

# EARTH SCIENCES, ENVIRONMENT AND SUSTAINABLE DEVELOPMENT RESEARCH CENTER

## Contact details

Name	<b>Earth Sciences, Environment and Sustainable Development Research Center</b>
Acronym	<b>EESD</b>
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## Areas of expertise

1. Risk assessment of geomorphologic, climatic and soil natural hazards.
2. Polluted soil geochemical surveys and mapping the distribution of heavy metals. Soil remediation by conventional methods and the use of natural resources.
3. Determining the degree of pollution of the environment factors like soil and water.
4. Research of zeolite tuff by optical methods and X-ray diffraction. The use of zeolite tuff in environmental protection for the restoration of degraded and polluted soils and the retention of heavy metals from polluted water.
5. Mineralogical and petrography geology studies on rocks and minerals by using optical methods, X-ray diffraction analysis and electron microprobe. Metalogenetic studies for research perimeters of mineral resources.
6. GIS database - making vector and raster files.
7. GIS modeling for surface erosion, landslides and flooding simulators.

## Team and key skills

**Prof. Dr Damian Floarea:** 13 ISI published articles, **Hirsch index 6, 115 citations** (without self-citation), geochemistry, soil science, environmental protection, soil restoration.

**Prof. Dr Damian Gheorghe:** 14 ISI published articles, **Hirsch index 8, 137 citations** (without self-citation), mineral resources, soil science, restoring of polluted soil, X-ray diffraction and environmental protection.

**Assoc. Prof. Dr. Macovei Gheorghe:** 5 ISI published articles, **Hirsch index 3, 40 citations** (without self-citation), geomorphology, paleontology, paleobotany, micropaleontology, climatology, environmental protection.

**Assist. Prof. drd. Nasui Daniel:** 1 ISI published article, **Hirsch index 1, 16 citations** natural risk assessment, GIS databases, GIS modeling of natural hazards.

**Assoc. Prof. Dr. Constantina Ciprian:** 4 ISI published articles, **Hirsch index 2, 7 citations** (without self-citation), environmental geology, mineral resources, mineral resources research, mineralogy and petrography.

## Infrastructure

1. Amplival and Jenapol microscopes and a universal polarizer used for: mineral, rocks, soils, dusts and slags research. Examinations are performed with a polarized light with one or two Nicols. Maximum magnification is 500X.
2. X-ray diffractometer with the following features: X-ray generator Muller Mikro 101, Type 70406/03, no. DY 1117:
  - High voltage Philips Muller model, type 70406/03, no. DY 1117- Radiogenic anode tube of Cu, model PW 1043 to 1001, type 72074-06, code 514152, D959 series, Philips,
  - Dome PW 1316, D934 series, Philips,
  - Goniometer PW 1050/25, series D915, Philips
3. Flame atomic absorption spectrometer Jena AAS Analytik Vario 6, controlled by PC. It is an automatic sequential machine (6 lamps mounted monoelement) for determination of trace metals, ultra-trace metals and semi-metals in samples of soil, clay, contaminated water, minerals.
4. Kruss type binocular microscopes - Optronic, 50 X maximum magnifications for micropaleontology determination, with an electronic image capture system.
5. FM fluorimeter 109520/2002, used to measure low concentrations of fluorescent substances used in tracer method.

## Development strategy

Participating in project proposals with national and international consortiums.  
Achieving contracts with economic beneficiaries.  
Developing the laboratory with new equipment through funds raised from scientific research projects;  
Attracting young researchers in the research team and publishing articles in international journals.

## Representative projects

**“Development of methods of stabilization and rehabilitation of soils polluted with heavy metals using zeolite resources”**, (2006-2008).. CNCSIS GRANT / code 138, Parameters control involved in stabilizing mechanisms of soils polluted with heavy metals in Baia Mare, Zlatna, Copsa Mica was achieved by treating the soil aggregate samples with natural materials like zeolite tuffs and by a mixture of organic material and natural zeolite tuffs (organo-zeolitic material). Grant Director: Damian Floarea

**“Telluride and selenide bearing gold-silver deposits” (International Geological Correlation Programme - Geoscience in the Service of Society)**, UNESCO-IUGS, (2003-2008). IGCP 486 Grant, The project was aimed at linking deposits of telluride with gold, organizing scientific meetings and preparing and publishing articles in various journals and international scientific meetings.

**“Minerals in the system Au-Ag-Bi-Ag-X and X where X = S, Se, Te are indicators of chemical and physical parameters of genesis for epithermal deposits”**, Contract no. 11/06. 02. (2008 - 2009), in cooperation with the "Institute of geology of ore deposits, petrology, mineralogy, and geochemistry from the Russian Academy of Sciences' (IGEM RAS). Various articles were published in ISI journals. Director: Damian Gheorghe.

