Computations of Deformation from Current and Predicted Changes in the Distribution of Water

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Background

- Surface Loading
  - Water exerts a load or force on the Earth's surface
  - This loading contributes to the seasonal displacement of Earth's surface
- GRACE (2002-2017) and GRACE-FO (2018-)
  - These satellites measure the distance between one another, which shifts due to gravitational changes caused by the movement of water on Earth's surface

Objectives

- Creating a user-friendly and easily accessible database for surface displacements computed from the GRACE mission data
- Plotting current and predictive deformation data for multiple sites

Methods

- LoadDef
  - Computes North, East, and Vertical values based on PREM reference model
- tcsh script
  - Combines three files for each site into one
- MatLab
  - Created a script that takes input, creates tables, and transfers the tables to database
- MySQL
  - Open-source database management system

Results

- Database
  - 1,049 tables
  - Each table has 7 columns and 132 rows (924 values)
- Possible Queries
  - Selecting all data for one site
  - Selecting all data for one site at a specific time point
  - Selecting multiple columns of data from different tables

- Time series analysis helps researchers to understand the underlying causes of trends and systematic patterns over time
  - BITS - Denali Highway, Matanuska-Susitna, Alaska, USA
  - DEAD - Giant Rock Road, San Bernardino County, CA, USA

- Mapping of water displacement allows us to visualize where water is displacing and at what rate (Credits: NASA)

- This database provides a user-friendly and easily accessible platform for our group to accurately study and interpret these changes of the Earth
- Plotting time series data furthers our understanding of how and where water is displacing and guides us in predicting future displacements
- The goal is to use the data our group has collected to visualize water displacement across the entire planet over time and discover any trends or patterns

References