Simplifying Access to Publicly Available Climate/Weather/Water Data Across Geopolitical Boundaries

Luis Alejandro Herrera Leon[1,2], Gabriel Lopez Morteo[1,2] and Francisco Munoz-Arriola[2]

[1] Instituto de Ingeniería, Universidad Autónoma de Baja California; [2] Department of Biological System Engineering, University of Nebraska-Lincoln

Introduction

- Local to federal weather/climate/water agencies in the US and Mexico aim to reduce vulnerability and build resilient infrastructure
- Data collected for multiple purposes create heterogeneous, discontinuous and variable records of climate measurements
- Effective data collection and transformation into information are needed

Our Research

Goals:

- To provide the user with an interactive tool for exploring climate data of a given set of data

Objectives:

- To identify to create a standardized mechanism to collect, store, and distribute data and information across geopolitical boundaries
- To develop a software platform that collects data sources in a repository and unifies the access mechanism

Expectations:

- To make data available in the format and structure requested through APIs and be an architecture that could host variable visualization/synthesis tools

Study Area

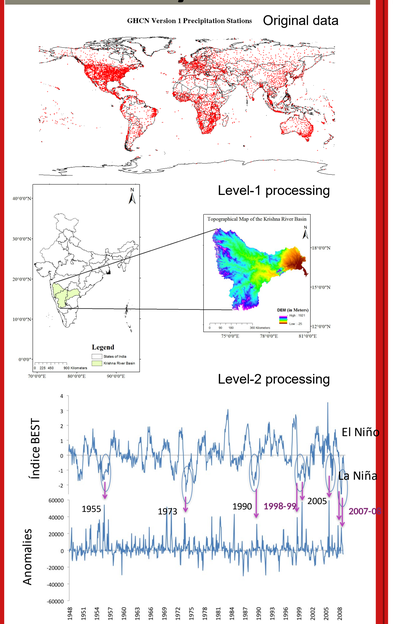
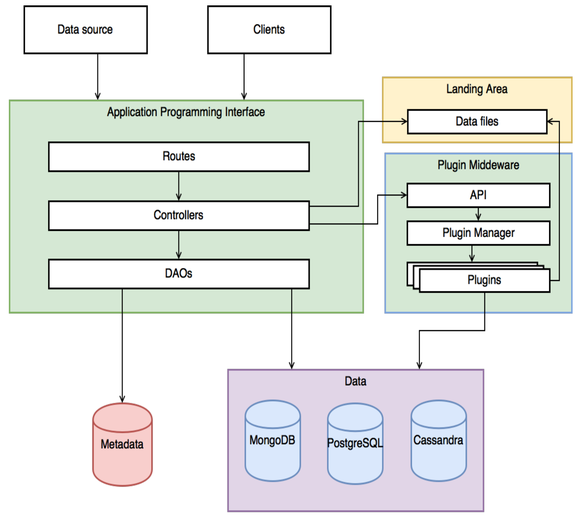


Figure 1. Processing levels from original data to climate information

Data and Methodology

- The data set selected is the Global Historical Climate Network (GHCN) from the National Oceanic and Atmospheric Administration.
- GHCN contains records from over 100,000 stations in 180 countries and territories. Some data are more than 175 years old while others are less than an hour old.
- We are interested in the stations on US, Canada Mexico, and India; North America constitute a total of 65,819 stations and India 6,000.
- In this study we only include stations from Mexico to develop a testbed with less number of stations, 277.
- We are proposing a plugin-based architecture (Figure 2) for a software platform that processes data and stores it in a databases management system (DBMS).
- We need to create software that provides the interactive aspect of the data, this aspect will allow the user to explore the data and analyze it.

Results/Discussion



- **Figure 2.** Platform Architecture Diagram. This platform uses a plugin-based architecture in order to easily add new data sources to the platform

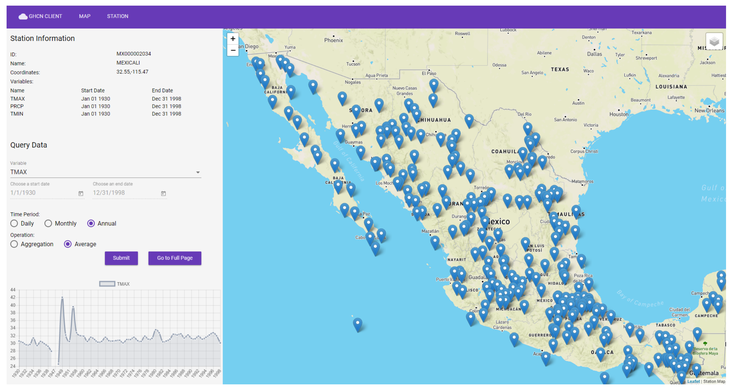


Figure 3. Stations map of Mexico where the user can explore the different stations stored.

