Understanding the Long-term Dynamics of Global Lake/Reservoir Storage and Evaporation using T/A/SNPP/JPSS Satellite Observations

PI: Huilin Gao (Texas A&M University)

Project Description

Product objective: to generate *a comprehensive, coherent, and long-term global lake/reservoir dataset* at improved spatial coverage by combining Terra/Aqua/Suomi NPP/JPSS-1 observations.

Science objective: to address important science questions related to the long-term lake/reservoir storage variations and evaporation trends; and to monitor flood & drought using lake/reservoir data.


2000-2022
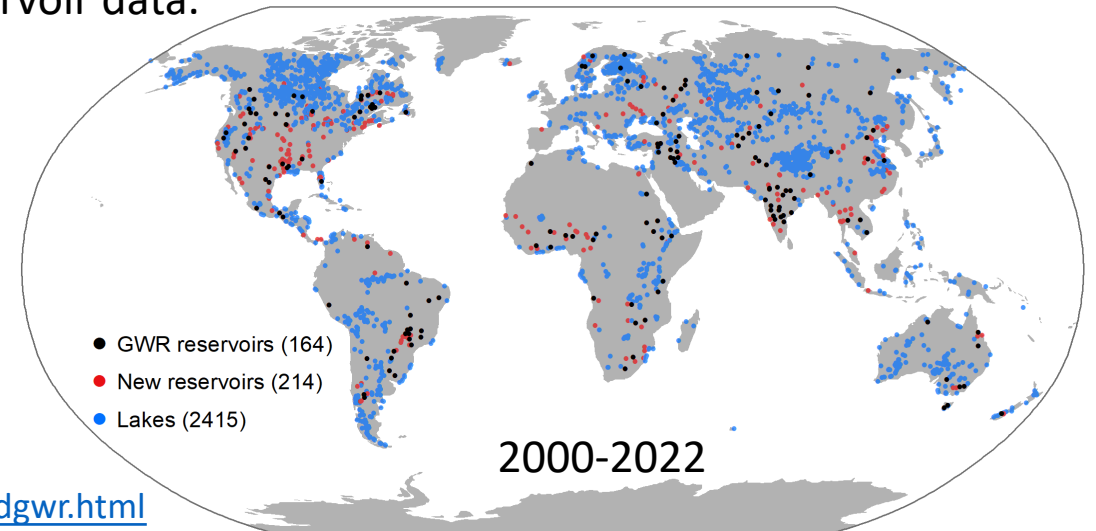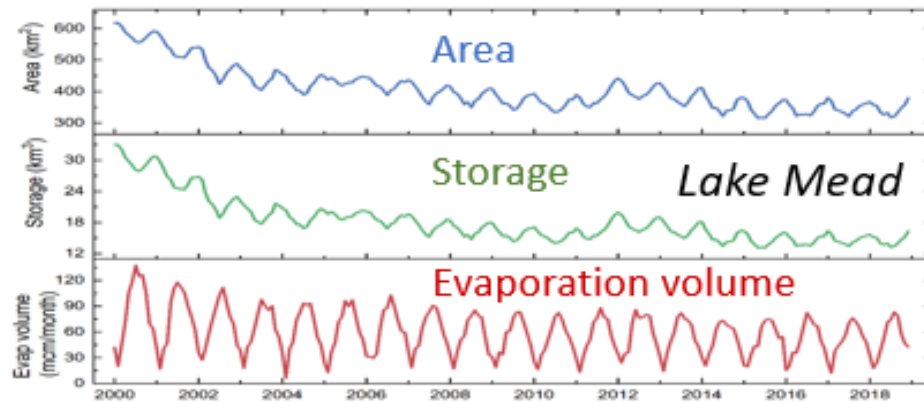
References: Global Water Reservoir (GWR) Product https://modis-land.gsfc.nasa.gov/modgwr.html
Algorithm Theoretical Basis Document (ATBD), Zhao et al., 2020, and Li et al., 2021.

The 2793 global lakes and reservoirs identified for this project.

Technical Challenges

▪ Some locations where the A-E relationships are not sufficiently robust may need to be excluded
▪ If large inconsistencies are found among the T/A/SNPP/JPSS MODIS/VIIRS based results, a plan for bias correcting the low quality results may be needed
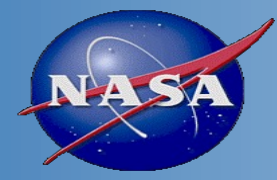
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Proposed Milestones

- **Establishing the Area-Elevation relationships** (year 1)
- **Developing the lake/reservoir dataset series** (year 1.5)
- **Validating the results & evaluating consistencies** (year 2)
- **Addressing critical science research questions**
  - Analyzing the long-term lake/reservoir storage dataset (year 2.5)
  - Analyzing the long-term lake/reservoir evaporation loss (year 2.5)
  - Assessing the impacts of climate extremes on lakes/reservoirs (year 3)
- **Decimating research results** (throughout the project period)

Deliverables

- **Data Products:**
  - The Area-Elevation relationships at the 2000+ lakes/reservoirs
  - 8-day area/elevation/storage time series at each location based on T/A/SNPP/JPSS MODIS/VIIRS data (2000-2022)
  - monthly area/elevation/storage/evaporation time series at each location based on T/A/SNPP/JPSS MODIS/VIIRS data (2000-2022)
  - Validation of results using in-situ observations and/or cross-validation of results using other satellite products
- *Generation and availability of products:*
  - To be generated on GEE and PI's cluster; to be made available at TX Data Repository and GEE (interactive data)
- **Conferences presentations and journal papers:**
  - Presentations at AGU, AMS, and science meetings
  - Manuscripts (from data product to analysis and applications) in peer-reviewed high-impact journals.