

Curriculum vitae (a version from November, 2021)

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Education:

- Ph.D., Applied Mathematics, 2008, Palacký University Olomouc, CR
- M.Sc. (Mgr.), Applied Mathematics, 2003, University of Ostrava, CR
- University of Liverpool, UK, 2001-2002, 1 semester, ERASMUS Programme

Current position:

- Researcher at [The Czech Academy of Sciences, Institute of Geonics](#), 2006-present
 - Department of Applied Mathematics and Computer Science & IT4Innovations (deputy head since 2011, head since 2021)

Research areas:

- *mathematical and numerical analysis:*
 - solvability and stability analysis in nonlinear mechanics; finite element method; a priori and a posteriori error analysis; duality and saddle-point problems
- *numerical methods for non-linear and optimization problems:*
 - non-smooth variants of the Newton method; penalization and continuation techniques; conic optimization; convergence analysis; mesh adaptivity
- *elastoplasticity:*
 - analysis and solution schemes for implicit constitutive operators and their derivatives; semismoothness of the operators, incremental methods, limit load analysis, shear strength reduction method
- *development of MATLAB codes and libraries:*
 - in elastoplasticity, damage mechanics, porous flow and other problems
- *geotechnical applications:*
 - stability of slopes, foundations or tunnels; excavation damage zones; nuclear waste repositories; numerical simulations with rock, soil and composite materials

Cooperation with well-known experts supported by common publications:

- Prof. J. Haslinger (Prague and Ostrava) – numerical analysis and methods in plasticity
- Prof. S. Repin (St. Petersburg and Jyväskylä) – a posteriori error estimates in plasticity
- Prof. B. D. Reddy (Cape Town) – strain-gradient plasticity, limit analysis, delamination
- Prof. O. Axelsson (Uppsala, Ostrava) – continuation and Newton methods
- Prof. R. Blaheta (Ostrava) – nonlinear mechanics and porous flow in geo-applications
- Prof. J. Kruis (Prague) – nonlinear mechanics and porous flow in engineering problems
- Prof. J. Zeman (Prague) – computational plasticity
- Ass. Prof. J. Valdmán (Prague and České Budějovice) – MATLAB implementation of elastoplastic problems, development of MATLAB library
- Prof. F. Tschuchnigg (Graz) – geotechnical stability, shear strength reduction method

Selected papers (more in a separated document):

- S. Sysala, E. Hrubešová, Z. Michalec, F. Tschuchnigg: Optimization and variational principles for the shear strength reduction method. *International Journal for Numerical and Analytical Methods in Geomechanics* 45 (2021) 2388-2407.
- S. Sysala, J. Haslinger, B. D. Reddy, S. Repin: An abstract inf-sup problem inspired by limit analysis in perfect plasticity and related applications. *M3AS - Mathematical Models and Methods in Applied Science* 31 (2021) 1593–1623.
- B. D. Reddy, S. Sysala: Bounds on the elastic threshold for problems of dissipative strain-gradient plasticity. *Journal of the Mechanics and Physics of Solids* **143** (2020) 104089.
- M. Čermák, S. Sysala, J. Valdmán: Efficient and flexible MATLAB implementation of 2D and 3D elastoplastic problems. *Applied Mathematics and Computation* 355 (2019) 595-614.
- S. Repin, S. Sysala, J. Haslinger: Computable majorants of the limit load in Hencky's plasticity problems. *Computer & Mathematics with Applications* 75 (2018) 199-217.
- S. Sysala, M. Cermak, T. Koudelka, J. Kruis, J. Zeman, R. Blaheta: Subdifferential-based implicit return-mapping operators in computational plasticity. *ZAMM* 96 (2016) 1318-1338.
- O. Axelsson, S. Sysala: Continuation Newton methods. *Computers & Mathematics with Applications* 70 (2015) 2621-2637.
- S. Sysala: Application of a modified semismooth Newton method to some elasto-plastic problems. *Math. Comp. Sim.* 82 (2012) 2004-2021.

