

Bruno Figueiredo

Geomechanical Engineer

<i>Expertise</i>	Rock Mechanics and Rock Engineering
<i>Education</i>	Ph.D. (Geophysics), 2013 Strasbourg University (IPGS), Strasbourg, France Master in Structural Engineering, 2007 Higher Technical Institute (IST), Lisbon, Portugal Graduation in Civil Engineering, 2004 Higher Technical Institute (IST), Lisbon, Portugal
<i>Professional Affiliations</i>	Member: International Society of Rock Mechanics, Member: Portuguese Order of Civil Engineers.
<i>Professional Experience</i>	
2018 – Present	<i>Itasca Consultants AB, Kista, Sweden Geomechanical Engineer</i>
2015 – 2018	<i>Uppsala University, Uppsala, Sweden Researcher in Coupled Thermo-Hydro-Mechanical (THM) Processes</i>
2013 – 2015	<i>Uppsala University, Uppsala, Sweden Postdoc in Coupled Thermo-Hydro-Mechanical (THM) Processes</i>
2009 – 2010	<i>New University of Lisbon (FCT-UNL), Lisbon, Portugal Invited Teaching Assistant</i>
2007 – 2013	<i>Portuguese Laboratory for Civil Engineering (LNEC), Lisbon, Portugal Assistant Researcher in Rock Mechanics</i>
2005 – 2006	<i>Higher Technical Institute, Lisbon, Portugal Research fellow in Structural Engineering</i>
2004 - 2005	<i>CivilSer-Estudios e Projectos de Engenharia, Lda Structural Engineer</i>

Project Experience

Mining:

Geomechanical study of crown pillar extraction at the Kemi Mine, using *FLAC3D*. The work included compilation of geomechanical parameters, numerical stress analysis and interpretation.

Discontinuum numerical analysis for Boliden Tara Mines, using *3DEC*, to evaluate the influence of ground water pressure on the consequences of the extraction of the crown pillar, with focus on the surface deformation.

Civil Engineering:

Monitoring the behavior of tunnels and caverns through the analysis of data (e.g. ground displacements, convergences, water pressure) provided by geotechnical instrumentation devices.

Numerical modelling of an underground repository intended for storing hazardous material using *FLAC3D*. The repository life-span is expected to be 3000 years, and analyses included long term stability and rock mechanical effects on flow paths.

Analysis and interpretation of large flat jack and dilatometer test results to characterize the deformability of rock masses.

Nuclear Waste Disposal:

Development of a computational code for SKB to consider a fully tensorial approach in the characterisation of the stress heterogeneity in rock masses. The methodology was applied to in situ stress data and numerical modelling results.

Stress Measurements:

Analysis and interpretation of data provided by overcoring, flat jack, hydraulic fracturing and hydraulic tests of pre-existing fractures to determine the in situ rock stresses. Integration of in situ stress measurements data with geomechanical models developed in *FLAC* and *FLAC3D* to assess the regional stress field for the design of several underground hydroelectric power schemes in northern Portugal that include large caverns and hydraulic pressure tunnels. Analysis of the effects of topography, tunnels and caverns on the in situ stresses. Development of back-analysis methodologies to estimate the transversely-isotropic elastic constants from biaxial tests done on the overcored rock samples.

Teaching and Academic Experience:

Teaching experience at the Civil Engineering department of the New University of Lisbon (FCT-UNL). Courses: Dynamic and Earthquake Engineering, Structural Analysis II and Continuum Mechanics.

Research experience:

Regional stress field assessment, investigation on the rheological properties of rock masses, development of geomechanical models for the interpretation of field and laboratory data, integration of laboratory and field data with geomechanical models in inversion schemes, sparse channel models for fluid flow and solute transport in fractured rocks, numerical modelling of coupled processes in fractured rocks induced by the injection and storage of CO₂ in deep underground formations, the hydraulic fracturing to extract oil or gas from underground shale formations and the injection of cold water in hot dry underground rocks.