SESSION 2: ADDRESSING CLIMATE CHANGE CHALLENGES

PANEL 2.1: Adaptation: Climate smart agriculture, water cycle and emergency preparedness

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Ana Navas manages the Gamma Lab and the Research Group on Erosion and Soil and Water Evaluation at the Estación Experimental de Aula Dei; she is a pioneer in the application of radionuclides (FRNs and ERNs) as indicators of environmental processes associated with glacial retreat under conditions of climate change in polar and high mountain regions.
Climate change and land degradation: The role of nuclear and isotopic techniques

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Climate Change threats Soil

- Loss of nutrients
- Soil compaction
- Soil productivity decrease

TOLERABLE soil loss $1.4 \, \text{t ha}^{-1} \, \text{yr}^{-1}$

Verheijen et al., 2009
Soil Degradation in the World

Agricultural soils
- Highly productive: 3 %
- With limitations: 78 %
- Marginal: 19 %

Impacts
- Water quality
- Siltation water bodies
  Sediments – Nutrients – Contaminants
Nuclear and Isotopic techniques:
Gamma emitting radionuclides (FRNs) - CSSIs

Soil Sampling

Gamma Spectrometry

FRNs

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Nuclear and Isotopic techniques: Gamma emitting radionuclides (FRNs) - CSSIs
Conceptual - Applications

GIS, Teledetection, Modelling

Reference Site
Sampling Sites
Sediments
Sediment Core

Fingerprinting
Sediment Sources

Sediment records
Dating changes

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Soil Erosion and Deposition Rates
Quantifying with \(^{137}\text{Cs}\)

\(^{137}\text{Cs} - \text{Sediment budget "Estanque Grande de Abajo" sub-catchment}

- Lake
- Catchment boundary
- Sub-catchm. boundary
- Sampling point

**Soil deposition**
Mg ha\(^{-1}\) yr\(^{-1}\)
- 40 - 113
- 15 - 40
- 3 - 15
- 0.9 - 3
- 0 - 0.9

**Soil erosion**
Mg ha\(^{-1}\) yr\(^{-1}\)
- -0.9 - 0
- -3 - -0.9
- -15 - -3
- -40 - -15
- -126 - -40


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Identifying Sediment Provenance Fingerprinting

FingerPro unmixing model

https://github.com/eead-csic-eesa/fingerPro

Sources:
- Source 1
- Source 2
- Source 3
- Source 4

Source Contribution
- Source 1 ?%
- Source 2 ?%
- Source 3 ?%
- Source 4 ?%

Mixtures
- Agricultural
- Forest
- Scrubland
- Subsoil Channel Bank

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Reservoir siltation: Tracing recent changes of sediment supply in large catchments

Relative source contributions:
- subsoil
- forest
- scrubland
- agricultural

1995

2011

Core Correlation

Yesa reservoir

Barasona reservoir

137Cs
Thanks you for your attention

Ana Navas