



ALERT - Geomaterials Application Form

Date 6 February 2009



Team:	<i>Ruhr-Universität Bochum, Germany Chair of Foundation Engineering, Soil and Rock Mechanics Institute of Mechanics - Continuum Mechanics</i>
Responsible ALERT member:	<i>Prof. Dr.-Ing. habil. Tom Schanz tom.schanz@rub.de Prof. Dr.-Ing. habil. Holger Steeb Holger.Steeb@rub.de</i>
Link to the website¹:	<i>http://www.bi-gbf@rub.de http://www.tm.bi@rub.de</i>
Size of the research group:	<i>31</i>

Researchers	Topic(s) of interest²
<i>Prof. Tom Schanz (Chair of Foundation Engineering, Soil and Rock Mechanics)</i>	<i>Unsaturated soils & physico-chemical fundamentals of clay behaviour Experimental and theoretical analysis of multi-physics problems Model identification in geomechanics by inverse approach</i>
<i>Prof. Dr.-Ing. Holger Steeb (Head of the Chair of Continuum Mechanics)</i>	<i>Continuum Modelling of Multiphase Materials (Porous Media) Phase Transition in Geomaterials (Internal Erosion etc.) Wave Propagation Phenomena (Experiments, Theory, Numerics) Multi-Scale Modelling (Homogenization) Numerical Modelling of Coupled Processes</i>
<i>Dr. Diethard König</i>	<i>Modelling of soil structure interaction (Experiments, Centrifuge Modelling) Development and Formation of Shear Bands in Granular materials</i>
<i>Prof. Dr.-Ing. Otto T. Bruhns</i>	<i>Continuum Modeling of Large Inelastic Deformations Continuum Modeling</i>

¹ Link to the ALERT page active in the web page in the site of the local institution.



<i>Dr. Albert Meyers</i>	<i>Kinematics of Large Deformation Eulerian Thermo-Elastoplasticity</i>
<i>Dr. Heng Xiao</i>	<i>Thermodynamics of Large Inelastic Deformations Thermocoupled Phenomena Leading to Localised Fracture and Failure Engineering Modeling of Shape Memory Materials</i>
<i>Jun. Prof. Dr.-Ing. Henning Schütte</i>	<i>Fracture and Damage Mechanics</i>

Post-docs	Topic(s) of interest²
<i>Dr. Maria Datcheva</i>	<i>Constitutive modelling of unsaturated soils; Elastoplasticity, porous materials, materials with internal friction; Multisurface plasticity, viscoplasticity; Hydro-mechanical coupled problems, soil hydraulic properties; Non-linear mechanics of anisotropic materials; Finite element method, model-parameter identification; Creep, multiaxial creep, creep rupture; damage mechanics, heterogeneous materials, homogenization</i>
<i>Dr. Lidija Stankovic M.Sc.</i>	<i>Numerical modelling of localised material failure</i>
<i>Dr. Zoran Stanković, M.Sc.</i>	<i>Detection of fatigue crack growth (acoustic emission, electrical resistance)</i>

Present PhD students	Title of the thesis
<i>Msc. Eng. Yaser M. H. Al-Badran</i>	<i>Volume change characteristics of unsaturated fine grained soils.</i>
<i>Dipl.-Ing. Wiebke Baille</i>	<i>Mechanical and hydraulic behaviour of clays with respect to their physico-chemical properties.</i>
<i>MSc. Houman S. Fard</i>	<i>Thermal, Hydraulic, Mechanical, and Chemical Analyse of Masonry Materials - with Application to Preservation of Cultural Heritages in Iran.</i>
<i>Msc. Eng. Muhammad-Ibrar Khan</i>	<i>Hydraulic conductivity of moderate and highly dense expansive clays from micro-structural and physicochemical considerations</i>
<i>Dipl.-Ing. Yvonne Lins</i>	<i>Hydraulic-mechanical properties of an unsaturated frictional material</i>
<i>Dipl.-Ing. Lars Röchter</i>	<i>Physical modeling of shear band formation in cohesive-frictional material</i>
<i>Dipl.-Ing. Michael Kleer</i>	<i>Ultrasound propagation in granular media</i>

² Each topic should be actively linked to the list of the relative pdf papers.



