



COLLABORATIVE RESEARCH CENTER 837

## INTERACTION MODELING IN MECHANIZED TUNNELING

RUB

# Compressibility of Porous Materials, Thermodynamics, and the Total Differential

Prof. Lynn Schreyer-Bennethum

*University of Colorado Denver, USA*

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Typical experiments performed on saturated soils (swelling and non-swelling porous materials) include the drained, jacketed, and pseudo-bulk compressibility experiments. In this talk we show how to use thermodynamics to develop the relationship between these compressibilities and the compressibility of each phase and the void fractions. The mathematical tool used is one commonly used in physical chemistry, but has not been used consistently in hydrology and geomechanics: the total differential. The

results of the thermodynamical analysis (with no constitutive assumptions) are presented for a saturated porous material with possibly both phases compressible, and the theory is compared with Biot's, Zimmerman's, and Gassmann's formulation. Also we examine the results of Brown and Korringa. Because minimal assumptions are made the results are applicable to developing a framework for deriving a Terzaghi result and potential consequences for wave propagation.

**Guests are welcome!**