

# Metrology for Earth Biosphere: Cosmic rays, ultraviolet radiation and fragility of ozone shield



21GRD02 BIOSPHERE

One of the most significant – yet unexplored – ecological challenges facing EU member states and beyond is the impact on human and ecological health of the increasing atmospheric ionization caused by extra-terrestrial radiation (cosmic rays and solar UV radiation) boosted by anthropogenic emissions.

21GRD02 BIOSPHERE project aims to develop the necessary tools, methodologies and measurement infrastructure needed to evaluate the mutual impact of cosmic rays and biologically active UV radiation on the Earth's biosphere, and to support EU policy makers with scientific assessments and information that have the potential to substantially improve policies on climate, health and anthropogenic emission activities.

## Goals

- Develop metrological methodologies to establish the correlations between cosmic rays, solar UV radiation, ozone layer thickness and anthropogenic activities.
- Establish a database of absolute ionization, excitation, and dissociation cross sections as a function of electron impact energy and projectile energy loss for natural atmospheric and anthropogenic gases relevant to ozone layer chemistry.
- Quantify molecular ionization and production rate of charged molecular fragments due to electron collision-induced dissociation of natural and anthropogenic atmospheric molecules.
- Assess biological damage in cells inflicted by combined UV and secondary cosmic radiation.
- Quantify correlation between irradiation parameters and changes of cellular parameters.

## Outcomes

*What changes are expected after successful dissemination and exploitation of project results?*

- Increased understanding of biological effects in cells (DNA damage, genome instability, cell death, etc.) inflicted by combined UV and secondary cosmic radiation.
- Greater accuracy in predictions of cosmic ray-induced ionization of the atmosphere and chemical processes related to ozone depletion.
- An increased knowledge that enables the provision of reference data and/or uncertainty budgets for the dependencies between cosmic ray flux, ozone layer thickness, anthropogenic emissions, and atmospheric profiling parameters.

## Impact

*What are the expected wider scientific, economic and societal effects of the project?*

- Modelers, users from national metrology institutes, public health and environmental agencies, research institutions focusing on the environment and climate will have reliable data to assess the role of low-energy cosmic electrons in the chemistry and dynamics of the ozone layer.
- Radiobiology/radiooncology researchers and various health groups can improve risk quantification and mitigation approaches based on informed assessments of cellular damage caused by combined cosmic ray and UV radiation.
- Policymakers and regulatory bodies will be able to make better informed decisions on climate and environmental policies by using an improved understanding of ozone depletion and its effects on the Earth's Biosphere.

## BIOSPHERE Consortium



<https://euramet-biosphere.eu/>