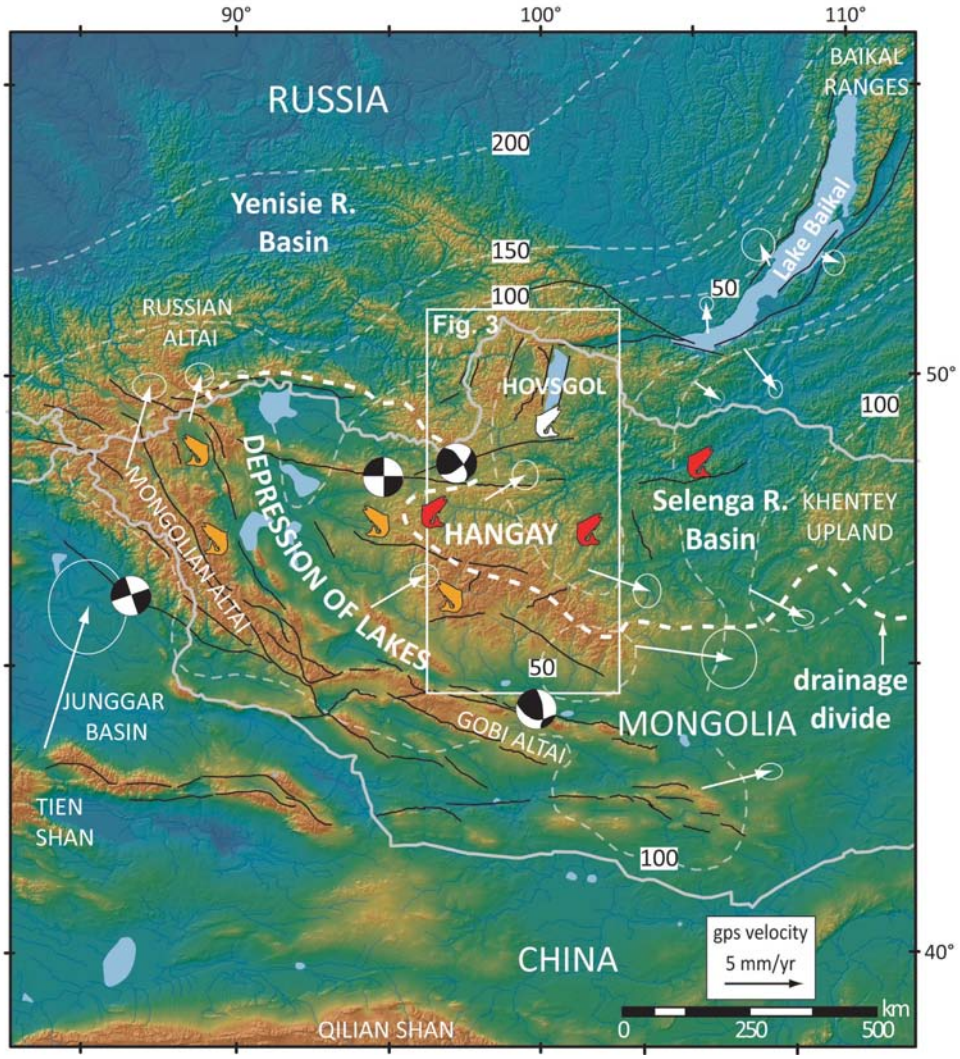
COLLABORATIVE RESEARCH: INTRACONTINENTAL DEFORMATION AND SURFACE UPLIFT – GEODYNAMIC EVOLUTION OF THE HANGAY DOME, MONGOLIA CENTRAL ASIA

PROJECT SUMMARY

Intellectual Merit. Large relatively high-elevation surfaces with low relief are common on the continents. Such "epeirogenic" uplifts have a significant impact on the geological record by influencing drainage networks and sediment supply, on climate by modifying atmospheric circulation, and on biogeography and the biota. Work in geodynamics has shown that such uplifts amount to a telling signature of mantle dynamics. Thus, they provide a means to discriminate among hypotheses about how the continental lithosphere and the deeper mantle interact through processes that result in uplift and mass transfer in continental interiors. The Hangay Dome in central Mongolia provides an excellent and accessible laboratory to investigate these processes and determine the degree to which mantle upwelling, mafic underplating, lithospheric foundering or plume activity have been important agents in its uplift. This five-year project proposes to use the Hangay Dome as such a laboratory to coordinate studies of both the structure and

state of the lithosphere and the sublithospheric mantle as well as the history of surface uplift and landscape evolution. The project will involve observations and measurements made using broadband seismology, basalt and xenolith petrology and geochemistry, $^{40}Ar/^{39}Ar$ geochronology, stable-isotope and vesicular-basalt paleoaltimetry, geomorphology and ^{10}Be geochronology, molecular genetics of divergent fish populations, and U-Th/He and $^{4}He/^{3}He$ thermochronology. The Hangay Dome's widespread exposures of basaltic lavas, which were erupted over the past 30 Ma across a broad range of elevations, will be key to the integration of all these data. Dating of the basalts will enable linkage of petrologic data bearing on basalt genesis and the nature of the Hangay-Dome mantle with studies that use the lavas as time markers for documenting landscape evolution and the history of surface uplift.



Broader Impacts. This project's work will contribute to the general understanding of lithospheric evolution and also provide boundary and initial conditions required for 4D geodynamic modeling. Large continental uplifts impact several parts of the Earth system, so results from this work will be relevant to fields beyond continental dynamics, including stratigraphy, biogeography, and climate history. The project will provide support for two early-career scientists and training for a number of graduate and undergraduate students. All project members will gain international experience working on a multidisciplinary project in the field with Mongolian counterparts. Project personnel will also participate in an international continental-dynamics field school, and U.S. and Mongolian undergraduate assistants will conduct research projects as part of this field school. Student participation will be fully supported by the project, and recruiting for the field school will target students from underrepresented groups. The field school will include workshops and short courses in Mongolia as well as more extended engagement facilitated by information technology in the form of an on-line course and the use of social-networking tools. The research project as a whole will be the focus of a feature-length documentary film aimed at Earth-science education and public outreach, and primary and interpreted project data will be available on the web for use in classrooms at various levels.