University of Saskatchewan

Visualization, Geometry & Algorithms Lab

Towards Collaborative Exploration of GWF Datasets

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INTRODUCTION

Predicting water futures and managing risk requires a need for a better understanding of the hydrological processes in a broader setting where people can come together and discuss to increase their awareness of sustainable water futures. We present our progress towards developing a collaborative platform that facilitates an intuitive and interactive exploration of large-scale geospatial data. The framework currently has two information-linked views and a global control for various user interactions. Users can filter variable ranges and see the relevant geospatial locations in real time. They can also select a rectangular geospatial location and see the behaviour of geospatial variables. The users can make notes on the map by adding their comments to specific geolocations and share those comments to the other users. We believe the system could provide an easier way for geographers to understand complex large-scale geographical dataset and work in a collaborate environment.

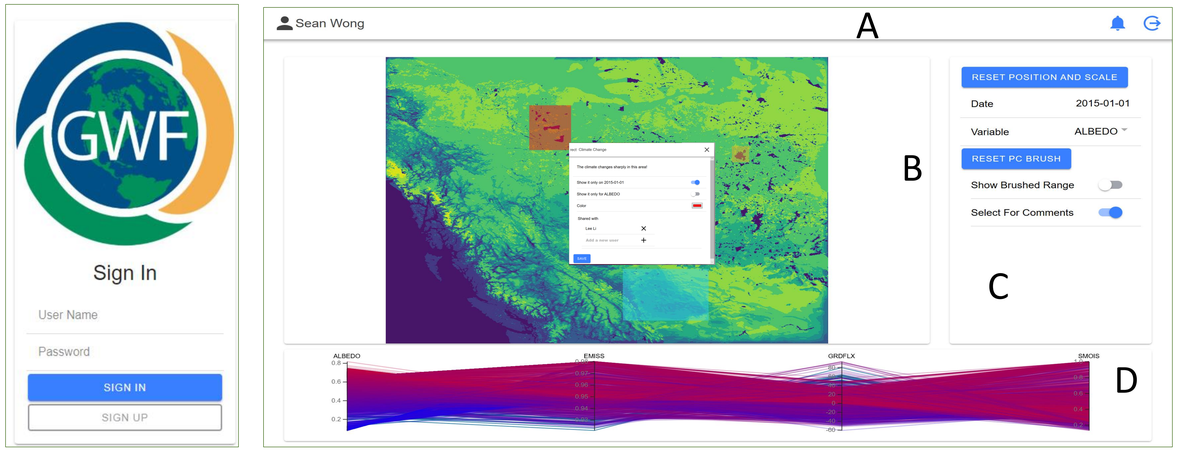
SYSTEM DESIGN

We used WRF model output dataset over western Canada. We first extracted four variables from the NetCDF files over one month. The large size of the data poses a problem for real-time interaction. Therefore, we choose to develop visualizations based on contour images. As a preprocessing step, we divided the image into grids and summarized the data of each cell using python scripts.

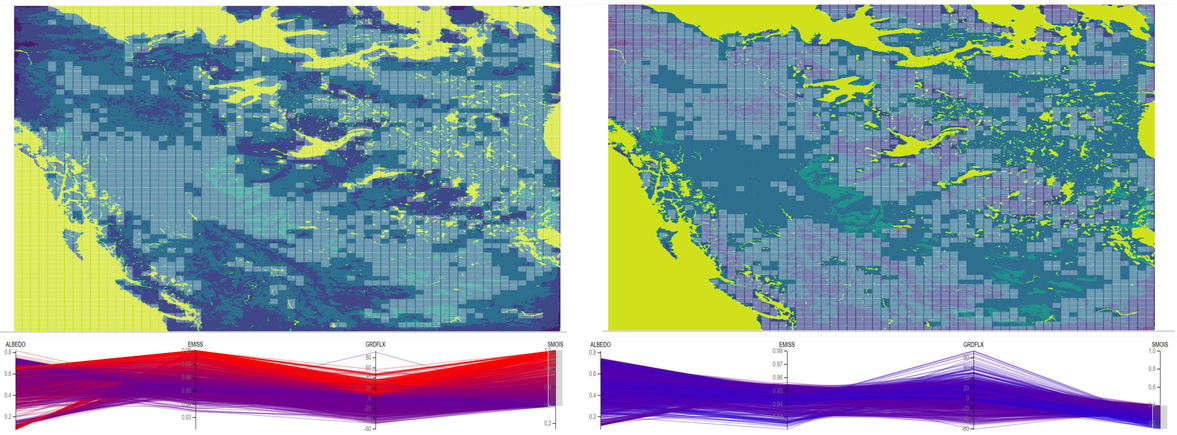
Our user interface is purely implemented for web-based collaboration, which can be used on multiple platforms that support a web browser. Since our system requires user logins, we use a MySQL database for storing user information and comments. An ASP.NET back-end is used as a bridge between the database and the web-based front-end. The back-end is also used to process some complex tasks that could be hard to process on a web browser. The following are the four main components of the system:

A. The top bar gives the login information and notification alerts.
B. The contour plot shows the magnitude of a specific variable, i.e., the one selected in the control panel.
C. The control panel lets users to choose whether to add a comment or analyze the data.
D. The parallel coordinates help visual correlation analysis, as well as allow users to select variable ranges and reveal the corresponding locations.

