

ENVIRONMENTAL GEOMECHANICS, GEOTECHNICS & GEOPHYSICS

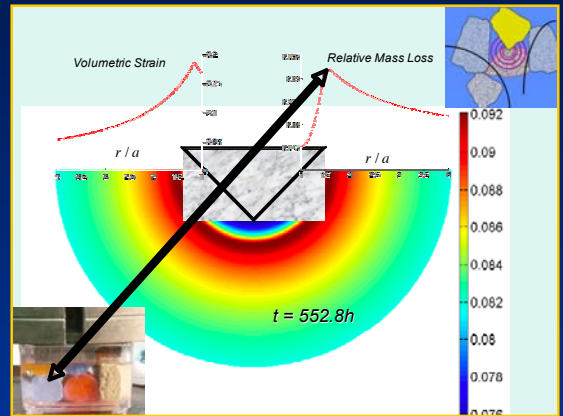
Duke offers a unique opportunity to pursue geosystems research. Explore faculty research options through the URLs provided.

Featured faculty:

Environmental Geomechanics [Prof. T. Hueckel](#)

Engineering and Environmental Geophysics [Prof. F. Boadu](#)

Environmental Soil Physics [Prof. A. Porporato](#).



Environmental Geomechanics –project examples: Current work of Prof. Hueckel group addresses:

- [desiccation shrinkage and damage in soils](#) (NSF grant from Geomechanics program, 2003-2008) – basic mechanism research w/ applications in environmental barriers
- [dissolution of minerals and long term strength of geomaterials](#) w/ application to underground infrastructure
- [atomic force microscopy \(AFM\) environmental studies of intergranular contact](#) (NSF grant from Geomechanics program, 2007-2010) – basic mechanism research with application to soil and sediment compaction in petroleum engineering. STUDENTS NEEDED !!!!!
- erosion and dissolution trigger mechanisms of landslides – with application to open pit mining
- mechanisms of aging of sediments and their mathematical modeling with applications to compaction of natural gas reservoirs
- [multi scale approach to chemo-mechanic coupling in soils](#)
- [nuclear waste disposal in clays / soil thermo-mechanics](#)

ENVIRONMENTAL GEOMECHANICS & GEOPHYSICS

Environmental Geomechanics is a spearheading cross-disciplinary research area of interest to structural (foundation) engineering on difficult soils, pavement engineering, mountain hazards, environmental protection, and energy and resource production.

Of particular interest are geomechanics issues in nuclear, hazardous and toxic waste disposal, petroleum engineering, geothermal energy, CO₂ sequestration geotechnology, methane hydrates technology. These are all areas of a recent tumultuous development and prospective massive investments in the near future. Without risk of exaggeration it can be stated that Environmental Geomechanics is a most dynamically developing area of geotechnology.

Environmental Geomechanics is distinguished by an intense coupling between geo-mechanics, subsurface hydrology, thermo-mechanics, geochemistry and engineering geology resulting from an intense influence of thermal, chemical and hydric phenomena and fields on mechanical behavior of soils and rocks.

Duke is one of the leading world centers in environmental geomechanics, and several of its early concepts were formulated and tested. These include: thermo-plasticity of clays, chemo-plasticity of soils and sediments, aging of soil.

Duke has developed intense international partnership in environmental geomechanics and involves its students in an international exchange and collaboration

NONLINEAR MECHANICS AND ADAPTIVE DYNAMIC SYSTEMS

- applications of nonlinear dynamical systems theory to problems of practical engineering importance
 - Virgin <http://nonlineardynamics.pratt.duke.edu/>
- mechatronics
 - Scruggs
<http://www.cee.duke.edu/faculty/scruggs/index.php>
- structural control (Gavin, Scruggs and Virgin), and related applications of controllable materials, especially the use of electrorheological and magnetorheological dampers for structural vibration suppression (Gavin <http://www.duke.edu/~hpgavin/>)