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Term Project Progress Report
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Basemap construction in the Eastern Cordillera, Colombia: glacial geomorphology, hydrogen isotope distribution, bathymetric mapping of Laguna Chingaza

My original project proposal consisted of several elements. The first stage consisted of digitization of topographic maps purchased at from the Colombian geographic survey, Instituto Geographico Agustin Codazzi (IGAC). These maps were shipped along with sediment core samples acquired in August 2011. I ran into several issues with the shipment of the cores that delayed their arrival until 2 weeks ago: contractual issues between UT-Austin and Ecopetrol (our source of funding), shipment approvals from the corporate office of Ecopetrol, and customs delays at the Miami port of entry. Initial preparation of the sediment core samples has taken precedence over the past two weeks to generate sufficient additional data for presentation at the 2011 AGU fall meeting. However, digitization of the maps has been completed (eg, Figure 1).

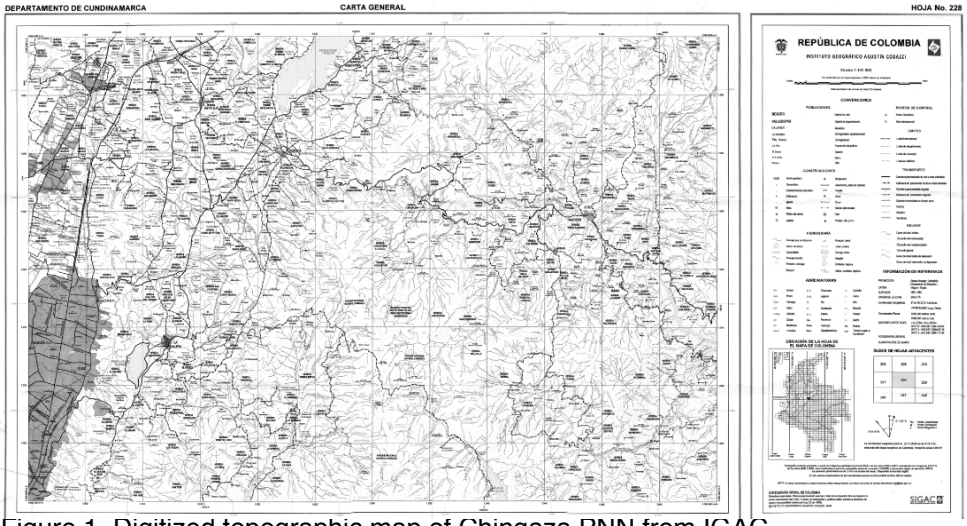

Figure 1. Digitized topographic map of Chingaza PNN from IGAC

Currently, I am working on georeferencing the topographic maps. These maps will be georeferenced to the Gauss-Krueger Colombia Transverse Mercator projection, the projection used on the scanned maps. Following georeferencing, I will pick contour lines to digitize the topographic data. After the topographic data is transferred to a vector data set, I will use it to create a raster DEM grid for each scanned map.

After DEMs have been created, I plan to georeference aerial photographs (with glacial ice extent margins included) to create shapefiles of glacial ice extent at 1850, 1955, 1978, and 1985. These shapefiles will provide a clear representation of the retreat of the tropical glaciers over the past 160 years. It will also be used in area calculations essential for glacier mass balance modeling which can be used to infer past temperature changes required for the given ice response.

Additionally, I recently received the GPS unit I used to log the bathymetry of Laguna Chingaza. I brought a Humminbird Fishfinder (with GPS and depth monitoring capability) to the field to automatically produce a high-resolution bathymetry map. However, the transducer on the unit was damaged during transit, and I was unable to use the depth monitoring function. Therefore, I had to use a handheld depthfinder to measure each depth point, then mark a waypoint on the GPS. I took over 325 datapoints over the lake on a kayak - over 7 hours of paddling and recording! I am currently sorting out some minor discrepancies between the recorded depth points and the GPS waypoints (some GPS waypoints may have not been stored). When that data is corrected and organized, I will have another vector dataset of depth readings and GPS points that I can use to create contours as well as a raster DEM of the bathymetry of Laguna Chingaza. This is especially useful to pick future coring sites in the lake and gain a general sense of the depositional dynamics of the basin. It can also indicate the morphology and nature of glacial scour in the basin. Additionally, I will use GPS tracks coupled with aerial photographs to map moraines in Chingaza PNN, up the valley from the lake. Finally, I plan to delineate the watershed of Laguna Chingaza from the DEM. I plan to use this watershed delineation coupled with moraine maps to gain an understanding of the dominant path of paleo-ice flow during the time when Chingaza PNN was glaciated.

I will be looking at soil temperature data from HOBO temperature loggers (courtesy of J. Saylor, post-doc at UT-Austin Jackson School of Geoscience) as well. I plan to use interpolation methods to map the distribution of soil temperatures throughout the Eastern Cordillera. I will create these layers as monthly averages throughout the collection period.

I am currently generating a water hydrogen isotope data set from streams across the Eastern Cordillera. Hydrogen isotopes in waters are relatively simple to analyze, and this dataset should be completed within the next 2 weeks. My plan for this dataset is similar to the temperature data: I will create a vector dataset with all the datapoints, and then use interpolation methods to analyze the spatial patterns in the hydrogen isotope ratios. The variability of the hydrogen isotope ratios with elevation is of particular interest because of its potential use as a modern calibration dataset for paleoaltimetry analysis in the region. This data will be essential for upcoming publications from our research group.

There is a possibility I may not gain access to soil type data for the watersheds of interest. The data from the IGAC is quite expensive, and I need to find a way to justify the purchase of the data using our tight grant money. Therefore, this data may not be obtained for this project.

In summary, my project has been a somewhat plagued early in its early stages by issues with shipment of samples and data. I am currently working on georeferencing of digitized topographic maps. Deliverables of this project will be: DEMs from Chingaza PNN, Sierra Nevada de Santa Marta, Sierra Nevada El Cocuy and Nevada del Huila, glacial extent mapping from Chingaza, Sierra Nevada, and El Cocuy, georeferencing of aerial photographs from various areas, and mapping the spatial patterns of soil temperature and hydrogen isotope ratios throughout the Eastern Cordillera.