

Dr. Pantelis Liolios

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RESEARCH INTERESTS

Computational mechanics, rock mechanics, constitutive modelling, numerical modelling, drilling and blasting of rocks, geotechnical engineering, fracture mechanics, surface and underground mining

EDUCATION

Technical University of Crete, School of Mineral Resources Engineering, Chania, Greece

Ph.D., Rock Mechanics, June 2013

- Dissertation: Hyperbolic failure model for cohesive-frictional materials
- Advisor: Prof. George Exadaktylos

M.Sc., Geotechnology and the Environment, February 2005

- Thesis: Thermoporomechanical analysis of fractured rocks

Diploma Mineral Resources Engineer, February 2002

- Thesis: Stress and displacement analysis of underground works and tunnels with the complex potentials method

AWARDS

First prize Diploma Thesis (period 2001-2003) by the Hellenic Society for Theoretical & Applied Mechanics, 2004.

TEACHING EXPERIENCE

Technical University of Crete, School of Mineral Resources Engineering, Chania, Greece

Independent Teaching

September 2014 to present

- Undergraduate Courses
 - * Rock Mechanics (spring, 2015 - present)
 - * Drilling and Blasting of Rocks (winter, 2014 - present)
 - * Fracture Mechanics (winter, 2016)
- Postgraduate Courses
 - * Design of Mining Projects and Tunnels (focusing on Rock Mechanics aspects) (winter, 2014 - present)
 - * Advanced Geomechanics (spring, 2015 - present)
 - * Rock Mechanics in Petroleum Engineering (spring, 2016)

Supportive Teaching

September 2002 to present

- Undergraduate Courses
 - * Fracture mechanics (winter, 2003 - winter, 2016)
 - * Underground mining and tunneling (winter, 2003 - winter, 2016)
 - * Surface mining (spring, 2003 - present)
 - * Stability of underground and surface technical works (spring, 2003 - spring, 2015)
 - * Geology (winter, 2002)

PROFESSIONAL EXPERIENCE

Technical University of Crete, School of Mineral Resources Engineering, Chania, Greece

Research Engineer

June 2002 to present

- Development of PFEM, a 1D, 2D and 3D nonlinear finite element solver for static problems (elliptic PDEs) [Python].
- Development of TBLAST, a code for the automatic calculation of the blast design for tunnels (drillhole pattern, charge per blasthole, delays and fragmentation estimation) [Python].
- Development of a web platform for the remote monitoring of the stress and deformation of an underground marble quarry [Python, SQL].
- Development of constitutive models for quasibrittle materials (rocks and concrete) [Matlab, Python].
- Development of closed form solutions for underground openings and fractures with the method of complex potentials [Matlab].
- Development of the **Strength of Materials Database** (StremaDB) [PHP, SQL].
- Development of the **Rock Mechanics Database** (RMDB) [JAVA, SQL].
- Conducted numerous rock mechanics experiments including uniaxial/triaxial compression tests, Brazilian disc tests, three point bending tests etc.
- Conducted microdrilling experiments and participated in the development of a theoretical microdrilling model [Matlab].
- Participated in the development of a jointed rock model (DEM) for underground quarries [Matlab, 3DEC].
- Participated in soil mechanics experiments including analogue experiments for the modeling of shallow tunnels and faults.
- Participated in the modeling of rock degradation due to fluid diffusion [Matlab, FLAC].
- Developed numerous scientific algorithms in the area of Geomechanics [Matlab, Python].
- Participated in the administration of several projects.

Scientific Conference Organization

July 2004 to June 2005

- Conference title: 7th International Workshop on Bifurcations, Instabilities and Degradation in Geomechanics (IWBIDG2005). Member of Local Organizing Committee.

SINTEF Petroleum Research, Formation Physics Department, Trondheim, Norway

Research Engineer

June 2004 to September 2004

- Conducted several borehole breakout experiments on hollow cylinder specimens.

KAVALA OIL, Hellenic Company of Exploration and Exploitation of Hydrocarbons, Kavala, Greece

Summer Internship

July 2000 to August 2000

- Participated in the drilling of a new borehole and the geological characterization of the reservoir formation.