**“Measurements with organic tracers to establish sanitary protection zones in the Băile Oglinzi area, Tg. Neamț”**, Contract no. 80 / 07.10. 2009, Two tracers were used in the field (fluorescein and Rhodamine) for marking areas outside the salted water perimeter for spa treatment. The measurement results showed one possible source of contamination of the perimeter by a water stream flowing along a collection basin. As a remedy was proposed the tubing of that valley along the proposed perimeter protection. Director Macovei Gheorghe.

**“Geology, Hydrology, Hydrogeology and protected valuable Geological Objectives of Baia Mare area”**, included in the environmental impact assessment documentation for CUPROM SA. Damian Gheorghe, Damian Floarea, Denut Ioan, Macovei Gh, Nasui Daniel (2006).

**“Mineralogy and petrography studies on samples from the Rovina perimeter”**, Contract Samax, (2008). Damian Floarea, Damian Gheorghe.

**“Mineralogical study of samples from the Cireșata mineralization - Valea Gărzii, Brad”** (3973/29.12.2010) accomplished for the Carpathian Gold Company. Damian Gheorghe, Damian Floarea

**“Mineralogy and petrography study based on evidence collected from boreholes made in Poprad perimeter, Maramureș County”** (No. 3090 of 16. 11. 2011), accomplished for ROMALTYN SA Company. Damian Floarea, Damian Gheorghe

## Significant results

1. Damian Floarea, Damian Gheorghe & Constantina Ciprian, The Subvolcanic Magmatic Rocks from the Nistru Zone (Gutii Mountains), Carpathian Journal of Earth and Environmental Sciences, 4 (2), pp. 101 – 122, 2009.
2. Plotinskaya Olga Yu., Damian Floarea, Prokofiev Vsevolod Yu., Kovalenker Vladimir, Damian Gheorghe, Tellurides Occurrences in the Baia Mare Region, Romania, Carpathian Journal of Earth and Environmental Sciences, 4, (2), pp.89 – 100, 2009.
3. Constantina Ciprian; Szakacs, Alexandru; Pecskay, Zolt, Petrography, geochemistry and age of volcanic rocks in the Gurasada Area, Southern Apuseni Mts. Carpathian Journal Of Earth And Environmental Sciences, 4 (1), pp. 31-47, 2009.
4. Constantina, Ciprian; Moxon, Terry, Agates from Gurasada, Southern Apuseni Mountains, Romania: An XRD and thermogravimetric study, Carpathian Journal Of Earth And Environmental Sciences, 5 (2), pp. 89-99, 2010.
5. Damian Gheorghe, Damian Floarea, Nasui Daniel, Pop Corina, Pricop Cornel, The soils quality from the Southern Eastern part of Baia Mare Zone affected by metallurgical industry, Carpathian Journal of Earth and Environmental Sciences, 5 (1), pp. 139-147, 2010.
6. Macovei Gheorghe *Quercus givulescui* sp. Nov. (fagaceae) in the fossil flora from Chiuzbaia, Maramureș County, Romania, Carpathian Journal of Earth and Environmental Sciences, 6, (1), pp. 293 – 296, 2011.
7. Macovei Gheorghe, Kalmár János, Lithology, sequences and geochemical background in Upper Oligocene outcrops from Râpa Malului – Rogoz (Maramureș County, Romania) Carpathian Journal of Earth and Environmental Sciences, 6, (2), pp. 303 – 312, 2011.
8. Pop, Aurica; Vida-Simiti, Ioan; Damian, Gheorghe; Iepure Gheorghe, Removal of heavy metals from wastewater by using zeolitic tuff, Carpathian Journal of Earth and Environmental Sciences, 7 (1) pp. 239-248, 2012.
9. Plotinskaya Olga Yu., Prokofiev Vsevolod Yu., Damian Gheorghe, Damian Floarea & Lehmann Bernd, The

