Changes in Snowmelt Streamflow Timing and Magnitude in Colorado

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Abstract. Peak flow rates and timing of peak flows from snowmelt are variable in time and space, and large changes in either are indicators of climate variability. This study investigated changes in streamflow timing and magnitude in Colorado using existing streamflow records. This was done by analyzing the mean daily streamflow data from 1967-2007 from 8 sites in the Colorado Rocky Mountains. Data were grouped into 10 year periods. For each 10 year period, discharge values were averaged and plotted as a single hydrograph. Hydrographs were compared by analyzing the peak flow timing and magnitude, as well as the general hydrograph shape, and distinctness of the peak flow value.

Streamflow data showed changes in both the timing and magnitude of flows. Hydrographs from Keystone Gulch, Lake Fork, Blue River and Eagle River showed that peak flows from the most recent time frame, 1997 – 2007, occur earlier than any time frame examined, ranging from 8 to 18 days earlier. The Blue River and Eagle River sites showed that peak mean daily discharge values from the most recent time frame are also the lowest peak flows on record, 29% lower on the Blue River and 34% lower on the Eagle River compared to the previous peak flows. These sites showed these changes with easily distinguishable hydrograph shapes. Similar trends were found in most of the other sites, but for some sites the hydrographs are less distinct with variations in the rising and recession limbs, and rather flat peaks.

Further studies concerning changes in timing and magnitude of streamflows in the Rocky Mountains should include investigation of long term flow data to determine natural variability of timing and magnitude. Better understanding or quantification of long-term natural variability may help explain the cause of the changes found here.