



Research Opportunities in Health Physics at Oregon State University



Primary Research Areas

- Radiographic Studies
- Simultaneous β/γ Spectroscopy
- Instrumentation Development
- Biota Dose Methodology
- Environmental Dosimetry
- Allometric Studies
- Risk Assessment
- International Assessments
- Probabilistic Dosimetry

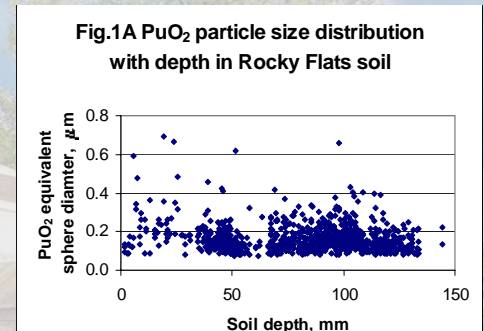
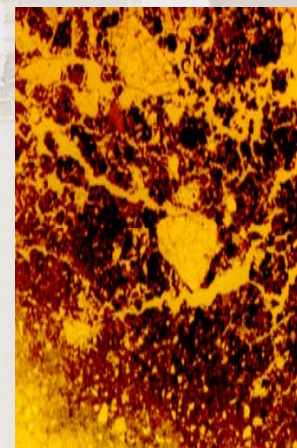
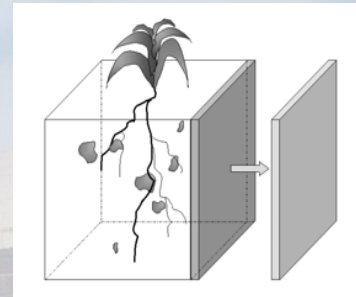
Funding Sources

- Federal Government
 - Department of Energy
 - National Nuclear Security Administration
 - Nuclear Engineering Education Research
 - Centers for Disease Control & Prevention
- State Government
 - Oregon Dept of Energy
- Foundations
 - McClellan Foundation

Radiographic Studies

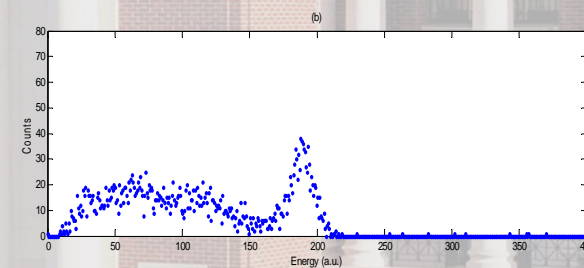
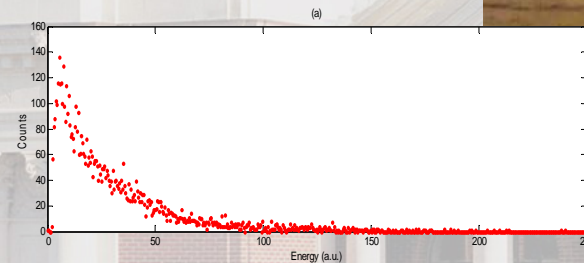
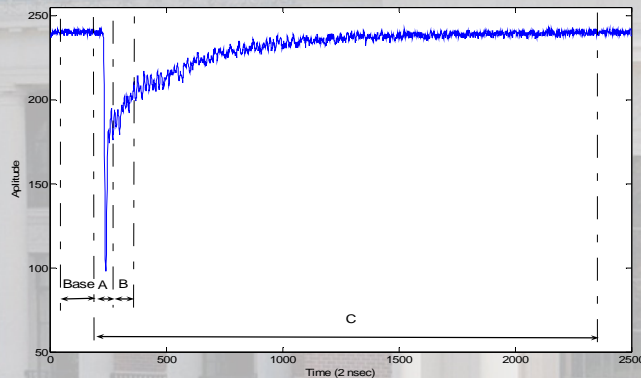
Applications

- nonproliferation
- fission track dating of ores
- contaminant migration studies



Simultaneous β/γ Spectroscopy

- Novel phoswich techniques
- Digital signal processing methods
- Pulse shape analysis
- Pattern recognition methods for beta identification