- Cisma deposit, Baiut District, Eastern Carpathians, Romania: Sphalerite composition and formation conditions, Carpathian Journal of Earth and Environmental Sciences, 7, (2), pp. 265 – 273, 2012.
10. Big, Cristina Laura; Lacatusu, R.; Damian, Floarea: Heavy metals in soil-plant system around Baia Mare City, Romania: Carpathian Journal of Earth and Environmental Sciences, 7 (3) pp. 219-230, 2012
  11. Gurzău Eugen Stelian, Baci Călin, Gurzău Anca Elena, Surdu Simona & Damian Gheorghe, Impact of the tailings impoundments on groundwater quality In Bozânta Area (Baia Mare – NW Romania) and human exposure, Carpathian Journal of Earth and Environmental Sciences, 7, (4), pp. 231 – 240, 2012.
  12. Macovei, Gheorghe A Revision Of Taxaceae Remains Of The Late Miocene Fossil Flora From Chiuzbaia, Maramures County, Romania, Carpathian Journal Of Earth And Environmental Sciences, Volume: 8, Issue: 3, Pages: 245-248
  13. Ioan Ianos, Daniel Peptenatu, Gheorghe Damian, Radu-Daniel Pintilii & Gabriela Silvia Gheorghe, A New Hypothesis To Explain The Unique Spatial Distribution Of Balkan Endemic Nephropathy, Carpathian Journal of Earth and Environmental Sciences, February 2013, Vol. 8. No. 1, 199 – 206
  14. Buzatu A., Buzgar N., Damian G., Vasilache V., Apopei A.I., The determination of the Fe content in natural sphalerites by means of Raman spectroscopy, Vibrational Spectroscopy V. 68 September 2013 p. 220–224,
  15. Naumov V.B., Kovalenker V.A., Prokofiev V.Yu, Tolstykh M.L., Damian G., Damian F., 2013ISSN 0016\_7029, Geochemistry International, 2013, Vol. 51, No. 11, pp. 876–888. Original Russian Text ©, published in Geokhimiya, 2013, Vol. 51, No. 11, pp. 957–970, ISSN PRINT: 0016-7029,.
  16. Floarea Damian, Gheorghe Damian, Radu Lăcătușu<sup>3</sup>, Carmen Postolache, Gheorghe Iepure<sup>1</sup>, Marian Jelea & Daniel Năsu<sup>1</sup> 2013 THE HEAVY METALS IMMOBILIZATION IN POLLUTED SOILS FROM ROMANIA BY THE NATURAL ZEOLITES USE, Carpathian Journal of Earth and Environmental Sciences, February 2013, Vol. 8. No. 4, p. 231-250,
  17. Cristiana L. Ciobanu<sup>1</sup>, Joël Brugger, Nigel J. Cook, Stuart J. Mills, Peter Elliott, Gheorghe Damian and Floarea Damian In press Grațianite, MnBi<sub>2</sub>S<sub>4</sub>, a new mineral from the Băița Bihor skarn, Romania, American Mineralogist

#### The offer addressed to the economic environment

Research & development in core areas	<ol style="list-style-type: none"> <li>1. National mineralogy heritage and mineral resources investigation.</li> <li>2. Risk assessment of natural geomorphologic, climatic and soil hazards.</li> <li>3. GIS databases creation (vector and raster)</li> <li>4. GIS modeling for surface erosion (USLE – The universal soil erosion model), landslides (SHALSTAB, SMORPH) and flood simulation (HEC-RAS).</li> </ol>
Research & development in applied fields	<ol style="list-style-type: none"> <li>1. Design and development of methods for the recovery of soils contaminated with heavy metals.</li> <li>2. Developing risk assessment maps.</li> <li>3. Geochemical mapping for heavy metals polluted areas.</li> <li>4. Mineralogical and petrography studies and quantitative determinations on minerals, rocks, building materials, etc.</li> <li>5. Restoring studies upon closed mining perimeters.</li> <li>6. Geological studies for the positioning of surface mining works</li> </ol>
Consulting	<ol style="list-style-type: none"> <li>1. The use of rocks and natural zeolites, soil type determinations.</li> <li>2. Using GIS in the creation and management of databases and in the risk assessment of natural and anthropogenic hazards.</li> <li>3. Paleontological determinations, determination of the anthropogenic pressure, management of protected areas, the use of thematic maps.</li> <li>4. Determination of sanitary blocks through the use of organic tracer method.</li> </ol>
Applied engineering services	
Training	<ol style="list-style-type: none"> <li>1. Using GIS in the creation and management of databases and in the risk assessment of natural and anthropogenic hazards.</li> </ol>



Fig. 1 Microscope Pol-U JENAPOL  
Determinations in reflected and transmitted  
light for the rocks and metallic minerals



Fig. 2 X-Ray Diffractometer Philips



Fig. 3 Binocular microscope



Fig. 4 Growth of the *Lolium perenne* specie on the "soil" from mining  
waste treated with the natural amendment (In collaboration with  
Department of Ecology and Environmental Education, Matej Bel  
University, Banská Bystrica Slovakia)



Fig. 5 Soil profile in the areas affected by  
heavy metal pollution