Tracing the Missoula Outburst Floods: K/Ar age characterization of terrestrial flood layers

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Abstract

Proglacial lakes associated with large ice sheets can be important factors in climate change as natural dams can suddenly fail, sending large volumes of fresh water to the ocean. Such anomalous fresh water fluxes can impact buoyancy driven ocean circulation, and may have initiated climate changes such as the Younger Dryas [e.g., 1]. The Missoula Floods were catastrophic outburst floods that drained melt-water from the margins of the Cordilleran Ice Sheet at the end of the last glacial period (~19-13 ka). Striking geomorphologic features (known as the channeled scablands) in the northwestern US were first attributed to outburst floods by Harland Bretz [2]. Though his interpretation was initially dismissed by renowned Yale Quaternary Geologist Richard Foster Flint, Bretz was vindicated once air photographs revealed the scale of the morphology. Since it has become widely accepted that the channeled scablands are the result of massive floods from glacial Lake Missoula, researchers have attempted to constrain the timing, periodicity and magnitude of the floods using tephra layers [3], paleomagnetism [4] turbidite sequences [5], and marine sediment proxies [6,7,8]. Here we propose to determine the provenance of terrestrial back-water flood layers using K/Ar dating on the fine sediment fraction from four sampling locations, which represent proximal to distal depositional environments (Fig. 1).