Ron Stoessell, department geochemist, has been active in low-temperature research in near-surface environments for the past 30 years. Although Ron is retiring from teaching at the end of 2006, he plans to continue research at UNO for many years to come as a professor emeritus. You can contact him by email at ronlondi@charter.net and find additional information at ronstoessell.org.

On-going low-temperature geochemical research projects deal with understanding water-rock interactions, fluid flow, and pollutant migration in South Louisiana clastic aquifers and in the unconfined surface carbonate aquifer of the Yucatan Peninsula. Surface water projects examine the controls of nutrients on algae blooms in Lake Pontchartrain and the relation between land use and water quality in the north-shore Tangipahoa River Basin. New projects will include those related to the critical problems of rebuilding the South Louisiana coast.

Ground water compositions in shallow South Louisiana aquifers evolve from rainwater by ion exchange in surface soils, weathering of silicates in the reservoirs, and through mixing with deeper saline reservoir fluids that have dissolved halite and entered the shallow aquifers after moving up dip on fault planes. The processes produce distinct chemical fingerprints for fluids in different reservoirs used for drinking water, irrigation, and industry. The idea of saline fluids moving up dip thousands of feet into shallow aquifers is a controversial idea that is the subject of ongoing debate. The evidence is shown below in the

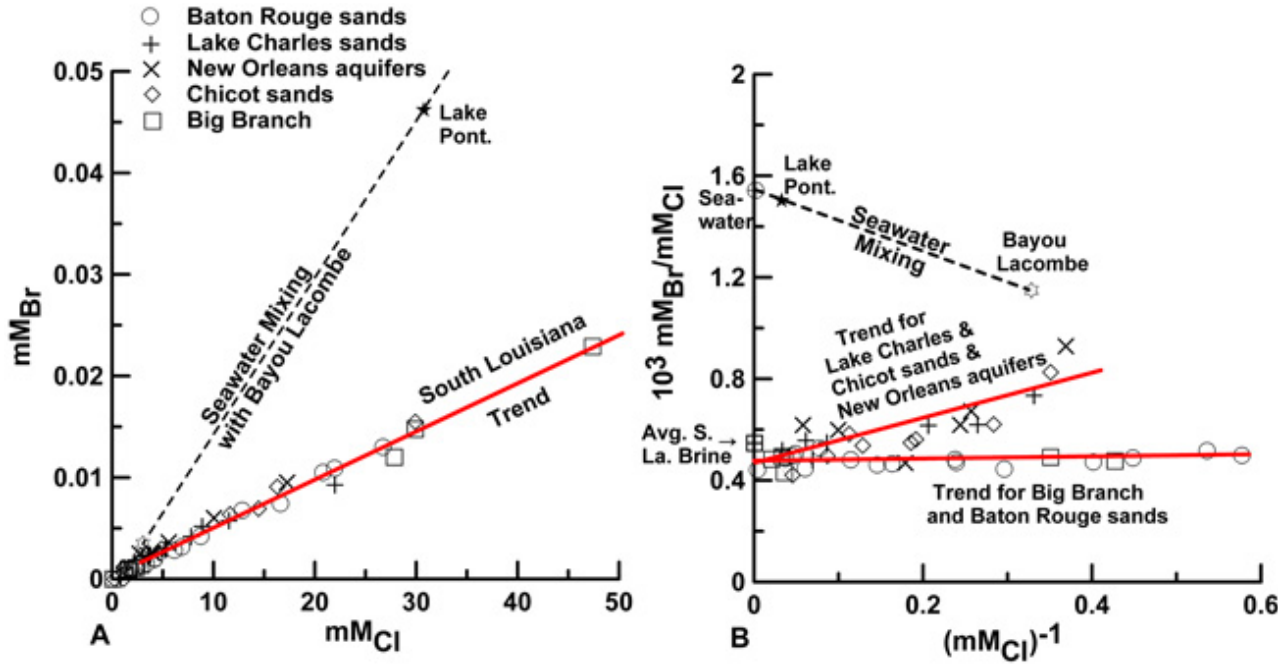
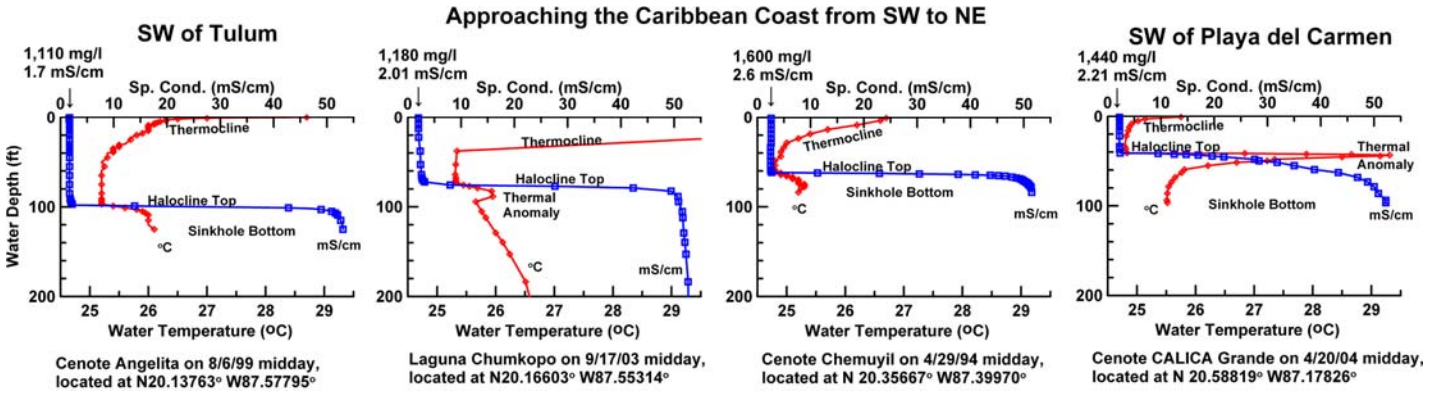
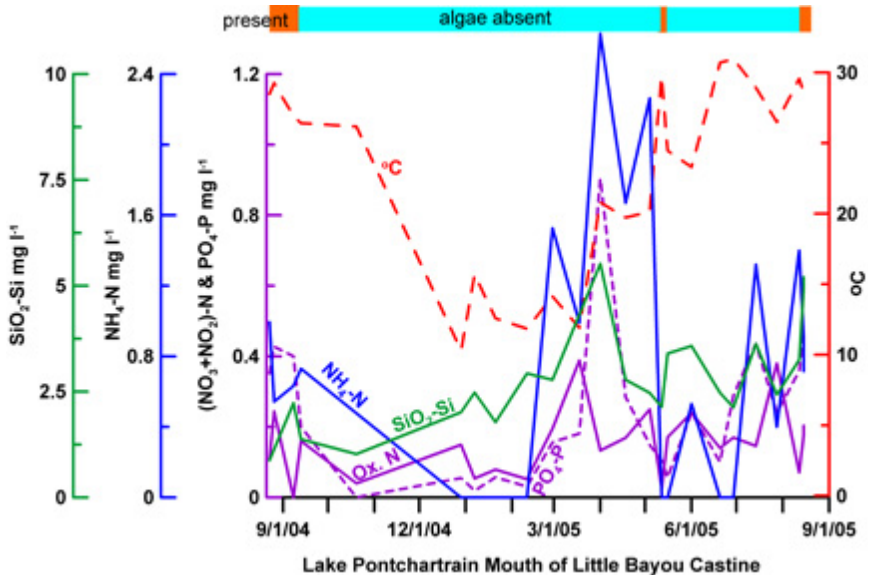


