Katie Markovich
10.24.11
CE 394K

Term Project Progress Report

My remote sensing term project is looking at surface water extent as an analog for change over time to the regional groundwater system of playa lakes in Northern Chile. My main methods include processing Landsat TM and ETM+ images from 1990-present with ERDAS Imagine, and then performing the spatial and temporal analysis in ESRI ArcMap 10.

I have acquired the Landsat images, and have begun the remote sensing work on all of them. The first question and/or challenge to this project is to see if I can sufficiently detect surface water presence on this highly reflective surface, and if so, which bands or band combinations are best suited for detection. Due to the absorption and reflectance properties of water, I have found that Band 4 provides the best contrast of the surface water to the salt crust surface, as water readily absorbs the wavelength domain and thus appears dark compared to the rest of the salar surface. The next challenge then is in classifying the surface water pixels in ArcMap. The distinction between moist salt crust, marsh, shallow stream, and lake is difficult to determine even at the field site (which I have been to this field site), and so I have tried several techniques to see which is best suited to quantify the spatial extent of water. These techniques include computing an NDVI, unsupervised classification, PCP analysis, and RGB Cluster. The jury is still out on which technique will provide the most reliable surface area estimate with minimal error.

Once I determine the best technique for estimating surface area, I will run the technique for each of my images and derive a linear regression to assess any trend over time. This trend can then be compared with the meteorological data which I have yet to acquire from the mining

company (El Abra) which monitors Salar de Ascotan. Climatic factors such as precipitation and evapotranspiration can have major impacts to the regional groundwater system over time, and so any increase or decrease in surface water presence may or may not correlate with the climatic data. I hope to also acquire pumping data for the salar system, as more pumping over time can also lead to changes to the spring-fed surface water on the salar. In terms of visualization for my presentation to the GIS in Water Resources class, I plan to construct a time-series of the salar satellite images using ArcMap.

The ultimate question I hope to answer with this term project is if remote sensing can be utilized for playa lake water resource management in this region of Northern Chile. This project is part of my undergraduate research thesis where I will also be adding a hydrogeochemistry component as a validation tool for the remote sensing analysis, as certain chemical parameters (Cl/Br ratios and Iodine isotopes) can provide insight to regional versus local systems as well as changes in evaporation rates over time. Depending on the time and data constraints, I might use the ArcHydro groundwater tools to display and analyze the data, but for now I hope to continue developing the remote sensing component of my project as it is the main research focus.