Reconstruction of eruption dynamics and conduit evolution from granulometry, componentry, and accessory lithic clast morphology: the 2360 BP eruption of Mount Meager

Michelle E. Campbell[1], Lucy Porritt[2], Kelly Russell[1]

[1]University of British Columbia, Canada, [2]University of Bristol, United Kingdom

E-mail: michelle.e.campbell@gmail.com

The Mount Meager Volcanic Complex in SW British Columbia is the source of the most recent (2360 BP) explosive eruption in Canada. The initial subplinian phase of the eruption produced an extensive, unconsolidated, pumiceous pyroclastic fallout deposit that is mainly distributed NE of the vent. The fallout was deposited on terrain characterized by mountainous topography and steep-sided river channels, resulting in intricate complexities within the deposit. Unlike archetypical fall deposits, the 2360 BP fallout exhibits irregularities in the thickness of the deposit, thickening into the steep valleys and thinning over topographic highs, and is commonly capped by remobilized or resedimented pumiceous fallout material.

Here, we present detailed stratigraphy, granulometry and componentry data for the fallout deposits, which reveal notable cryptostratigraphic trends. In addition to the local variations in deposit thickness due to topography, detailed stratigraphy reveals additional complexity relating to the aerial location of the deposit and its source, either from the edge or core of the eruption plume. Granulometry results indicate a total of five distinct phases within the central zone of the fallout deposit (oriented ENE from the vent), while the margins of the fallout deposit feature no distinguishable variations in grain size. Componentry results show that within the juvenile material, the primary trend is a gradual increase in the abundance of gray and banded pumice, relative to the dominant white pumice, with increasing stratigraphic height. This indicates a change in magma properties as the eruption progressed. Particular attention was also paid to the accessory lithic componentry within these deposits. The most notable trend is a gradual increase in the abundance of monzogranite accessory lithics. The source of these monzogranite lithics is the Miocene Fall Creek Stock, the upper contact of which is located approximately 700 m below the vent. Thus, the increase in monzogranite lithics with increasing stratigraphic height suggests a deepening of the fragmentation front as the eruption progressed.

Morphological analyses of accessory lithics present in the fallout deposits were also performed. These analyses revealed notable correlations between lithic source depth and the overall degree of rounding, and between lithic size and the degree of rounding observed.

Detailed stratigraphic analysis and traditional granulometry and componentry data of the 2360 BP Mount Meager fallout deposits indicate fluctuating eruption conditions, expressed by a deepening of the fragmentation front and change in magma properties during the course of the eruption. A more turbulent or dynamic plume core resulted in increased complexities within the centre of the deposits compared to the margins. The results presented here promise to enhance our overall understanding of pyroclastic fallout deposits and how to interpret the information embedded within them.