<i>Dipl.-Ing. Alexander Arnold</i>	<i>An efficient quantitative ultrasonic elastography based on variational mesh refinement</i>
<i>Dipl.-Ing. Nikolaus Bleier</i>	<i>On variational constitutive updates for plasticity models at finite strain in geoscience</i>
<i>Radan Radulovic M.Sc.</i>	<i>Numerical modelling of jointed and faulted rocks</i>

Number of international journal papers in the last five years:	~55
Number of conference papers in the last three years:	~70
Number of invited/keynote lecturers in the last three years:	~35

Titles of books (as author or editors) in the last five years

- 1) **T. Schanz** (Ed.) *Unsaturated Soils, Proc. of the International conference “From Experimental evidence towards Numerical Modelling of Unsaturated Soils” Weimar, Germany, September 18 – 19, 2003, Vol. I: Experimental studies, Vol. II: Numerical and Theoretical Approaches. Springer. Berlin Heidelberg. 2003*
- 2) **T. Schanz** (Ed.) *Proc. of the 2nd Int. Conf. Mechanics of Unsaturated Soils, Weimar, Germany, 7 – 9 march 2007, Vol. I Experimental Unsaturated Soil Mechanics, Vol. II, Theoretical and Numerical Unsaturated Soil Mechanics. Springer. Berlin Heidelberg. 2007*
- 3) *Proceeding of NATO ARW on Site effects in earthquake engineering, Springer Publisher, 2009*
- 4) **Meyers**: *IMPLAST 2007: Plasticity and Impact Mechanics*
- 5) **Bruhns**: *IMPLAST 2007: Plasticity and Impact Mechanics*
- 6) **Bruhns**: *Elemente der Mechanik, Bände I, II und III*
- 7) **Bruhns**: *Lifetime-oriented Design Concepts*
- 8) **Bruhns**: *Plasticity and Impact Mechanics*

Research Projects in the last three years (max five titles)

1) Title:	<i>Physical modeling of shear band formation in cohesive-frictional material</i>
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Source Budget:	<i>DFG</i>		
Period:	<i>1.2009 - 6.2011</i>	Funding:	<i>DFG (215.000 €)³</i>

2) Title:	<i>Physical modeling of shear band formation in cohesive-frictional material</i>		
Source Budget:	<i>SFB 526</i>		
Period:	<i>6.2005 - 12.2008</i>	Funding:	<i>DFG (280.000 €)</i>

3) Title:	<i>Research group on partially saturated soils (speaker)</i>		
Source Budget:	<i>DFG</i>		
Period:	<i>2001-2007</i>	Funding:	<i>About 2 Mio. EUR</i>

4) Title:	<i>Graduate school on Model validation (speaker)</i>		
Source Budget:	<i>DFG</i>		
Period:	<i>2008-2012</i>	Funding:	<i>About 4.5 Mio. EUR</i>

5) Title:	<i>Hydraulic conductivity of expansive clays from micro-structural and physico-chemical considerations</i>		
Source Budget:	<i>BMBF</i>		
Period:	<i>2007-2009</i>	Funding:	<i>About 350.000 EUR</i>

6) Title:	<i>Fluid transport and frictional strength of jointed or faulted rocks</i>		
Source Budget:	<i>SFB 526 – A10</i>		

