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Snowmelt controls on streamflow generation in Lake Tahoe watershed

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In future warming scenarios, decreasing ratios of snow to rain will have implications on streamflow generation in mountain areas. One hypothesis is that warmer winter temperatures will lead to a reduced snowpack and an earlier and slower melt, potentially decreasing streamflow. Variations in streamflow will control nearshore fate as snowmelt timing may determine lake inflow mixing and seasonal variation in nutrient fluxes. However, the mechanisms controlling streamflow generation in mountain areas are still elusive. In this work we explore how different snow-to-rainfall ratios influence streamflow generation in seven catchments around Lake Tahoe. Lake Tahoe is a deep (500 m), oligotrophic lake, positioned at the snowline (1900m) in the Sierra Nevada Mountains (CA/NV, USA) and renowned for its clarity (average annual Secchi depth greater than 20 m). As a long-term study site, extensive data have been collected since 1967 on both the basin hydrology and lake conditions. The total watershed area is 800 km2 and the catchments we analyzed range in size from 15 to 140 km2. Daily streamflow data was obtained through USGS and daily SWE data from SNOTEL as well as Sierra Nevada Snow Reanalysis Data. Our preliminary analysis indicates that there is a significant variation in the amount of streamflow for different SWE to precipitation ratios (SWE2P). Snowmelt is usually slower in warmer years and there is less streamflow in years with a smaller SWE2P. It seems that there is a threshold of 500 mm where total streamflow starts to increase proportionally to winter peak SWE, below that threshold total streamflow is not sensitive to the amount of snow in the catchment. There are differences in both the SWE2P and on streamflow signatures of the catchments on the east and west sides of the lake. For its unique location and dataset, we believe Lake Tahoe data provides a good opportunity for further studies on climatic and physiographic controls of snowmelt and streamflow generation in mountain areas.