RESEARCH PROJECTS

- 1 *Optimization of the blast design for tunnels (T-BLAST)*. Private research program, 2021.
- 2 *Planning of underground exploitation of Granite and Volakas marble deposits*. Private research program, 2020.
- 3 *Geophysical and geotechnical study of the Kisos location at Sfinary, Chania*. Private research program, 2019.
- 4 *Geomechanics and environment of CO₂ geological Storage*. THALES Research program, 2012-2015.
- 5 *Designing Safer Urban Spaces (DESURBS)*. EU FP7 Program, 2011-2015.
- 6 *Technology Innovation in Underground Construction Structures (TUNCONSTRUCT)*. EU FP6 Program, 2005-2009.
- 7 *Development of an integrated method of simulation of the mechanical behaviour of underground marble quarries in discontinuous rocks*. Research program PYTHAGORAS II, 2005-2007.
- 8 *Degradation and Instabilities in Geomaterials with Application to Hazard Mitigation (DIGA)*. EU FP5 Program, 2002-2006.
- 9 *Integrated Tool for In Situ Characterization of Effectiveness and Durability of Conservation Techniques in Historical Structures (DIAS)*. EU FP5 Program, 2002-2005.
- 10 *Effect of the Weathering on Stone Materials: Assesment of their Mechanical Durability (MCDUR)*. EU FP5 Program, 2001-2005.

PUBLICATIONS

Refereed Journals

- J.1 M. Stavropoulou, **P. Liolios**, G. Saratsis, G. Exadaktylos. Stress-deformation monitoring and modelling of an underground marble quarry. *Materials Today: Proceedings*, In Press, 2023.
- J.2 **P. Liolios** and G. Exadaktylos. Hyperbolic hardening model for quasibrittle materials. *International Journal of Solids and Structures*, 120:257-267, 2017.
- J.3 **P. Liolios** and G. Exadaktylos. Comparison of a hyperbolic failure criterion with established failure criteria for cohesive-frictional materials. *International Journal of Rock Mechanics and Mining Sciences*, 63:12-26, 2013.
- J.4 G. Exadaktylos and **P. Liolios**. Web driven strength of materials database and modelling tool (StreMa-DB). *International Journal of Engineering and Innovative Technology*, 3(3):286-292, 2013.
- J.5 **P. Liolios** and G. Exadaktylos. A smooth hyperbolic failure criterion for cohesive-frictional materials. *International Journal of Rock Mechanics and Mining Sciences*, 58:85-91, 2013.
- J.6 M. Stavropoulou, **P. Liolios** and G. Exadaktylos. Calibration of the triaxial hyperbolic Mohr-Coulomb elastoplastic model parameters on laboratory rock mechanics tests. *International Journal of Geomechanics, ASCE*, 12(6):618-631, 2012.
- J.7 **P. Liolios** and G. Exadaktylos. A relational rock mechanics database scheme with a hierarchical structure. *Computers and Geosciences*, 37(8):1192-1204, 2011.
- J.8 G. Exadaktylos, S. Tsouvala, **P. Liolios** and G. Barakos. A three-dimensional model of an underground excavation and comparison with in situ measurements. *International Journal for Numerical and Analytical Methods in Geomechanics*, 31(3):411-433, 2007.
- J.9 **P. Liolios** and G. Exadaktylos. A solution of steady-state fluid flow in multiply fractured isotropic porous media. *International Journal of Solids and Structures*, 43(13):3960-3982, 2006.
- J.10 G. Exadaktylos, **P. Liolios** and M. Stavropoulou. A semi-analytical elastic stress-displacement solution for notched circular openings in rocks. *International Journal of Solids and Structures*, 40(5):1165-1187, 2003.

