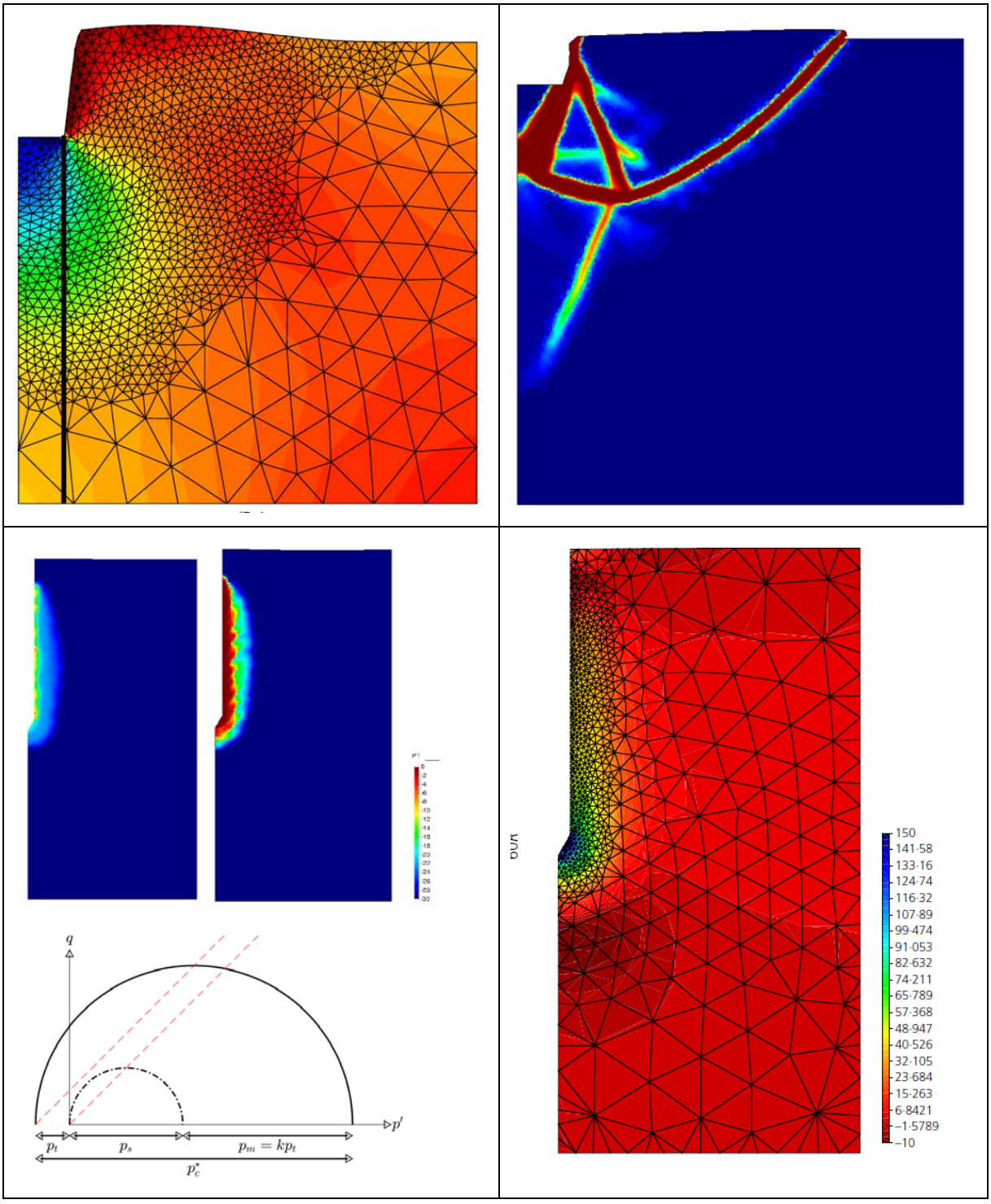
UNIVERSITAT POLITÈCNICA DE CATALUNYA
BARCELONATECH

Department of Civil and Environmental Engineering

Division of Geotechnical Engineering and Geosciences

Short course: Introduction to the Geotechnical PFEM in Kratos

Barcelona, 21, 22 and 23rd JANUARY 2020



Presentation

G-PFEM is a recently developed numerical code capable of modelling soil-solid interactions involving large displacements and deformations. Currently it has the capability to handle coupled hydromechanical problems in quasistatic 2D problems [1,2,3,4,5] using a variety of constitutive models appropriate for soils and soft rocks [6]. Ongoing development is extending this capability to fully dynamic conditions [7] and three-dimensional problems [1,8].