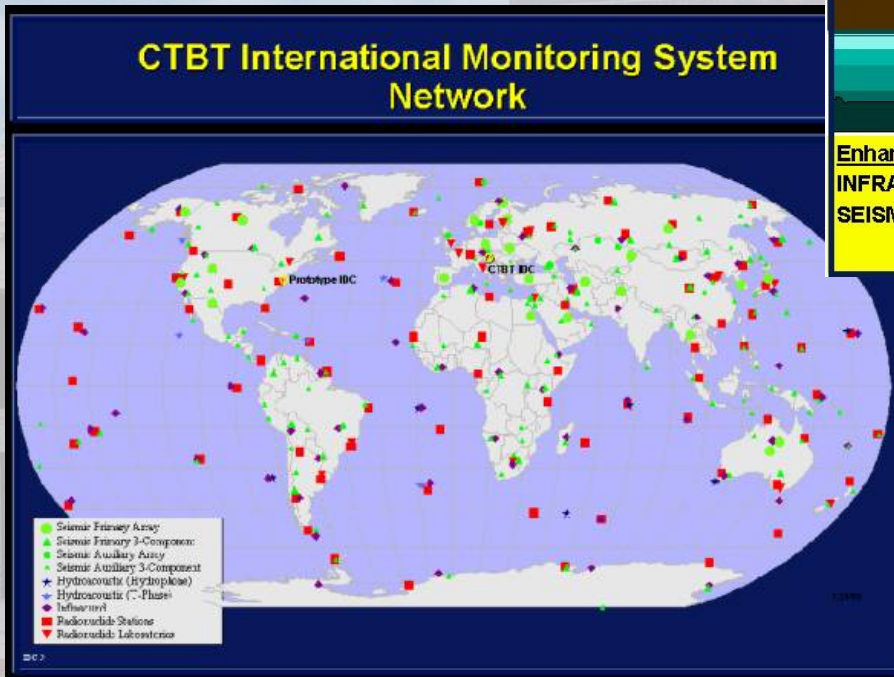
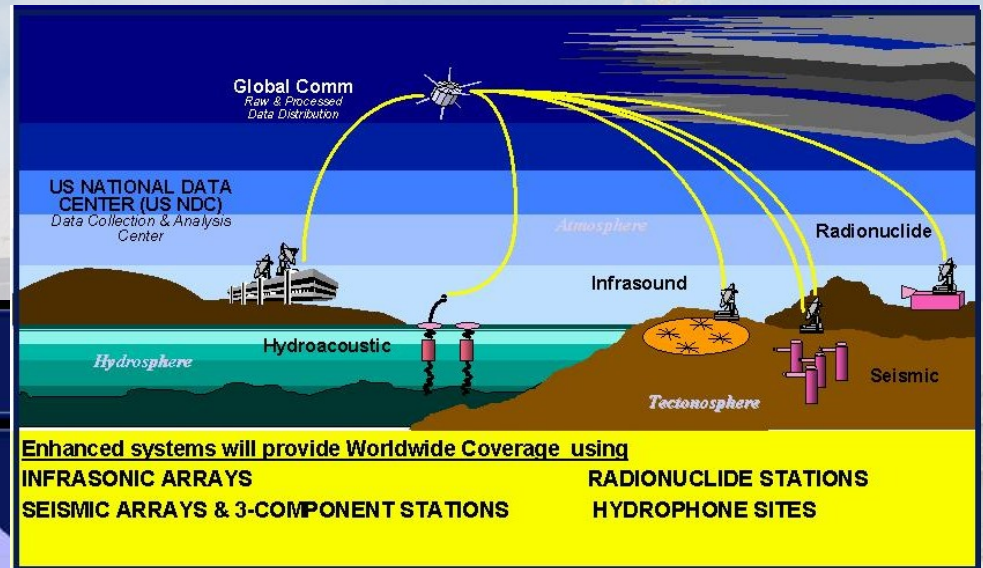
Instrumentation Development

- Dynamic (scanning) efficiency calculations
- Static efficiency optimization for hot particles
- Instrument characterization



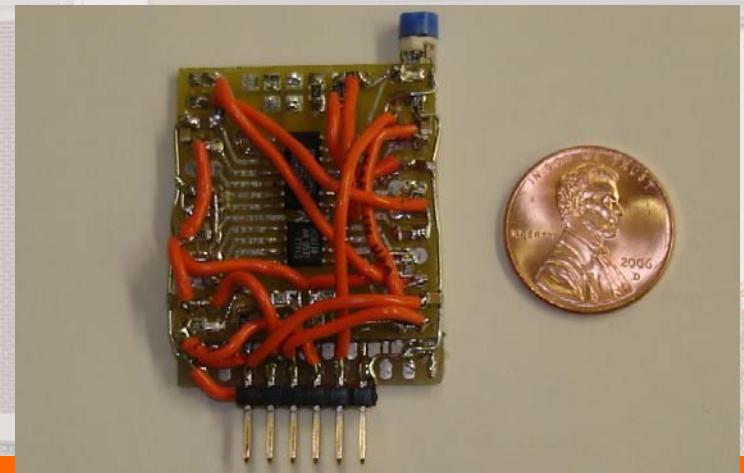
Instrumentation Development

- Radioxenon detector development to support the Comprehensive Test Ban Treaty



Instrumentation Development

- FPGA-based digital readout electronics
- Soft-Core DSP in FPGA
- Fast digitization up to 200 MSPS, 12 bits
- Low-noise preamp design
- Graphical User Interface development



