PhD Opportunity In Modeling of Coupled Lithospheric Deformation and Landscape Evolution

Funding: Full time for 4 years, with 3 years of RA support

Start Date: prefer August, 2025, but can be flexible

Location: The position is based in the <u>Department of Earth & Environmental Science</u> at the New Mexico Institute of Mining and Technology (NMT), Socorro, New Mexico.

Contact Information: If you are interested in the position, please contact <u>Dr. John</u> <u>Naliboff</u>(john.naliboff@nmt.edu).

What you will do: This PhD opportunity is focused on modeling interactions between solid Earth and landscape evolution processes. The position is part of a larger collaborative effort to couple existing landscape evolution and geodynamic software packages, and use the new software elements to develop state-of-the-art multiphysics Earth system simulations. The graduate student at NMT will work in Dr. John Naliboff's research group on various technical components of the software coupling and its application to problems including continental rift evolution, large-scale subduction dynamics, volcanic systems, and global deformation patterns. The position will involve close collaboration with project partners at multiple institutions, including attendance of annual conferences, project workshops, and hackathons.

What is required: The position will require participation in collaborative activities that include software development in python and C++, designing and conducting multiphysics simulations, use of high-performance computing platforms, and 4D data analysis and visualization. Candidates with experience in numerical modelling, data analysis, programming, and research are highly desired. Knowledge of solid Earth and landscape evolution processes is beneficial, but not necessarily required. As such, we encourage applications from students with backgrounds in computational geophysics, Earth surface processes, climate and hydrologic modeling, physics, applied mathematics, engineering, and computer science.

About the broader project: A major challenge in geoscience research is understanding how the Earth's surface and its interior shape one another to influence tectonic motions, volcanic processes, and climate on timescales from tens to millions of years. However, interactions between these systems remain poorly constrained due to a lack of models that capture the coupled dynamics between Earth's interior and surface processes. This project, funded through the <u>NSF CSSI Program</u>, will couple two widely used, open-source software packages: <u>ASPECT</u>, a mantle dynamics simulation package that is used extensively for long-term modeling of tectonic plates; and <u>Landlab</u>, an environment that models surface processes. The software and workflows developed through this project will enable scientific communities that are typically siloed, studying either Earth's surface or its interior, to initiate new studies of coupled processes with direct societal relevance (e.g., geohazards, resource exploration). Model use cases will be developed to demonstrate the implementation of coupling on different spatial and temporal

scales, which can be used by domain scientists to initiate independent research projects. Training materials will be developed and incorporated into long-standing training programs associated with both ASPECT and Landlab, as well as online videos and interactive web visualizations.