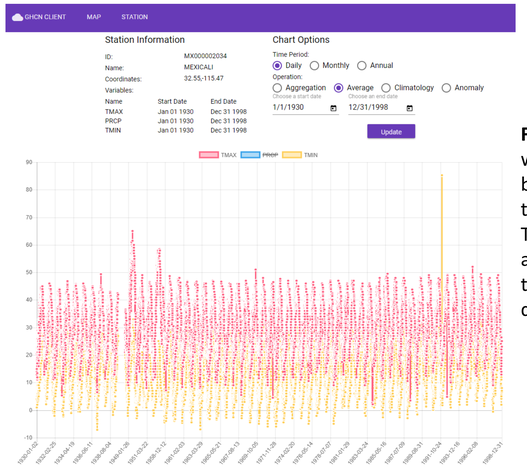
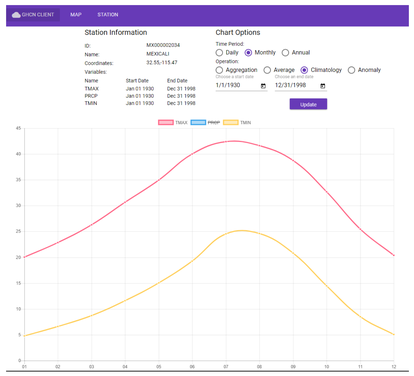
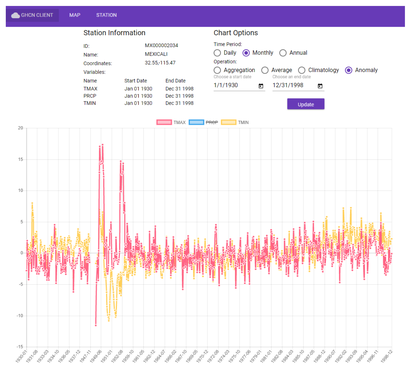


Figure 4. Data query section where the user can execute basic analytical operation on the data of a specific station. This graph shows the daily average for max and min temperature of all the station data.

Results/Discussion



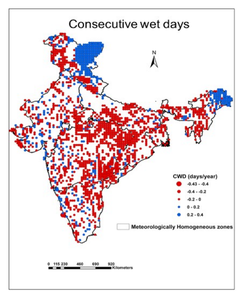
- **Figure 5.** This graph shows monthly climatology for max and min temperature of all station data, this data is from 1930 to 1998.



- **Figure 6.** This graph shows monthly anomaly for max and min temperature of all station data, from 1930 to 1998.

Conclusions and Future Work

- A web-client was developed to verify the effectiveness of an plugin-based architecture.
  - An unexpected weakness was found on map scaling and "re-adjusted"area data retrieval.
- This platform can be used in developing countries such as Mexico and India, which monitoring and software infrastructure are limited.
- In the future we plan to integrate new data sources (e.g. Mexican and Indian Meteorological Services) into an "unified" platform to access multiple data sets.
- Web functionality will enable a client-driven data retrievals (in multiple formats and different structures).
- Additional client-driven and web accessible tools will allow complex analytical operations, such as extreme climate indices derived from stored data



References

- Global Historical Climatology Network (GHCN). (n.d.). Retrieved September 26, 2017, from https://www.ncdc.noaa.gov/data-access/land-based-station-data/land-based-datasets/global-historical-climatology-network-ghcn.

Acknowledgements

The research work presented here is thanks in large part to the Consejo Nacional de Ciencia y Tecnología's "Becas Mixtas", the University of Nebraska Program of Excellence in Computational Sciences and Hydroinformatics and Integrated Hydrology Research Group. Second author thanks CONACYT for sabbatical-year founding with the project "Gestión de datos climáticos: divulgación de avances científicos y consolidación de tecnologías"