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CE 394K

GIS in Water Resources Term Project Proposal

Title: Multi-temporal remote sensing analysis of two salars in Northern Chile

Background/Motivation: Salar de Ascotán and Salar de Carcote are internally drained, evaporative basins located in the Atacama Desert, 200 km northeast of Antofogasta in Region II, Chile. The two salars are part of a regional groundwater system that recharges in the adjacent uplands to the east and terminates in the regional topographic low at Salar de Uyuni, Bolivia. This regional groundwater system is discharged locally as spring-fed perennial surface water that flows across the salar surface and either evaporates, or reinfiltrates, in lagoon-like environments. This perennial surface water supports diverse flora and fauna in the salar basins, including flamingo, vicuña, and the endemic fish species *Orestias ascotanensis*. Mining projects in the region began pumping the groundwater system in the Ascotán basin in the mid-1990's, leading to concern about the preservation of spring-fed surface flows. While hydrologic and ecologic monitoring efforts have been coordinated, data collection is limited to in-situ measurements and antecedent records precede extraction by approximately six months. Remote sensing can provide a means for large scale monitoring of the salars, as well as providing additional historical data to support environmental management of the systems. Key

Figure 1. Aerial image of Northern Chile, with Salar de Ascotán and Salar de Carcote inset (Source: Google Earth)

controls on the water balance in the basins include climatic and hydrologic conditions, human-induced changes to surface structures, water resource extraction, and artificial recharge efforts recently implemented to mitigate the effects of pumping.

Methods: I will perform a remote sensing analysis of surface water extent over time and integrate the remotely sensed observations with in situ data (precipitation, evaporation, pumping, etc.) for the two salars as an indicator for climatic and/or anthropogenic impacts. This term project will hopefully develop a methodology which can be applied to other salar systems in Chile and around the world. The results will be incorporated into a decision support system as part of my advisor's cyberinfrastructure project in Chile which will aid in education and optimization of resource management.

Data: Landsat MSS, TM, and ETM+ images spanning the time period of 1986-present from the USGS dataset: http://glovis.usgs.gov/

DEM for watershed analysis: GTOPO30 - 30 arc-second cell (1:1,000,000 scale) global DEM http://eros.usgs.gov/#/Find_Data/Products_and_Data_Available/GTOPO30

Hydrologic, meteorologic, and pumping data for Salar de Ascotan will be acquired from the El Abra Mine environmental management office, as well as from