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Special Guest Lectures

Validation and Verification of Moving Boundary Models of Land Building Processes

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National Center for Earth-surface Dynamics

Johnston Hall 338
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Abstract:

A major question of current interest in the geosciences is how a shore-line responds to environmental conditions such as changes in sediment transport, sea-level, and subsidence. With an appropriate averaging of time and space scales, a mass transfer model of shore-line dynamics can be cast in terms of a diffusion controlled moving boundary problem—a field problem in which one of the domain boundaries (the shore-line position) is an unknown function of space and time. In this seminar a variety of moving-boundary problems related to sediment transport and land building process will be presented. The power of combining experimental, analytical and numerical tools to understand key features in these systems will then be illustrated. Throughout a keen focus will be placed on (i) validating the moving boundary models by comparison with experimental land building systems and (ii) verifying the numerical tools with limit case analytical solutions. The seminar will close with some current thinking on how the moving boundary models can be coupled to critical biological processes such as plant succession and carbon burning.

Speaker's Bio:

Dr. Voller is currently a professor at the University of Minnesota. He received his B.Sc. and M.Sc. in Applied Mathematics from the University of East Anglia, United Kingdom, and his Ph.D. in Numerical Modeling from Sunderland Polytechnic, UK. His research interests are in the development of numerical techniques for thermal-fluid and thermo-mechanical problems, with emphasis on problems that involve moving boundaries or free surfaces. Current research includes modeling of stresses and cracking in engineered systems, modeling of free surfaces in sedimentation and basin dynamics, and development of macro-micro models to describe segregation behavior in solidifying metals. Dr. Voller conducts his research at the St. Anthony Falls Laboratory and through the National Center for Earth-surface Dynamics.