figure of Br versus Cl plots which can only be explained by the chloride source being halite dissolution. Lesley Prochaska has been working with Ron on this topic.

Near-surface groundwater compositions in the unconfined surface carbonate aquifer of the Yucatan reflect the dissolution and transformation of aragonite and high-Mg calcite to low-Mg calcite and subsequent mixing with the underlying saline water which is modified seawater. The saline water is thought to move between the Caribbean Sea and the Bay of Campeche and the Gulf of Mexico. The overlying brackish water lens is thin, less than 100 meters thick, and the waters move rapidly coastward from the center of the Peninsula. Upward heat flow across the halocline, sets up convection within this overlying lens, producing a vertical zone of uniform brackish and polluted composition within waters that are commonly used for drinking. Within the underlying saline water are shallow convection cells driven by upward flowing geothermal heat and by fresh-water loading from surface rainwater being added to the overlying brackish lens. These saline convection cells have their return arms moving coastward within the halocline. Numerous sinkholes show the evidence of past changes in sea level and present sulfate reduction and methane generation from organic matter falling into them and sinking below into the saline waters under the halocline. Some evaporite dissolution is occurring in the south half of the peninsula. The chemical and flow processes are complex and far from being fully understood, much less agreed upon by different researchers. Caribbean coast examples of depth profiles of temperature and specific conductivity in the sinkholes are shown below to illustrate the upward heat flow across the halocline to set up convection in the brackish groundwater lens. Also shown is Cenote Calica Grande with a calcite raft forming on the surface.



Periodic algae blooms occur in Lake Pontchartrain which is usually considered a nitrogen-limiting lake. These have been linked to input of nutrient-rich Mississippi River water, when the Bonnet Carre Spillway is periodically opened, and from various streams and rivers that drain into the lake. One year of data has been taken to determine the level of variables, e.g., temperature, lake salinity, and different nutrient concentrations, that can initiate these blooms. An example of the data taken in the ongoing study is shown below. Note the data set ended with Hurricane Katrina's arrival in 2005 and has since been restarted.



A "recently begun" long-term EPA funded study by Andrea Bourgeois-Calvin is examining the difference in water quality within the Tangipahoa River Basin, resulting from different land uses. The basin has areas devoted to dairy farms, urban development (including industry and with and without municipal wastewater treatment plants), and forests, swamps, and marshes. Several months of data show extreme differences in water quality between the urban areas, the farms, and the wildlife areas with high total dissolved solids, high sulfate and high nutrient concentrations characterizing the polluted areas. The main river channel is phosphorous limiting and has good water quality with a marked decrease in water quality in tributaries draining the farm regions and urban areas lacking municipal wastewater treatment plants or having industrial plants.