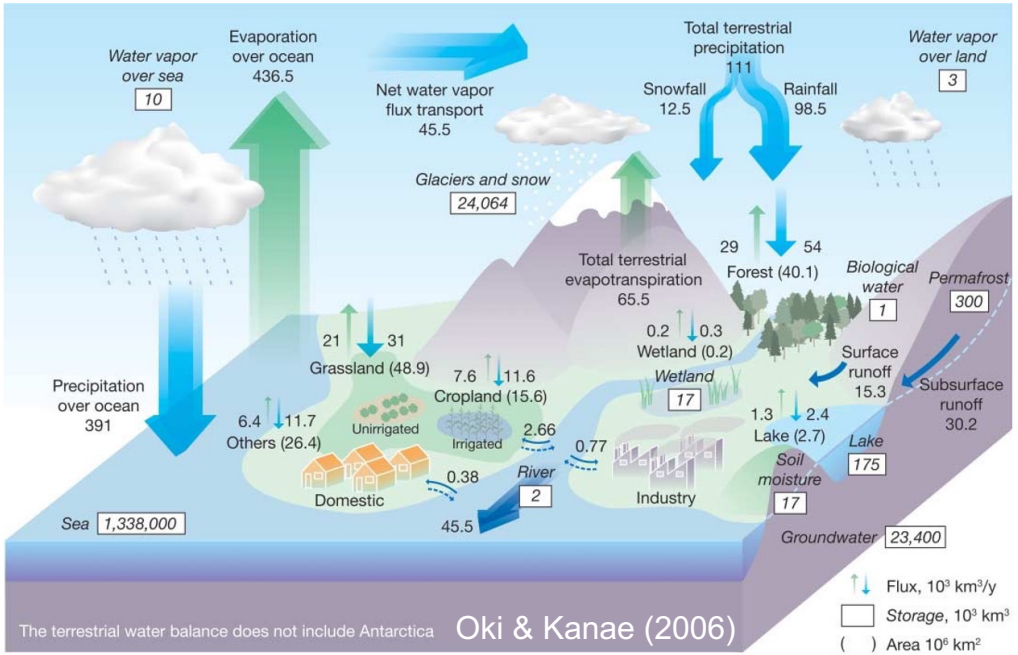
RPC 2020



Virtual Research Presentation Conference

A Golden Era for Hydrology from Space

Principal Investigator: Cédric H. David (329)
Co-Is: Andreas Colliander (329), Thomas G. Farr (329), Renato P. M. Frasson (329), Christine Lee (329), Noah P. Molotch (329), John T. Reager (329)
Program: Strategic Initiative

Assigned Presentation # 47

Jet Propulsion Laboratory
California Institute of Technology

Introduction

Abstract

The golden age for remote sensing of the terrestrial water cycle is here, with most components of the hydrological cycle being (or soon to be) observed by a variety of current NASA missions. This hydrologic data deluge presents challenges for 1) extracting the most value of available measurements through different techniques, including combination of the different datasets, as it does for 2) determining what potential future measurements would be most needed. Together these two challenges also represent an unprecedented opportunity to advance our understanding of water cycle, monitoring freshwater availability and water resources – one of JPL's strategic goals – by addressing the following a) how much water do we have?, b) how is water availability changing spatially and temporally?, c) are existing measurements sufficient or shall new space missions be designed for terrestrial hydrology?, d) what are the critical ways the water cycle links to other components of the Earth system?, and e) how can this knowledge be used to support water resources understanding and applied research? To maintain and accelerate JPL's contributions to the understanding the Earth's water cycles and water resources, additional workforce is needed in the Terrestrial Hydrology group, which is the primary focus of this Strategic R&TD.

Problem Description – A golden era for hydrology

Current and upcoming satellites

Observing most of the water cycle

Analysis
Interpretation
Synthesis

Transforming data into knowledge

- Action needed: regrow the terrestrial hydrology group
- Relevance to NASA and JPL:
  - Responds to “understanding our water cycle and monitoring our freshwater availability” in JPL 2018 Strategic Implementation plan: Earth Science and Applications Strategic Themes

Methodology

a) Surveying the terrestrial hydrology group → need for 2 scientists:

- Remote sensing of rivers
- Familiarity with image processing
- Support SWOT and NISAR

- Data assimilation
- Remote sensing of precipitation
- Rainfall runoff modeling

b) Addition of both professionals → solidify → JPL's leadership in remote sensing of hydrology

Results

a) Approach and Results

- 1st hiring: Renato Frasson started 01 Jun 2020.
- 2nd hiring: Offer acceptance revoked before start date.
- Reassessment of group's strengths → seeking approval to open new position.

b) Significance

- New effort has started focusing on analytical uncertainty quantification of SWOT's river discharge estimates
- New hire has finalized and submitted a manuscript exploring the controls on SWOT discharge uncertainty.
- Submission of an abstract to the American Geophysical Union Fall meeting on the application of SWOT discharge algorithms in complex rivers.

c) Next steps

- Advertise the new position, proceed with hiring process.

Publications and References

Frasson, R. P. d. M., Durand, M., Larnier, K., Gleason, C., Andreadis, K. M., Hagemann, M. W., et al.. Exploring the factors controlling the error characteristics of the Surface Water and Ocean Topography mission discharge estimates. Water Resources Research, Submitted.

Frasson, R. P. d. M., Durand, M., Dai, C., Wadkowski, K., Rodriguez, E., Lin, P., Yadav, B. (2020). Evaluating the applicability of SWOT discharge inversion algorithms in multichannel rivers using satellite imagery-derived timeseries of water surface height, slope, and river width. A.G.U. Fall Meeting, San Francisco, December 7-11, 2020.