Refereed Conferences

- C.1 G. Exadaktylos, **P. Liolios** and M. Stavropoulou. A web-driven platform of stress-strain monitoring of an underground marble quarry. In *38th Danubia-Adria Symposium on Advances in Experimental Mechanics*, Poros island, Greece, September 2022.
- C.2 G. Exadaktylos, **P. Liolios**, G. Xiroudakis, M. Stavropoulou. Stress analysis around an opening of arbitrary shape in elastic solid. In *13th HSTAM International Congress on Mechanics*, Patras, August 2022.
- C.3 G. Exadaktylos, G. Alevizos, **P. Liolios** and S. Mavrigiannakis. Microstructural and mechanical characterization of two marbles in a folded geological setting. In *1st International Conference of the Greek Society of Experimental Mechanics of Materials*, Athens, Greece, May 2018.
- C.4 G. Exadaktylos, **P. Liolios**, M. Stavropoulou and G. Xiroudakis. A generic relational database of materials with a strength modeling tool. *Information Technology in Geo-Engineering*, D.G. Toll et al. (Eds.), IOS Press, 2014.
- C.5 G. Exadaktylos, **P. Liolios** and G. Barakos. Some new developments on the representation and standardization of rock mechanics data: From the laboratory to the full scale project. In *Rock Mechanics Data: Representation and Standardisation, 11th ISRM Congress*, Lisbon, Portugal, July 2007.
- C.6 G. Exadaktylos, S. Tsouvala and **P. Liolios**. Three-dimensional Modeling aspects of underground excavations in jointed rocks. In *8th HSTAM International Congress on Mechanics*, Patras, July 2007.
- C.7 V.C. Kelessidis, K. Founargiotakis and **P. Liolios**. Sensitivity analysis of important parameters during two-phase solid-liquid flow in horizontal annulus for the two layer model. In *5th Panhellenic Symposium of Chemical Engineering*, Thessaloniki, Greece, May 2005. (in Greek)
- C.8 **P. Liolios** and G. Exadaktylos. Stress analysis of multiply fractured porous rocks. *Bifurcations, Instabilities and Degradation of Geomaterials*, Exadaktylos and Vardoulakis (Eds), Springer, 2007.

C.9 E. Papamichos, **P. Liolios** and P. van den Hoek. Breakout stability experiments and analysis. In *Proc. Gulf Rocks 2004, the 6th North America Rock Mech. Symp.*, Houston, 2004.

Other Publications

O.1 G. Exadaktylos, M. Stavropoulou, G. Saratsis, S. Tsouvala, G. Xiroudakis, **P. Liolios** and G. Barakos. Three-dimensional modeling aspects of underground excavations in heterogeneous and discontinuous rocks. *Presentation at 18th ALERT Workshop*, Aussois, France, 2006.

O.2 G. Exadaktylos, M. Stavropoulou, S. Tsouvala and **P. Liolios**. Experimental monitoring and numerical modeling of an underground chamber of a marble quarry and a new instrument for in situ non-destructive measurements of elasticity and strength of rocks. *Presentation at 17th ALERT Workshop*, Aussois, France, 2005.

O.3 E. Papamichos, **P. Liolios** and G. Exadaktylos. Shear bands in hollow cylinder and trap door experiments. *Presentation at 15th ALERT Workshop on Post-failure behaviour*, Aussois, France, 2003.

O.4 E. Papamichos, **P. Liolios** and J. Tronvoll. Post-failure analysis of cavity failures. In *Book of abstracts in 5th EUROMECH Solid Mechanics Conf.*, Thessaloniki, Greece, 2003.

O.5 G.E. Exadaktylos and **P.A. Liolios**. Poromechanical behaviour of faulted rocks. In *Book of abstracts in EGS - AGU - EUG Joint Assembly*, Nice, France, April 2003.

CITATIONS

SCOPUS May 2023 (excluding self citations)

Total: 158

Last 5 years: 67

h-index: 5

SERVICE AND AFFILIATIONS

Reviewer in the international journals:

- Rock Mechanics and Rock Engineering, Springer
- International Journal for Numerical and Analytical Methods in Geomechanics, Wiley
- Journal of Geotechnical and Geoenvironmental Engineering, Springer
- Journal of Advanced Research, Elsevier
- Geotechnics, MDPI
- Applied Sciences, MDPI

Member of the examination committee in 17 Engineering Diploma Theses and one MSc Dissertation up to May 2023

Member of the Technical Chamber of Greece

Member of the Hellenic Association of Mineral Resources Engineers