ABSTRACT

TITLE:	The Timing and Emplacement of the Heart Mountain Detachment at White Mountain and Silvergate, Wyoming: Detritial Zircon and Anisotropy of Magnetic Susceptibility Analysis
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ABSTRACT: The Eocene Heart Mountain detachment (HMD) is a rootless low angle normal fault that moved upper plate Paleozoic rocks up to 50km southeastward from the Absaroka Mountains into the western margin of the Bighorn Basin. The detachment is preserved over an area of 3400 km2 and occurred as a result of a lateral volcanic eruption similar to the eruption of Mount Saint Helens. Basal carbonate ultracataclasite (CUC) fault breccia marks the detachment plane of the HMD. At White Mountain, eight CUC dikes have been injected vertically (~120 m) from the bedding plane detachment CUC into the overlaying Mississippian Madison and Bighorn formations, and another CUC injectite is located at Silvergate closer to the break-away portion of the detachment. These injectites are evidence of forceful upward motion of fault gouge material during the emplacement of the HMD and are anomalous to all fault systems as they have a disproportional relationship between fault offset and cataclasite injection. At White Mountain the CUC is injected ~40 times farther into the hanging wall than would be expected for a normal fault with one episode of motion. To further understand the timing and emplacement of the HMD we analyzed the anisotropy of magnetic susceptibility (AMS) and the age of zircons within the CUC injectites. AMS analysis of the nine injectites show high variability in Kmax and Kmin values, suggesting a violent intrusion of fault gouge material. AMS samples were collected at the bottom, middle and top of CUC-4 and the resultant magnetic fabric changes from chaotic AMS orientations to orientations consistent with a vertical flow from bottom to top. At the top, Kmax values become more parallel to the injectite, suggesting a greater time and distance for the carrier mineral (magnetite) to align itself. LA-MC-ICPMS analysis of zircons from the CUC injectites and igneous dike intrusion at White Mountain provide similar ages of 48.8 0.9 Ma which are within error of ash deposit ages at Jim Mountain (49.8 1.1 Ma) and Hominy Peak (49.1 0.75). These corresponding ages mark the timing of the eruption that liberated the HMD upper plate Paleozoic rocks to 48.8 Ma. The data reported in this paper support the hypothesis of volcanic landslide induced, catastrophic emplacement of upper plate rocks as opposed to slow moving allochthon models.