Tulane Scientist Seeks to Unravel the Physics of Erosion Caused by Groundwater

February 19, 2009 11:00 AM Kathryn Hobgood
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The March issue of *Nature Geoscience* will feature a paper co-authored by Kyle M. Straub, an assistant professor in the Department of Earth & Environmental Sciences at Tulane University, that examines how groundwater flow beneath the surface of the earth impacts the rate of erosion. The topic has local interest because it has recently been observed that significant erosion is occurring on New Orleans area levees primarily caused by seepage driven flow.

Recently work began by the U.S. Army Corps of Engineers to plug in the shipping channel known as the Mississippi River-Gulf Outlet Canal (MRGO) that extends for 76 miles from New Orleans through wetlands to the Gulf of Mexico. The erosion of thousands of acres of cypress wetlands and marsh caused by the channel has been blamed for increased storm surge during Hurricane Katrina in 2005.

“Our theory would suggest that seepage caused by underwater flow will continue to erode and weaken the levee system around New Orleans, but the rate of this erosion should gradually slow with time,” says Straub. “Hopefully this research will aid the U.S. Army Corps of Engineers in identifying levees that need repair and assessing the lifespan of structures like the MRGO that are not planned for upkeep.”

Using fieldwork conducted in the Florida Panhandle, Straub and his fellow researchers were able to better understand the process of seepage erosion, which occurs when the re-emergence of groundwater at the surface shapes the Earth"s topography. In the *Nature Geoscience* article, they present a new theory about how channels on the Earth"s surface can be carved through erosion associated with the reemergence of groundwater at natural springs.

The paper suggests that the velocity at which channel heads advance is proportional to the flux of groundwater to the heads. The researchers used field observations and numerical modeling to come up with the theory. To demonstrate how it works, they created computer animations depicting how the network of deep ravines in Florida grew over time.

Straub says that this theory of growth laws for seepage driven channels can also be applied to better understand the topographical features of planet Mars, as well as Earth.

“Within earth science, the subject is of interest because of its fundamental role in sculpting landscapes. The animations provide an explicit answer to the age-old question of how particularly striking and visually attractive erosional features on Earth"s surface attained their modern form,” explains Straub. “The problem is of topical interest in planetary science because channelized features on Mars are thought, but not proven, to have arisen from groundwater flow.”

For more information about Straub"s research, click here.