Biota Dose Methodology

- National & International visibility
 - NAEP award for methodology
 - IAEA working group member
 - invited by Swedish radiation protection institute to discuss folding European Union research into U.S. platform
 - transfer BCG calculator to RESRAD platform
 - NRC and EPA now funding
- Tool currently used at DOE sites as part of annual environmental reporting requirement



Biota Dose Methodology

- Develop protocols for compliance and dose assessment for non-human biota
- U.S. is world leader in this area, OSU faculty are leading the U.S. efforts

The screenshot displays a software application for biota dose assessment. It consists of several overlapping windows:

- Limiting Media Concentrations for Terrestrial Animals at 0.001 Gy/d:** A table with columns for Nuclide, Mass of Terrestrial Organism (g), Fraction of Intake retained, Biological Decay constant, λ_{bio} (d⁻¹), Reference, DCG_{TA} (Bq/kg), and DCG_{TA} (Bq/m²). Rows include Am-241 and Cs-137.
- Co-located Samples: Organisms Responsible for Limits for Water, Sediment, and Soil:** A table with columns for Nuclide, DCG(water), DCG(sediment), and DCG(soil). Rows include Am-241, Cs-137, and Cs-135.
- Table 1. Initial Screen - Aquatic Systems Limits for Water and Sediment:** A table with columns for Water Limit, Site, Partial Link, Sediment Link, Site, Partial Link, and Water & Sediment Fraction of Fractions. Rows include Th-232.
- Initial Screen - Aquatic Systems:** A dialog box with the following text:

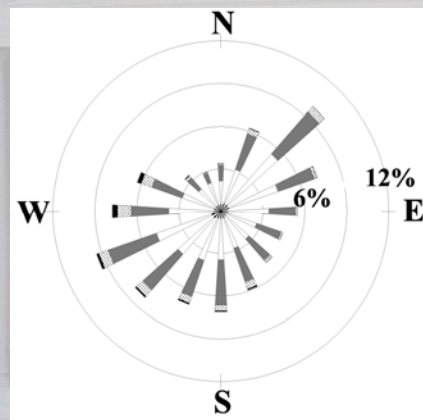
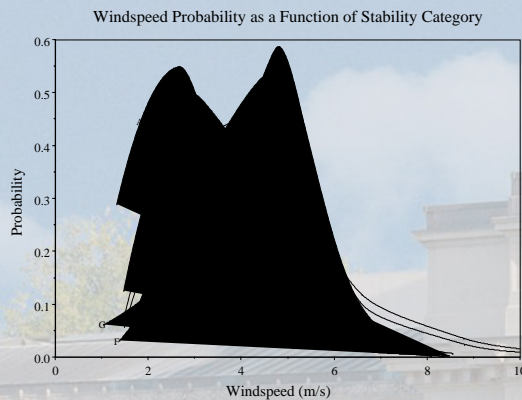
The following series of pages are designed to walk you through the assessment of compliance with the biota dose limits of the Department of Energy.

You may access individual pages by using the tabs located at the bottom of the screen. You can also use the option buttons provided below to move you to the next appropriate section of the form.

Do you have co-located water and sediment samples for your site?