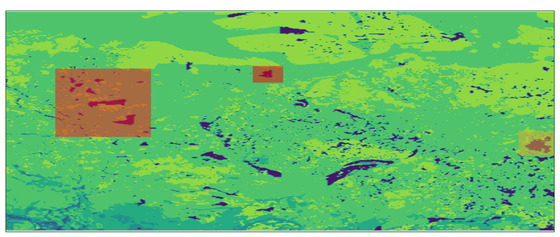
SYSTEM OVERVIEW



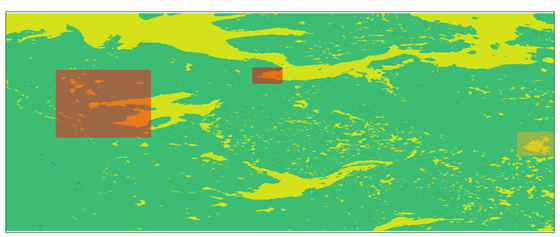
▲Fig 1: User Login, Contour Plots, Parallel Coordinates, and Control Panel



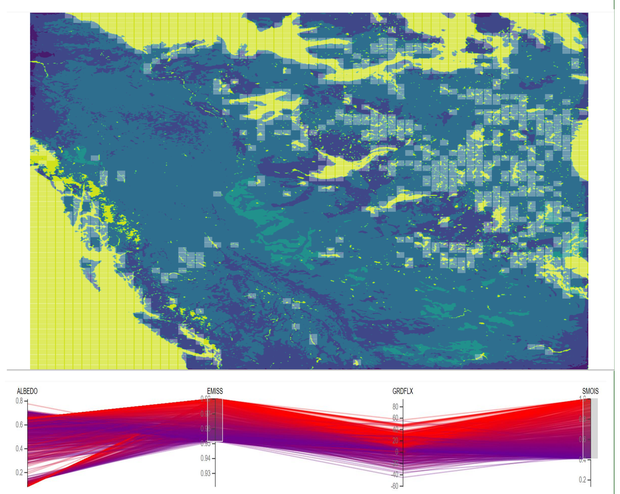
▲Fig 2: The change in the geospatial locations covered by different ranges of soil moisture (SMOIS)



▲Fig 2: Contour Plot for ALBEDO



▲Fig 3: Contour Plot for SMOIS



▲Fig 5: Selection of multiple variable ranges

USER INTERACTIONS

The main visualization is split into four parts: top bar, contour view, parallel coordinates view and control panel. Users can see their usernames and notification alerts on the top bar, which also contains a logout button for switching users. The contour view shows the pre-generated contour images for a specific date and variable that selected from the control panel. Users can create their comments by selecting a rectangular area and share it with other users.

The figures correspond to the month of January over western Canada. Each line in the parallel coordinates view represents the mean values of a unit cell (small geographic region) on a date picked from the control panel and the data could be filtered by brush the axis. The control panel lets users choose a date or a variable, reset the zoom level or brushes, etc.

The contour view is a zoomable view that shows a single variable based on its geographical location. Users can add and share their comments (shown as transparent rectangles) with a name, a description and a colour. When users brush on the parallel coordinates, the filtered range could be display back to the contour view (shown as little white rectangles in Fig. 2). Users can also select a rectangular area on the contour view and show only data from the selected area in the parallel coordinates (the white rectangle in Fig. 1).
The colour in the parallel coordinate is from blue (low) to red (high) for the selected variable in the control panel. Fig. 2 shows the changes when high and low values of soil moisture have been selected. Fig. 5 reveals that selection of high SMOIS and high EMISS covers most of the ocean and lake regions.

FUTRUE WORKS

We envision extending our system to a rich platform that would support messaging, chat, notification alert, and integration with the social media apps. We are also planning to integrate controls such that the users can perform statistical analysis on the datasets in real time.

REFERENCES

[1] Implementation of the project illustrated in this poster: https://github.com/SeanWong24/GWF
[2] parcoords-es (used for the parallel coordinates): https://github.com/BigFatDog/parcoords-es
[3] Ionic (used for the front-end UI components): https://github.com/ionic-team/ionic