# Petrochemical Stratigraphy and Corrleation of Steens Basalt between Catlow Peak and Steens Mountain, Oregon

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## Abstract

Catlow Peak is located in southeastern Oregon, near the McDermitt caldera which is the first caldera to form along the Yellowstone hotspot track. The Catlow Peak section includes 421 m of Steens Basalt, which represents the oldest basalt unit of the Columbia River Basalt Group (CRBG). Most workers believe that the CRBG and the Yellowstone hotspot track are genetically related, with the former forming above the Yellowstone mantle plume head and the latter above its connecting plume tail. The most complete section of Steens Basalt was collected at Steens Mountain, ~77 km north of Catlow Peak. Here, I examine the chemical stratigraphy of Steens Basalt at Catlow Peak with the intent of determining if flow correlations can be made between Catlow Peak and Steens Mountain. Knowing these correlations will result in a further understanding of the processes that develop this major basaltic group.

Samples from Catlow Peak were collected by Nick Jarboe, a Ph.D. candidate at UC Santa Cruz, for a detailed paleomagnetic study. I have obtained his complete section of 70 samples, each of which I have analyzed for major and trace elements on the MagixPro XRF spectrometer at San Diego State Universtity. Here, I combine my data on rock chemistry with the paleomagnetic data of Jarboe for Catlow Peak, the paleomagnetic data of Mankinin et al. (1987) for Steens Mountain, and the geochemical data of Johnson et al. (1998) for Steens Mountain in an attempt to correlate flows or groups of flows between these two stratigraphic sections.

The Steens Basalt has been divided into two stratigraphic and chemical groups: Upper Steens and Lower Steens by Camp et.al (2003). The Lower Steens lavas typically have Ba contents < 290 ppm and $K_2O$ contents < 1.00 wt.%, with Upper Steens lavas typically being higher than these values. The Upper Steens shows more variability in Ba and $K_2O$ while the Lower Steens shows more homogeneity. The Catlow Peak lavas show more variability so it is assumed that the chemistry is somewhat similar to the Upper Steens section. This is consistent with the paleomagnetic stratigraphy in that the Catlow Peak lavas occur across a well-established paleomagnetic transition in Upper Steens basalt which is present in the upper third of the Steens Mountain section. However, there are slight differences in the chemical pattern of the Catlow peak lavas, indicating that they were derived from different eruptive centers than the lavas at Steens Mountain. Incompatible elements such as Nb and Zr were plotted together showing three visible trend lines: Upper Steens, Lower Steens, and Catlow Peak. The Steens trend lines appear to pass through the origin, which indicates trends of constant Zr/Nb ratio. The Catlow Peak trend line appears to have a slightly different origin. These trends with subtly different ratios indicate that the Steens section (upper and lower), and Catlow Peak lavas may have been derived from subtly but different mantle sources.