³ DFG: Deutsche Forschungsgemeinschaft, German Science Foundation



Period:	<i>6.2008 - 6.2011</i>	Funding:	<i>DFG⁴</i>
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7) Title:	<i>Lebensdauerabschätzung auf der Basis einer Schädigungsanalyse inelastisch deformierter Strukturen – Theorie und experimentelle Absicherung</i>		
Source Budget:	<i>SFB 398 – B1</i>		
Period:	<i>1.2005 - 1.2008</i>	Funding:	<i>DFG</i>
8) Title:	<i>Numerical homogenization strategies in the framework of extended continua</i>		
Source Budget:	<i>DFG</i>		
Period:	<i>1/2007 -1/2009</i>	Funding:	<i>DFG (137.500.- Euro)</i>
9) Title:	<i>Quantification of heterogeneity effects for the improvement of oil and gas detection based on hydrocarbon microtremor analysis</i>		
Source Budget:	<i>CTI/KTI</i>		
Period:	<i>2007 – 2009</i>	Funding:	<i>CTI/KTI (22.500 SFr).</i>
10) Title:	<i>Experimental investigation of internal erosion in geomaterials</i>		
Source Budget:	<i>Saarland University (Young Scientist Grant, PI: Steeb)</i>		
Period:	<i>2007</i>	Funding:	<i>Saarland University</i>

Title of five key publications in the last five years

1) Title:	<i>Tripathy, S., Sridharan, A. & Schanz, T. (2004), ‘Swelling pressures of compacted bentonites from diffuse double layer theory’, Can. Geotech. J. 41(3), 437–450</i>
2) Title:	<i>Wolf, H., König, D., Triantafyllidis, Th. (2005): Centrifuge model tests on sand specimen under extensional load. Int. J. Numer. Anal. Meth. Geomech. 29, 25 – 47</i>

⁴ DFG: Deutsche Forschungsgemeinschaft, German Science Foundation



3) Title:	Wang, W., Datcheva, M., Schanz, T. & Kolditz, O. (2006), 'A sub-stepping approach for elasto-plasticity with rotational hardening', <i>Computational Mechanics</i> 37(3), 266–278.
4) Title:	Schanz, T. & Tripathy, S. (2009) 'Swelling pressure of a divalent-rich bentonite: Diffuse double theory revisited', <i>Water Resources Research</i> 45, W00C1
5) Title:	Xie, M., Kolditz, O., Agus, S. S. & Schanz, T. (2004), 'An upscaling method and a numerical analysis of swelling/shrinking processes in a compacted bentonite/sand mixture', <i>Int. J. Anal. Numer. Meth. Geomech.</i> 28(15), 1479–1502.
6) Title:	Comparison of finite difference and finite element methods for simulating two-dimensional scattering of elastic waves. <i>Phys. Earth. Planet. Int.</i> 171 (2008), 112-121
7) Title:	A new hybrid velocity integration method applied to elastic wave propagation. <i>Int. J. Numer. Meth. Engng.</i> 74 (2008), 56-79
8) Title:	A space-time discontinuous Galerkin method applied to single-phase flow in porous media. <i>Comp. Geosci.</i> 12 (2008), 525-539
9) Title:	On non-rotational rates of Oldroyd's type and relevant issues in rate constitutive formulations. <i>Proc. Roy. Soc. London A</i> 460 (2004), 909-928
10) Title:	Thermodynamic laws and consistent Eulerian formulation of finite elasto-plasticity with thermal effects. <i>J. Mech. Phys. Solids</i> 55 (2007), 338-365

Title of five PhD thesis (last five years)

1) Title:	<i>Beitrag zur Standortidentifizierung mit Oberflächenwellen</i>	Year:	2005
2) Title:	<i>An Experimental Study on Hydro-Mechanical Characteristics of Compacted Bentonite-Sand Mixtures</i>	Year:	2005
3) Title:	<i>Analyse tiefgreifender Hangdeformationen - Einfluss des Initialspannungszustands und der konstitutiven Formulierung</i>	Year:	2008
4) Title:	<i>Parameterbestimmung mittels inverser Verfahren für geotechnische Fragestellungen</i>	Year:	2008
5) Title:	<i>Thermo-Hydro-Mechanical Behavior of Compacted Bentonite-Sand Mixtures: An experimental study</i>	Year:	2008
6) Title:	<i>Sound propagation in granular media</i>	Year:	2009
7) Title:	<i>Discontinuous-time Galerkin methods for the numerical modeling of porous media</i>	Year:	2008
8) Title:	<i>Numerical modelling of localised material failure</i>	Year:	2008
9) Title:	<i>Detection of fatigue crack growth (acoustic emission, electrical</i>	Year:	2008