Yes No Reset

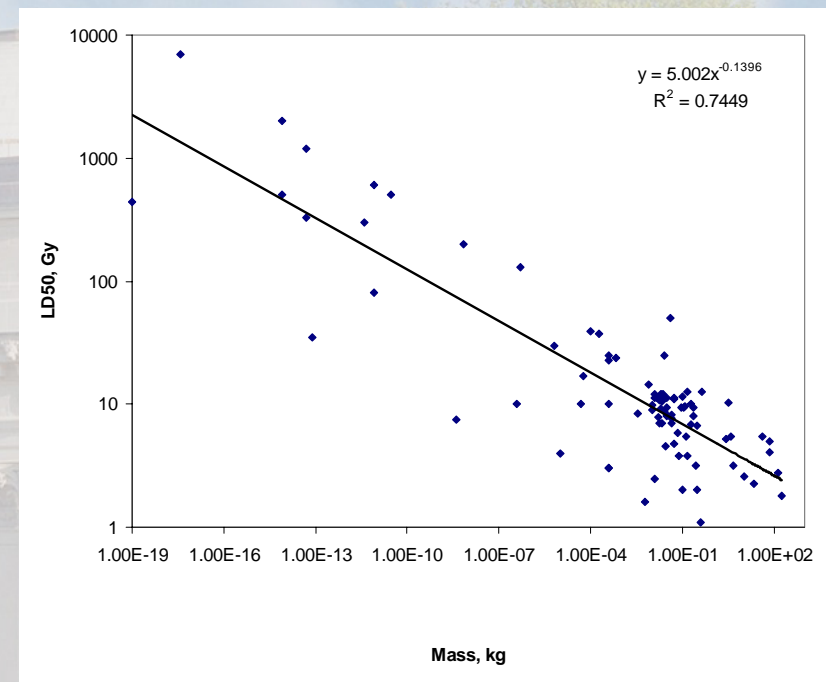
Environmental Dosimetry



- Lung deposition, clearance, gaseous uptake
- Meteorological data reconstruction
- Analysis of sensitive populations
- Sensitivity of the Gaussian model
- Variability in pathway analysis
- Age-dependent dose factors

Allometric Studies

- Biological scaling: the study of size and its consequences
- Useful tool for comparative physiology
- Parameters include ingestion rate, lifespan, inhalation rate, home range, etc
- Useful tool for deriving limiting values of uptake, elimination factors, and radionuclide tissue concentration across a large range of species



Risk Assessment

- Tritium Dose Uncertainties
 - CDC sponsored project
 - Savannah River and Hanford
- Johnston Atoll
 - field assessments and Pu hot particle identification
- Umatilla Weapons Depot
 - probabilistic risk techniques on nuclear weapons incineration

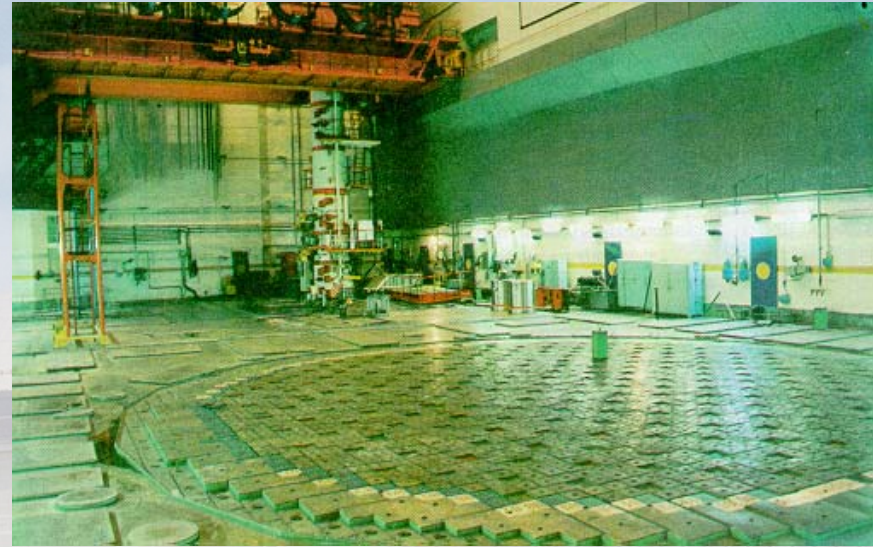


International Assessments

- Kyrgyzstan
 - Central Asia; former Soviet Republic
 - high natural radioactivity on the shoreline of Lake Issyk-Kyol
 - radiation levels ten-fold over background



- Lithuania
 - IAEA evaluation of Lithuania's radiological protection program
 - Radiation Safety Center; equivalent to the U.S. NRC
 - Ignalina NPP RBMK-1500
 - evaluation of medical physics facilities



Probabilistic Dosimetry

- Incorporation of probabilistic methods into current environmental reporting practices
- Techniques in public dissemination of probabilistic results



Collaborations in Scientific Computing

- Neutron dosimetry
 - MCNP simulation of dose from nuclear reactor on the Martian surface
- Detector modeling
 - EGS4 simulation of a FIDLR land scanning system
 - optimization of multi-layer phoswich detectors for beta spectroscopy
- Analysis of internal kinetic model for free and bound tritium
 - development of an analytic solution of coupled ODEs for a tritium kinetic model
- Advanced multi-compartment lung models
 - code development for the solution of coupled ODEs for particulate deposition and gaseous diffusion



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