Geophysical Research Abstracts
Vol. 12, EGU2010-5543, 2010
EGU General Assembly 2010

Stratigraphic relationships from two previously undescribed tuyas in northern British Columbia: Constraints on Quaternary paleo-ice distributions

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Stratigraphic features such as passage zones are indicative of changes in eruption environment and sometimes a change in the style of eruption, ie. explosive vs. effusive (Mathews, 1947; Smellie 2006). Here, we present preliminary volcanic stratigraphy for two tuyas located in northern B.C.; both tuyas feature at least two passage zones. Tanker tuya (i.e. Kawdy Mountain of Mathews 1947; 58° 52′ 48″ N, 131° 13′ 48″ W) is located on the Kawdy Plateau, which is a broad physiographic feature surrounded by lower topography. In contrast to Tanker tuya, Blue River tuya is located in the heavily glaciated and rugged Cassiar Mountains (59°19'12.98"N, 130°14'17.56"W). The passage zones at these tuyas can be used to determine the nature of the transition from suaqueous to subaerial. These observations and interpretations can then be used to track the development and dynamics of intraglacial lakes during the period of eruption, and can help constrain minimum ice thickness and fluctuations of the ice sheet; both useful paleoclimate proxies. Tanker Tuya has one of the most dramatically exposed double passage zones in North America. At least two passage zones are well exposed at the northern end of the edifice, where two basalt flow sequences are separated by a thick hyaloclastite unit. The hyaloclastite unit comprises dipping forest beds containing intact basalt pillows and laminated fine-grained deposits that are interpreted to have formed in a delta-fed glacial lake. Other volcanic features at Tanker tuya include accretionary lapilli and dikes that cross-cut the hyaloclastite unit. The sequence at Blue River tuya comprises a basal pillow basalt unit overlain by a crudely-layered lower hyaloclastite unit and a lower basalt flow sequence. This package is overlain by a second hyaloclastite unit which is capped by an upper lava flow sequence. Both the hyaloclastite and lava flow units are cross-cut by dikes. Additionally, laminated volcaniclastic sediments tentatively interpreted as deposits that formed within a glacial lake that existed during the course of eruptions responsible for tuya formation have been found within the stratigraphy. The potential paleoclimate proxy information present at Tanker and Blue River tuyas is useful because it: 1) provides minimum constraints on ice sheet thicknesses at the time of eruption; 2) provides contrasting information that may be related to different glacial environments (little basal topography vs. extensive basal topography) across a broad region of northern BC; and 3) provides local details of ice (e.g. syn-eruption lake formation similar to the 2004 Grimsvatn eruption at Blue River tuya) and climate (accretionary lapilli at Tanker tuya) conditions. This work is ongoing and will eventually include petrological, volcanological and geochronometric studies focused on helping to reconstruct the paleo-environmental conditions regulating fluctuations of the Cordilleran Ice Sheet in space and time.