GRAND JUNCTION GEOLOGICAL SOCIETY

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NOVEMBER MEETING

Joint meeting with the CMU geology students
November 18, 2015
7:30 PM
SACCOMANNO LECTURE HALL
(In the Wubben Science Building)

Lauren Foster, Ph.D. Candidate, Dept. of Geology and Geological Engineering. CO School of Mines
Will Speak On
"Energy Budget Changes Impact Arid Mountain Hydrology More Than Snow-Rain Transitions"

Abstract On Reverse

Guests Are Always Welcome

There Will Be The Election Of The 2016 Officers At This Meeting

Your 2016 Dues-$15.00- are due now. Make your check to the GJGS Foundation for a tax deduction. Bring to the meeting or mail to GJGS,
P O Box 4045, Grand Junction, CO 81502

Abstract:
Temperature increases such as those due to climate change will alter energy balance and atmospheric moisture content in snow-dominated mountain regions. These changes are likely to impact two main drivers of hydrology- snowfall and evapotranspiration- by reducing the fraction of precipitation falling as snow, as well as increasing land surface energy. Recent hydrological work has studied the impacts of these two drivers using statistical analysis of basins with different average precipitation and climate as proxies for moisture and energy changes, however, no studies to date have used modeling to explicitly separate energy budget changes from snow to rain transitions. Integrated hydrologic models that simulate lateral flow, water, energy, and interactions between the subsurface and land surface provide an opportunity to isolate these effects of climate change from natural interannual variability, the latter of which are difficult to tease out in field and statistical studies. Given that much of the world depends on mountain snowpack for their water supply, understanding hydrologic sensitivity to variability in phase of precipitation, temperature and runoff in complex terrain is imperative.

This study uses an integrated hydrologic model to study response to energy budget and precipitation phase changes due to warming in two representative mountain headwaters transects of the central Rocky Mountains in North America. A complete shift in precipitation from snow to rain had less than half the impact on streamflow (reductions between 5-10%) as 4 degrees of warming during the year (reductions between 23-27%), suggesting that the energy budget is a more dominant driver of total yearly streamflow, not the phase of precipitation. Phase changes demonstrated a strong impact on system memory, with complete phase shifts reducing memory to less than 1 week, thus altering expected storage and runoff patterns. This methodology and modeling framework can be applied in other areas at the watershed and regional scales to better delineate the impacts from different drivers of environmental change.