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Revising the stratigraphy at Mollies Nipple, Kane County, Utah, USA to better understand the origin of jarosite and alunite cements

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Mollies Nipple—a butte located in the Grand Staircase-Escalante National Monument (GSENM)—is of special interest because of the presence of unusual alunite and jarosite cements within the caprock. These minerals precipitate in hyperacidic environments (pH1-2) and are not stable over ~pH5; yet they are abundant on Mars where they are used to interpret depositional and diagenetic environments. The caprock at Mollies Nipple is historically interpreted as Navajo Sandstone via photogeologic mapping; however, it is ~200 m above the mapped upper extent of the Navajo Sandstone in this region. The units overlying the Navajo Sandstone have complex stratigraphic relations in this region and the caprock could be the Carmel or Temple Cap Formations, or the Page Sandstone. This study aims to characterize Mollies Nipple through measured sections, mineralogical analyses, palynomorph analysis, and radiometric age dates from ash lenses present in the caprock. The results will better define the stratigraphy of Mollies Nipple and determine the regional correlation of the caprock. Ultimately, this work will contribute to the understanding of how alunite and jarosite were precipitated at Mollies Nipple; why these minerals are still present at Mollies Nipple, and potentially revise the understanding of Martian depositional environments.