Selected projects (more in a separated document):

- Czech Science Foundation (GA ČR), grant No. 19-11441S: *Efficient and reliable computational techniques for limit analysis and incremental methods in geotechnical stability*, 2019-2021. My role: project leader.
- The Ministry of Education, Youth and Sports (of the Czech Republic), National Programme of Sustainability (NPU II), project No LQ1602: *IT4Innovations excellence in science*, 2016-2020. My role: senior researcher and key person.
- *European Joint Programme on Radioactive Waste Management – EURAD*. The European Union's Horizon 2020 research and innovation programme, no. 847593, 2019-2024. Inst. Geonics is a linked third party supported by the Czech Radioactive Waste Authority (SÚRAO). My role: coordination of the Inst. Geonics team since 2021, research on nonlinear mechanics.
- *Prediction of EDZ properties with impact on safety and reliability of deep radioactive waste repository – ENDORSE*. Technology Agency of the Czech Republic (TA ČR), grant No. TK02010118, 2019-2022. Inst. Geonics is a project partner. My role: coordination of the Inst. Geonics team since 2021, research on nonlinear mechanics.

Selected organization activities (more in a separated document):

- *Mathematical modelling and computational methods in applied sciences and engineering – Modelling 2019*, September 16-20, 2019. My roles: member of scientific and local organizing committees, minisymposium organizer, special issue guest editor in Mathematics and Computers in Simulation. <http://www.ugn.cas.cz/actually/event/2019/modelling/>.
- *Seminar on Numerical Analysis & Winter School – SNA 2017, SNA 2019, SNA 2021* <http://www.ugn.cas.cz/link/sna21>. My roles: main organizer in 2021, member of programme and organizing committees, editor of special issues of the journal Applications of Mathematics.
- Invited Session *Limit Analysis and Plastic Collapse* organized by S. Sysala and E. Hrubešová, XV International Conference on Computational Plasticity – COMPLAS 2019, <https://congress.cimne.com/complas2019/>.

Editorial work:

- Editorial Board of Applications of Mathematics (Springer)
- Special issue guest editor in Mathematics and Computers in Simulation

Selected memberships:

- Union of Czech Mathematicians and Physicists and its Mathematical Section
- International Association for Mathematics and Computers in Simulation (IMACS)
- Scientific Committees of COMPLAS 2017, 2019, 2021 (Barcelona Spain)
- Scientific Committee of Modelling 2019 (Olomouc, Czech Republic)

Selected invited lectures:

- *A rigorous variant of the shear strength reduction method and its usage in geotechnical stability analysis*, seminar series Current Problems in Numerical Analysis, Institute of Mathematics of the Czech Academy of Sciences, Prague, 17.9.2021
- *Computable majorants of the limit load in perfect plasticity*, Nečas Seminar, Charles University, Prague, 19.3.2018.
- *Limit load for variational problems with linear growth and its importance in perfect plasticity*, Seminar on Numerical Analysis and Winter School – SNA'15, Institute of Geonics, Ostrava, 23.1.2015.

Teaching and supervising:

- *Mathematical seminar III - an introduction to elastic and elastoplastic problems*, VŠB-TU Ostrava, courses for master students, winter semesters in 2017, 2018, 2019, 2020.
- J. Cenek, VSB-TU Ostrava, master thesis supervisor – defended in 2020,
- J. Kmec, Palacký University Olomouc, 2013-2014, master thesis supervisor – defended in 2014,
- M. Čermák, VSB-TU Ostrava, cooperation on supervising of PhD. thesis – defended in 2012

Scientometric data:

- *Web of Science*: 20 journal articles and 17 other outputs; 195 citations, h-index 10;
- *SCOPUS*: 22 journal articles and 16 other outputs; 231 citations, h-index 10;
- [Google Scholar Citations](#): 23 journal articles and 35 other outputs; 367 citations, h-index 12.