International Postdoctoral Position

Hydrogeology, Environmental Data Science, and Ferruginous Karst Systems

Laboratory of Hydrogeological Studies (LEHID) – Federal University of Minas Gerais (UFMG), Brazil

The Laboratory of Hydrogeological Studies (LEHID), Institute of Geosciences (IGC), Federal University of Minas Gerais (UFMG), Brazil, invites applications for an international postdoctoral position associated with a strategic research project developed in partnership with VALE S.A., focused on the hydrological dynamics of ferruginous caves in the Carajás Mineral Province (Brazilian Amazon).

The position is strongly oriented toward high-impact scientific research integrating hydrology, hydrogeology, hydrogeochemistry, environmental isotopes, geostatistics, GIS, and environmental data science.

Position Overview

The selected researcher will play a central scientific role in the project, acting as the academic lead responsible for:

- identifying scientific gaps and innovative research questions;
- integrating multidisciplinary environmental datasets;
- developing advanced quantitative analyses and interpretations;
- supporting scientific publications in high-impact international journals;
- contributing to the development of data-driven methodologies for ferruginous karst systems.

The researcher will work directly with Prof. Dr. Paulo Galvão and the LEHID/UFMG research group, while also interacting with technical teams from VALE S.A.

Scholarship and Duration

- Duration: 36 months
- Scholarship: R$ 12,000/month
- Equivalent annual value: approximately US$ 28,000/year
- Location: Belo Horizonte, Minas Gerais, Brazil

The scholarship provides an excellent quality of life in Brazil, particularly in Belo Horizonte, where the cost of living is substantially lower than in most North American and European cities.

Expected start date: July-August 2026.

Scientific Context

The project focuses on ferruginous karst systems developed in banded iron formations (BIFs) and ferruginous lateritic duricrusts ("canga") in the Carajás region, Brazilian Amazon.

The main scientific objective is to understand hydrological and hydrogeological dynamics associated with caves classified as having maximum environmental relevance, particularly regarding:

- subsurface and hypodermic flows;
- hydraulic connectivity;
- vadose zone dynamics;
- recharge/discharge processes;
- integration between geological structures and groundwater flow.

The project combines:

- geological-structural mapping;
- hydrogeology;
- hydrogeochemistry;
- stable isotopes (^{18}O and D);
- geophysics;
- dye tracer tests;
- GIS and environmental spatial analysis;
- advanced environmental data interpretation.

Main Work Fronts

(1) UFMG/LEHID – Scientific Front

This front focuses on scientific development and methodological innovation.

The selected researcher will:

- help identify high-impact scientific questions;
- support the development of conceptual and quantitative hydrogeological models;
- integrate long-term hydrogeological datasets;
- collaborate in scientific publications;
- develop advanced geostatistical and environmental data analyses;
- contribute to the internationalization of LEHID research.

LEHID publications:
https://www.researchgate.net/profile/Paulo-Galvao/publications

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(2) VALE – Data Integration and Automation Front

This front is focused on applied environmental data management and automation.

The researcher will contribute to:

- structuring and organizing environmental and cave-related databases;
- developing Python or R routines for automated environmental data processing;
- automating GIS workflows and shapefile generation;
- creating integrated geospatial products to support internal decision-making.

Interaction with VALE's speleology and mining teams will be part of this work front.

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(3) Carajás Project – Interpretation Front

This front is directly associated with the interpretation of hydrogeological and environmental monitoring datasets generated in ferruginous cave systems.

Activities include:

- interpretation of stable isotope monitoring;
- hydrogeochemical analysis;
- physicochemical data integration;
- multivariate statistical analysis;
- hydrogeological interpretation of caves developed in ferruginous formations.

The researcher will support the scientific interpretation of integrated datasets and contribute to methodological advances in ferruginous karst hydrogeology.

Candidate Profile

Applicants should preferably have:

- PhD in Hydrogeology, Hydrology, Environmental Geosciences, Environmental Engineering, Geochemistry, or related fields;
- strong quantitative and analytical background;
- experience with hydrogeological or hydrological data interpretation;
- advanced knowledge of geostatistics and multivariate statistics;
- experience with GIS platforms (ArcGIS/QGIS);

- proficiency in Python and/or R for environmental data analysis and automation;
- experience with environmental isotopes and hydrogeochemistry (desirable);
- strong scientific publication record in international journals;
- excellent English communication skills.

Experience with machine learning applied to environmental sciences will be considered highly valuable.

Expected Scientific Contributions

The selected researcher is expected to contribute to:

- high-impact scientific publications;
- methodological advances in ferruginous karst hydrogeology;
- integrated interpretation workflows;
- environmental data automation and spatial analysis;
- conceptual and predictive hydrogeological models;
- training and mentoring of students associated with LEHID/UFMG.

Application

Interested candidates should send:

- CV;
- publication list;
- short statement of research interests;
- examples of previous work involving hydrogeology, data analysis, GIS, or programming.

Applications and questions should be directed to:

Prof. Dr. Paulo Henrique Ferreira Galvão
Laboratory of Hydrogeological Studies (LEHID)
Federal University of Minas Gerais (UFMG)
Email: hidropaulo@gmail.com