).
- Use of predictive models (J-RODOS) to evaluate the radiological consequences of a nuclear or radiological accident and any remediation or restoration response.
- Implantation, demonstration and training of decision-making assistance systems in outside emergencies, basically for management of the last stages and environmental restoration.

Radiation Dosimetry

- Mathematical methods and models applied to radiation dosimetry: Monte Carlo methods to simulate transport of photons, electrons and neutrons; mathematical models to represent complex geometries to calculate doses in human organs.
- Internal dosimetry. Development of new dose measurement and calculation capacities to improve the existing infrastructure for internal dosimetry nationwide.
- External dosimetry. Developments in neutronic dosimetry (dose measurements in mixed neutron-gamma fields applied to personal and area dosimetry).
- Retrospective dosimetry. Thermoluminescence and Optically Stimulated Luminescent (OSL) techniques are applied to estimate the dose in nuclear/radiological emergencies, to detect irradiated food, for dating, for spatial dosimetry, among other applications.

Environmental radioactivity and radiation surveillance

- Determination and control of environmental radioactivity levels in Spain
- Development of new methodologies and measurement systems to increase their sensitivity and adjust to the goals of surveillance networks.

IRSN
INSTITUT
DE RADIOPROTECTION
ET DE SÛRETÉ NUCLÉAIRE

Enhancing nuclear safety

PRESENTATION OF IRSN,

Institut de Radioprotection et de Sûreté Nucléaire

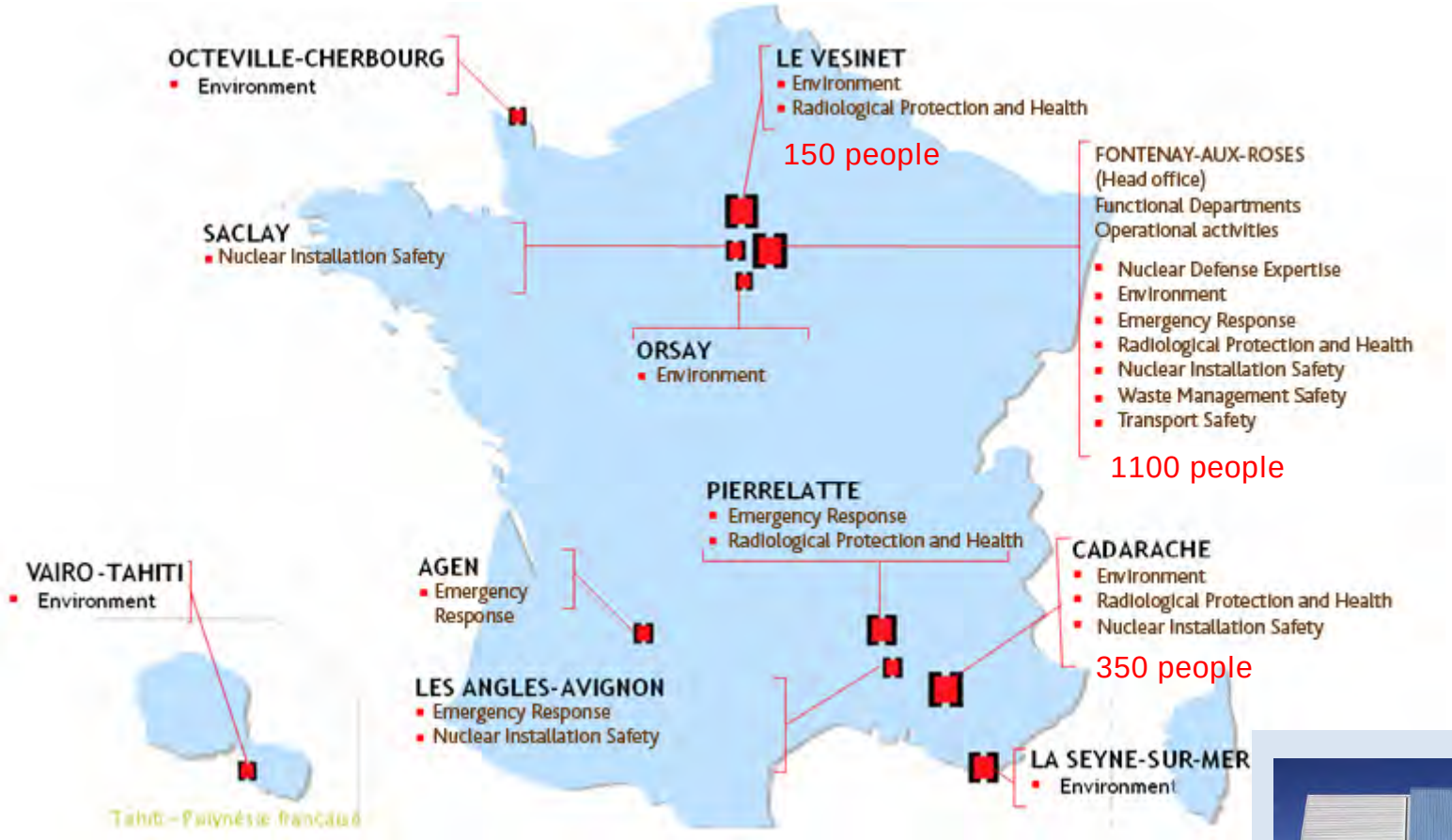
Colleagues in the room « topic 2 »:

evelyne.barker@irsn.fr

marie.simon-cornu@irsn.fr

+ colleagues in « topic 1 »

1748 personnel at 11 sites



Missions of IRSN

- Research and services of public interest, including public transparency
  - Research on nuclear safety and security and radiation protection
    - Some keywords linked to topic 2: multi-media environmental transfers (atmosphere, soil, water …) , internal transfers, bioavailability, ecotoxicology, experiment/monitoring/modelling, internal/external dosimetry, risk assessment (human-biota), stakeholder's involvement in decision-making…
  - Contribution to the radiological monitoring of France
  - Contribution to national emergency preparedness and response planning
  - Monitoring of populations exposed to ionizing radiation
  - (…)
- Support and technical assistance to the public authorities for civil or defense-related activities
- Contractual assessment, study and measurement services for public and private organizations