MORE Science at UTSA
Environment Science and Engineering
Fall 2006 Seminar Series

Where: **Loeffler room (3.03.02) in the BioScience Building**
When: **4:00 PM – 5:00 PM on October 27, 2006**

Snack and drinks will be served

Speaker: Dr. Zong-liang Yang

Dr. Yang is an Associate Professor of Climate Science at Department of Geological Sciences at UT Austin. The climate science program (CSP) led by Dr. Yang received ~$1.5m federal support from EPA, NASA and NOAA as well as support from the Geology Foundation. The CSP, consists of graduate research assistants, postdoctoral fellows, and research associates who are working on a wide variety of research questions. These include mathematical modeling of land-surface hydrology and its role in controlling weather and climate, characterizing vegetation and snow cover including their influences on the surface energy and water balances using ground-based and remotely-sensed datasets, quantifying the relative role of land versus oceans in determining rainfall in southwest and south central USA, developing tools for assessing the potential impacts of heavy precipitation associated with severe weather on urban watersheds and flash flood prediction, and investigating the impact of vegetation-derived chemicals on Texas air quality. Dr. Yang was a research associate and research scientist at the University of Arizona from 1993-2001 and got his PhD degree at the Macquarie University (Australia) in 1992.

Topic: **Developing a Regional Environmental Prediction System for Central and Eastern Texas**

Will Texas' summers become longer and hotter in the coming decades? Will a warmer climate mean less frequent but more intense thunderstorms? How will these potential changes in extreme weather patterns affect flash flooding, agriculture, ecosystems, air quality, and water resources in Texas? These are some the questions being addressed by the Climate Science Program at the Jackson School of Geosciences at the University of Texas at Austin.

Over the past five years, we have been developing an integrated environmental system modeling framework that consists of multi-scale and multi-disciplinary sciences. Individual components include climate modeling, air quality modeling, hydrological modeling, remote sensing, biogeochemistry, and in situ measurements. The integrated system model is designed to benefit a wide range of applications. Although the model development has been focused on the State of Texas, the model framework can be applied elsewhere. Meteorological simulations will also be directly compared to instrumental measurements made at weather stations, radiosondes, eddy flux towers, rain gauges, and by weather radars, aircrafts and satellites to improve upon model calibration. In the presentation, I will provide highlights of results in climate dynamic downscaling, biogenic emissions, seasonal climate forecasts, and regional-scale flood forecasting for Central Texas. The flood forecasting will be the focus of my talk. The Weather Research and Forecasting (WRF) Model, created with the purpose of improving upon the current Pennsylvania State University / National Center for Atmospheric Research Fifth-Generation Mesoscale Model (PSU/NCAR MM5), is specifically designed for regional resolutions of 1-10 km. Previous research by the authors resulted in the development of a regional-scale prediction system over the San Antonio River Basin, using a GIS database, a hydrologic model, and a hydraulic model. Observed precipitation drives the prediction system; the authors hypothesize that the WRF model has the potential to predict flooding, at a lead time of several days, with an accuracy near that of observed precipitation. Causes of model bias are also investigated, to determine the relative errors caused by model physics, initialization interval, buffer zone and domain size, and small-amplitude random errors. Results show that the Betts-Miller-Janjic cumulus and Lin microphysics schemes, 48-hour initialization interval, and two-domain configuration covering minimal ocean and having a parent-to-nest area ratio of greater than ten best simulates the 2002 storm event. Location errors in rainfall are most significant because of the inherent difficulties in their prediction. Errors in intensity and timing show a more predictable watershed response that may be useful in estimation of streamflow ranges for flood forecasting.