G-PFEM has been developed within KRATOS, an open source platform for numerical code development. The code is ready for application and / or further development. However, getting acquainted with its Kratos implementation has usually required some training before autonomous work can be developed.

This short course aims to provide such training in a concentrated setting. At the end of the course the attendees should be able to use existing tools and/or start developing new ones with G-PFEM.

[1] Carbonell, J. M., Oñate, E & Suarez, B. (2010). Modeling of Ground Excavation with the Particle Finite-Element Method. Journal of Engineering Mechanics, 136(4), 455-463.

[2] Carbonell, J. M., Oñate, E & Suarez, B. (2013). Modelling of tunnelling processes and rock cutting tool wear with the particle finite element method. Computational Mechanics, 52(3), 607--629.

[3] Monforte, L., Arroyo, M., Carbonell, J. M., & Gens, A. (2017). Numerical simulation of undrained insertion problems in geotechnical engineering with the particle finite element method (PFEM). Computers and Geotechnics, 82, 144-156.

[4] Monforte, L., Arroyo, M., Carbonell, J. M., & Gens, A. (2018). Coupled effective stress analysis of insertion problems in geotechnics with the Particle Finite Element Method. Computers and Geotechnics, 101, 114-129.

[5] Gens, A. (2019). Hydraulic fills with special focus on liquefaction. Proceedings of the XVII ECSMGE-2019

[6] Monforte, L., Ciantia, M. O., Carbonell, J. M., Arroyo, M., & Gens, A. (2019). A stable mesh-independent approach for numerical modelling of structured soils at large strains. Computers and Geotechnics, 116, 103215.

[7] Monforte, L., Navas, P., Carbonell, J. M., Arroyo, M., & Gens, A. (2019). Low-order stabilized finite element for the full Biot formulation in soil mechanics at finite strain. International Journal for Numerical and Analytical Methods in Geomechanics, 43(7), 1488-1515.

[8] Monforte, L, Arroyo, M., Gens, A. & Carbonell, J. M. (2018). Three-dimensional analysis of penetration problems using G-PFEM. Proceedings of the 9th European Conference on Numerical Methods in Geotechnical Engineering (NUMGE 2018), June 25-27, 2018, Porto, Portugal

Contents

Part I	**The code. General structure.**	
	Kratos. General structure. Object Oriented	2 hours
	Solver + Elements + Constitutive Laws. Processes	2 hours
Part II	**Installation**	
	Installation and compilation of Kratos-GPFEM	4 hours
Part III	**Running geotechnical FEM problems in Kratos**	
	Boundary conditions. Gid Interface.	1 hour
	Setting up a problem without remeshing.	3 hours
Part IV	**Running G_PFEM (1)**	
	Basic algorithms and overview of code structure	2 hours

	Running G_PFEM	2 hours
Part V	**Running G_PFEM (2)**	
	Contact problems	2 hours
	Further developments: dynamics, nonlocal formulation	2 hours

Instructors

Prof. J.M. Carbonell, Vic University, Spain

Dr. L. Monforte, Newcastle University, UK

Mr. Laurin Hauser, Graz University, Austria

Conditions

Location: Couse lessons will be held at Building D2, Room 212, Campus Nord, UPC, Barcelona, Spain (https://goo.gl/maps/zdAwTv8nN6i9gUEU9)

Price: 550€. Documentation & catering included.

Attendance: Limited to a maximum of 15 inscriptions.

Inscriptions: course inscriptions on request to mecmat.civileng@upc.edu and/or marcos.arroyo@upc.edu