Lacustrine chemical sediments of the Wilkins Peak Member, Eocene Green River Formation potentially preserve paleoclimate information relating to the conditions of their formation and preservation within the lake basin during the Early Eocene Climatic Optimum. The Green River Formation comprises the world's largest sodium-carbonate evaporite deposit in the form of trona ($Na_2CO_3 \cdot NaHCO_3 \cdot 2H_2O$) in the Bridger sub-basin and nahcolite ($NaHCO_3$) in the neighboring Piceance Creek basin. Modern analogues suggest that these minerals necessitate the existence of an alkaline source water. Detrital provenance geochronometers suggest that the most likely source for volcanic waters to the Greater Green River Basin is the Colorado Mineral Belt, connected to the basin via the Aspen paleo-river.

We tested the hypothesis that magmatic waters from the Colorado Mineral Belt could have supplied the Greater Green River Basin with the alkalinity needed to precipitate sodium-carbonate evaporites that are preserved in the Wilkins Peak Member by numerically simulating the evaporation of modern soda spring waters from northwestern Colorado at various temperature and atmospheric pCO_2 conditions. We compare the resulting simulated evaporite sequences of the modern soda spring waters to the mineralogy preserved within the Wilkins Peak Member. Simulated evaporation of Steamboat Springs water produces the closest match to core observations and mineralogy. These simulations provide constraints on the salinities at which various minerals precipitated in the Wilkins Peak Member as well as insights into the regional temperature (>15ºC for gaylussite and trona; >27º for pirssonite and trona) and pCO_2 conditions (<1200ppm for gaylussite and trona) during the EECO.