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**GROUNDWATER RECHARGE AND FLOW:
APPROACHES AND CHALLENGES FOR MONITORING AND MODELING
USING REMOTELY SENSED DATA**

June 27-28, 2019

WORKSHOP AGENDA

Keck Center of the National Academies of Sciences, Engineering, and Medicine
500 Fifth St. NW, Washington, DC 20001

WEBCAST [*information to be added*]

Overarching Workshop Questions:

- What are the scientific and technological frontiers in monitoring and modeling regional groundwater recharge and flow in various regions of the globe?
- How can remotely sensed data be utilized in regions where in situ measurements, observations, and instrumentation may be particularly difficult?

Workshop Goals:

- Assess regional freshwater budgets under major use scenarios (e.g., agriculture, industry, municipal);
- Examine state of the art and research frontiers in characterizing groundwater aquifers, including residence time, quantity, flow, depletion, and recharge, using remotely sensed observations and proxy data;
- Discuss groundwater model uncertainties and methods for mitigating them using sparse ground observations or data and other approaches; and
- Consider our ability to detect which water management strategies (e.g., water reuse, irrigation efficiencies, desalination) that affect groundwater flow and recharge are being used and any changes in their use over time.

<p>Thursday, June 27, 2019 Keck Center Room 100</p>

8:00 AM *Please plan to meet in the hotel lobby at 8:00 AM to share taxis to the Keck Center*

8:30 AM *Breakfast available*

9:00 AM **Welcome, Purpose of the Workshop**
Elizabeth Eide, Water Science and Technology Board (WSTB) Director
Venkataraman (Venkat) Lakshmi, University of Virginia, Planning Committee Chair

9:20 AM **Reflections from the Workshop Sponsor**
Anthony (Tony) Nguy-Robertson, National Geospatial-Intelligence Agency (NGA)

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- 9:30 AM **Keynote Overview Talk**
Matthew Rodell, NASA Goddard Space Flight Center
- 10:15 AM **Keynote Overview Talk**
Holly Michael, University of Delaware
- 11:00 AM *Break*
- 11:20 AM **Panel 1: Regional Freshwater Budgets under Major Use Scenarios**
Moderated by Venkat Lakshmi, University of Virginia, Planning Committee Chair
- Upmanu Lall, Columbia University
 - Harihar Rajaram, Johns Hopkins University
 - Ryan Smith, Missouri University of Science and Technology
 - Mark Person, New Mexico Institute of Mining and Technology
- 12:05 PM *Working Lunch*
- 1:05 PM **Instructions for Breakouts**
Venkat Lakshmi, University of Virginia, Planning Committee Chair
- 1:15 PM Breakout Session 1
- 2:30 PM *Break*
- 2:40 PM Breakouts Report Back
- 3:10 PM **Panel 2: Research Frontiers in Characterizing Groundwater Aquifers**
Moderated by Cathleen Jones, Jet Propulsion Laboratory, Planning Committee Member
- InSAR: Estelle Chaussard, University of Oregon
 - GRACE: Isabella Velicogna, University of California, Irvine
 - SWOT: Edward Beighley, Northeastern University
 - Airborne electromagnetics: Burke Minsley, U.S. Geological Survey
 - Ground-based, in situ: Jim Butler, Kansas Geological Survey, University of Kansas
- 4:10 PM Breakout Session 2
- 5:20 PM *Break*
- 5:30 PM Breakouts Report Back
- 6:00 PM *Adjourn [Participants are encouraged to gather for continued discussion over dinner at Vapiano, 623 H Street N.W.]*

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Friday, June 28, 2019
Keck Center Room 100

- 8:00 AM *Please plan to meet in the hotel lobby at 8:00 AM to share taxis to the Keck Center*
- 8:30 AM *Breakfast available*
- 9:00 AM **Recap from Day 1**
Venkat Lakshmi, University of Virginia, Planning Committee Chair
- 9:15 AM **Panel 3: Mitigating Groundwater Model Uncertainties**
Moderated by Kamini Singha, Colorado School of Mines, Planning Committee Member
- Laura Condon, University of Arizona
 - John (JT) Reager, NASA Jet Propulsion Laboratory
 - Stacey Archfield, U.S. Geological Survey
- 10:00 AM Breakout Session 3
- 11:15 AM *Break*
- 11:30 AM Breakouts Report Back
- 12:00 PM *Working Lunch*
- 1:00 PM **Panel 4: Changes in Water Management Strategies over Time**
Moderated by Antarpreet (Antar) Jutla, University of Florida, Planning Committee Member
- Thanh (Helen) Nguyen, University of Illinois at Urbana-Champaign
 - Michael (Mike) Cosh, U.S. Department of Agriculture
 - Sankar Arumugam, North Carolina State University
- 1:45 PM Breakout Session 4
- 3:00 PM *Break*
- 3:10 PM Breakouts Report Back
- 3:40 PM **Closing Remarks and Key Messages**
Comments by Planning Committee Members
- 4:00 PM *Adjourn Workshop*