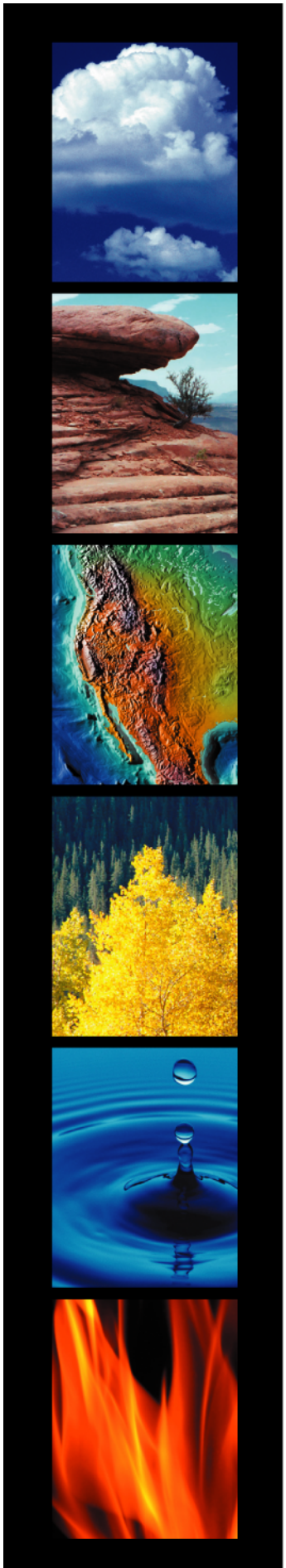

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Frontiers in Geoscience Colloquium

Monday, July 18, 2016
3:00pm – 4:00pm
Physics Auditorium (TA-3, Bldg 215)

2016 GSA Birdsall-Dreiss Distinguished Lecturer:

Groundwater Dynamics in Headwater Regions under a Changing Climate

Professor Shemin Ge

University of Colorado - Boulder

Groundwater systems receive significant recharge in high-altitude headwater regions. Seasonal and longer term variations in surface temperature and precipitation are expected under a changing climate, which could substantially impact groundwater recharge and subsequently groundwater storage and discharge to surface waters downstream. These headwater regions are hydrologically sensitive to surface temperature changes due to the presence of frozen grounds that freeze and thaw seasonally and degrading permafrost. The freeze and thaw processes lead to changes in subsurface hydrologic properties and dynamically impede or invigorate groundwater flow. A key question is how seasonal and long-term surface temperature variations impact recharge to groundwater and its interaction with surface water. This presentation addresses this question as it relates to groundwater flow in headwater regions. Coupled heat transfer and groundwater flow processes are modeled for two headwater catchments, one in the Colorado Rocky Mountains and the other on the Tibet Plateau. These studies illustrate that shallow groundwater flow in summer and early fall is most energetic as thawed ground promotes snowmelt infiltration, invigorating the exchange between groundwater and surface water. Under increasing temperature scenarios, groundwater discharge to surface may experience a several-fold increase in magnitude over the decadal scale. While projected warming leads to increased groundwater discharge to surface waters, in the long run, insufficient recharge upstream will make it challenge to sustain the discharge.

Host: Katrina Bennett, EES-16, 664-0698

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