

## Project Summary

Sustaining our precious water resource depends upon our ability to understand and predict the availability and variability of this resource. The proposed research aims to organize and conduct field experiments in Saudi Arabia to study the key fundamental processes of the hydrometeorology of arid-semiarid regions. The project will support four U.S. undergraduate and graduate students led by a faculty member from the University of Texas at San Antonio (UTSA) to travel to Saudi Arabia to conduct field experiments together with Saudi counterparts- a faculty member and four students. The experiments will be followed by data analysis, modeling, and hypothesis-driven research. The main purpose of the program is to provide U.S. students with a unique, international, hands-on experience required for succeeding in international research environments. The field experiment involves “hands-on” training in a number of hydrometeorological sensors, field preparation and design of experiments, data collection and analysis, teamwork, and dissemination of knowledge through presentations and publications. Because of its unique arid-semiarid climate, topography, strong diversity in ecology, and susceptibility to flash floods, the study region (Asir in Saudi Arabia) offers an exciting environment to perform hypothesis-driven research through an international research experience.

### **Intellectual Merit**

The proposed research activities are organized into three major thrust areas, the results from which will have a significant influence in our understanding of the key fundamental components of the hydrometeorology of semiarid regions. The specific science objectives are to:

- 1) Evaluate satellite-based estimates of evapotranspiration in the region;*
- 2) Characterize orographic controls on the space-time variability of rainfall; and*
- 3) Characterize dominant runoff mechanisms and quantify partitioning of precipitation into surface runoff, infiltration, groundwater recharge, and evapotranspiration through measurement and modeling.*

Hydrometeorological sensors will be installed by the team, and short-term field campaigns will be conducted in the Asir region. The site will also be used to validate remote sensing observations of rainfall, evapotranspiration, and a land surface model. The project can eventually become the first step of a series of focused research projects addressing surface water and groundwater sustainability in arid-semiarid regions with similar physiographical settings.

### **Broader Impacts**

The project will support 12 U.S. undergraduate and graduate minority students (over a period of three summers) under a faculty member to conduct field experiments in a unique region of an extremely dry country. The field experience will help consolidate inquiry-driven, problem-based learning and promote development of global perspective in scientific research in a region with similar climatic characteristics as parts of South Texas and Mexico from which most UTSA students originate. The program will also help forge relationships between young researchers from both the U.S. and the Middle East in the early stages of their careers. Educational activities will expand collaborations between the UTSA and King Fahd University for Petroleum & Minerals. Two-way mentoring, an annual colloquium, and outreach activities will ensure that participating students share the gained knowledge and experience with peers and pre-college students. The project will help attract future funding for similar collaborative research activities in neighboring countries in the Arabian Peninsula and promote integrated bi- or multi-national water management policies in the region.