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Downscaling GRACE satellite data for climate variability analysis in the California's central valley

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The Central Valley aquifer is a vital economic and environmental resource for California and the United States, and supplies water for one of the most agriculturally productive regions in the world. Recent estimates of groundwater availability in California have indicated declines in groundwater levels that may pose a threat to sustainability this region. Climate variability poses an additional challenge to this region, altering groundwater recharge and influencing pumping practices. The Gravity Recovery and Climate Experiment (GRACE) provides total water storage (TWS) anomalies and understanding the effects of climate variability, such as the El Niño Southern Oscillation (ENSO), may improve GRACE-derived estimates of groundwater availability during periods of increased rain or droughts. To understand the effects of the ENSO oscillation on groundwater storage in the Central Valley, we first downscaled the GRACE data to the groundwater basin level using in-situ groundwater level data and a hydrological model provided by the California Department of Water Resources (DWR). Additionally, we assessed the effects of ENSO on GRACE-derived groundwater storage estimates, and groundwater elevations in the Central Valley aquifer using singular spectral analysis (SSA) and wavelet analysis. Results from SSA and wavelet analysis indicate variations in water availability similar to the 2–7 year ENSO periodicity. The incorporation of these new methods for estimating variations in groundwater storage in highly productive aquifers may improve water management techniques in California.

Biography

Amber Jean Kuss is currently the Assistant Center Lead for the NASA Ames DEVELOP Program, and has been with the program since summer of 2010. Ms. Kuss has been the team lead for a research project using GRACE satellite data for estimating changes in groundwater storage in the Central Valley aquifer. Ms. Kuss received her B.S. in Geology from the College of Charleston, and her M.Sc. in Geosciences from San Francisco State University. Ms. Kuss also has experience as Staff Geologist for Environmental Resources Management (ERM) and as a lecturer for Oceanography at San Francisco State University.

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The dysfunction and destruction of the tropical rainforest

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Destruction of the tropical rainforest is occurring rapidly. Some estimates suggest the annual loss to be an area equal in size to the state of West Virginia. In many tropical areas, 1 to 2% of the rainforest is cut or burned each year. This is equivalent to removal of 20 to 50 hectares each minute. The area of tropical rainforest in the Ivory Coast dropped 30% from 1956 to 1966. From 1980 to 1990, some 154 million hectares of forest land was cleared for other use. Studies now show that the area of degraded and fragmented tropical forest may be greater than the area deforested. This is extremely important in terms of loss of biodiversity. The pressure to cut these forests comes from several sources. The need for land for farming and ranching is the major reason for removal. Second is the demand for tropical wood for lumber. Between 10 and 15 million hectares of land are cleared of forest in the tropics each year for agriculture and pasture. Brazil and Indonesia account for about 45% of global rainforest depletion. In India between 1972 and 1982, about one-fourth of the forest was cleared. This research examines the links between deforestation of tropical forests, climate change, and exploitation of developing societies.

Biography

Dr. Rich Snow and Dr. Mary Snow each earned the B.S. in Geography (both summa cum laude) and the M.S. in Geoscience from Western Kentucky University prior to taking the PhD. in Physical Geography from Indiana State University in 1999. They teach meteorology, climatology, and climate change in the Department of Applied Aviation Sciences at Embry-Riddle Aeronautical University in Daytona Beach, Florida. The two have written numerous journal articles and are co-authors of *Climatology: An Atmospheric Science*, published by Prentice-Hall

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