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Current international collaborations

Partner	Topic	Project Type⁵
<i>Dr. Luc Thorel / Dr. Jacques Garnier, LCPC Nantes, France</i>	<i>Physical modelling of Soil Structure Interaction, Centrifuge Modelling</i>	<i>8 publications, 2 times EU Fund., 3 times DAAD Fund.</i>
<i>Prof. B.V.S. Viswanadham, IIT Bombay, India</i>	<i>Behavior of geotextile reinforced earth structures</i>	<i>6 publications</i>
<i>Dr. S. Tripathy, Cardiff University</i>	<i>Hydraulic conductivity of clays</i>	<i>DAAD ARC-PPP funding, > 5 papers</i>
<i>Prof. R. Iankov, Prof. P. Dineva, Bulgarian Academy of Sciences</i>	<i>Dynamic soil structure interaction; Hybrid model for wave propagation</i>	<i>NATO, 5 papers</i>
<i>Prof. Sai Vanapalli, University of Ottawa</i>	<i>Bearing capacity of footings on unsaturated subsoil</i>	<i>Started very recently</i>
<i>Dr. A. Corsini, University of Modena, Dr. L. Borgatti, University of Bologna</i>	<i>Modelling large landslides</i>	<i>DAAD, > 5 papers</i>
<i>Prof. I. Vardoulakis, NTU Athens, Greece</i>	<i>Internal erosion, coupled problems</i>	<i>5 publ.</i>
<i>Dr. Stefan Schmalholz, ETH Zurich, Suisse</i>	<i>Wave propagation in partially-saturated rocks</i>	<i>5 publ., KTI/CTI Fund, 22.500 SFr</i>
<i>Dr. Alexander Scheuermann, TU Karlsruhe, Germany</i>	<i>Internal Erosion</i>	<i>1 publ.</i>
<i>Prof. Stefan Luding, Univ. of Twente, Netherlands</i>	<i>Modelling of Granular Media</i>	<i>2 publ.</i>
<i>PD Dr. Alexander Düster, TU München, Germany</i>	<i>Numerical Homogenization</i>	<i>5 publ., DFG Fund., 500.000 Euro</i>
<i>Prof. Stefan Diebels, Saarland University, Germany</i>	<i>Extended Continua, FE2</i>	<i>45 publ., DFG Fund.</i>
<i>Dr. David Smeulders, TU Delft, Netherlands</i>	<i>Wave propagation in granular media (Experiments)</i>	
<i>Prof. Dr. Katia Bertoldi, Univ.</i>	<i>Acoustic band gaps</i>	<i>1 publ.</i>

⁵ Financial support, number of joint publications.



<i>of Twente, Netherlands</i>		
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Contribution to ALERT

	2003	2004	2005
Number of participants to ALERT School:	3	3	3
Number of participants to ALERT Workshop:	3	3	3
Number of lecturers in ALERT events	1	1	2

	2006	2007	2008
Number of participants to ALERT School:	2	2	2
Number of participants to ALERT Workshop:	1	2	3
Number of lecturers in ALERT events	1	1	1

Activity in International Boards, Committees, Commissions, ...

<p>Schanz: Chairman German technical committee “Numerical Methods in Geotechnics”, Member European committee “Numerical Methods in Geotechnics”, member TC 6 “Unsaturated Soils” Member editorial board “ASTM Geotechnical Testing Journal, status: since > 5 years” and “Acta Geotechnica (Springer), status: since 2009</p> <p>Xiao: Co-Editor-in-Chief of international journal “Multidiscipline Modeling in Materials and Structures”, VSP, Brill Academic Publishers, Leiden, the Netherlands</p> <p>Bruhns: Member of Editorial Board of the International Journal of Plasticity</p> <p>Steeb: Funding member of GAMM Activity Group: “Multiscale Material Modelling”</p>
