The Bishop Tuff: a direct descendant of Glass Mountain rhyolite? Probably not

JUSTIN I. SIMON AND MARY R. REID

Dept of Earth and Space Sciences, UCLA, Los Angeles (jisimon@ucla.edu, reid@ess.ucla.edu)

The 0.76 Ma Bishop Tuff (BT) rhyolite of Long Valley, CA is used as the classic example for culmination of large long-lived silicic magma systems. Despite provocative evidence of protracted magma residence based on isotopic affinities between precaldera Glass Mountain (GM) and BT feldspars (Davies and Halliday, 1998), the BT contains little evidence for GM aged zircon when compared to those of young GM rhyolites ~0.90 Ma YG and ~0.79 Ma YA. New ion microprobe U-Pb isotope analyses of zircon from the Late BT (Ig2NW) yield a weighted mean age of 815±8 ka (MSWD=3.8; N=20) that is indistinguishable from the mean age determined by Reid and Coath (2000) for the Early BT (823±11 ka). The BT ages indicate an episode of zircon growth no more than ~150 ky prior to eruption. Similar analyses of zircon from YG and YA yield weighted mean ages of 1031±19 ka and 1009±21 ka, respectively, even though YA erupted only ~0.03 Ma before the BT. Furthermore, in contrast to BT zircon ages, the range in GM zircon ages indicate preeruptive zircon growth for > 300 ky for both GM rhyolites. Although ~30 % of all the zircon data from the BT and the GM rhyolites overlap in age a significant portion of the determined GM ages are not seen in the BT. The apparent lack of older zircon carry over from GM rhyolites to the BT coupled with the compositional discontinuity between the young GM rhyolites and the more evolved Early BT (Metz and Mahood, 1991; Davies and Halliday, 1998) indicate a largely independent episode of differentiation for the BT. The YG, YA, and BT data can be explained by: (1) fractionation of feldspar at ~1.15 and ~1.09 (2) protracted zircon crystallization from = 1.1 Ma to eruptionof the highly differentiated GM rhyolites (1.2 to 0.79 Ma), and (3) injection of magma into or through the mush zone incorporating GM aged feldspar to eventually produce the BT magma. The BT magma body either represents hybridization of residual magma/ mush related to GM magmatism or new melt generated less than ~150 ky prior to eruption. Regardless the compositional trends and ages exhibited by the BT and young GM rhyolites preclude a coherent long-lived evolving magma chamber as the source of the Bishop Tuff.

Significance of novel branched alkanes with quaternary carbon centers in black shales

D.-J.H. SIMONS[1], F. KENIG[1], D. CRICH[2] AND C.J. SCHRÖDER-ADAMS[3]

[1] University of Illinois at Chicago, Earth and Environmental Sciences, m/c 186, Chicago, Illinois 60607, USA (fkenig@uic.edu)

[2] University of Illinois at Chicago, Dept. of Chemistry, m/c 111, Chicago, Illinois 60607, USA (dcrich@uic.edu)

[3] Carleton University, Dept. of Earth Sciences, 1125 Colonel By Drive, Ottawa, Ontario, CA (csadams@ccs.carleton.ca)

The hydrocarbon fractions extracted from 9 thermally immature samples of the Cenomanian and Turonian sediments of the Pasquia Hill (Western Interior Seaway, Saskatchewan, Canada) contain abundant branched alkanes with quaternary carbon atoms (BAQCAs). These novel biomarkers were identified on the basis of unambiguous mass spectral data, retention time and the structure of one of the isomers (5,5-diethylpentadecane) was verified by synthesis of an authentic standard. These BAQCAs are dominated by 2,2-dimethylalkanes (2,2-DMAs) and 5,5-diethylalkanes (5,5-DEAs) which have exclusively even and odd numbers of carbon atoms, respectively. These samples also contain many other isomers of BAQCAs such as 7,7-diethylalkanes, 6,6-diethylalkanes, 5-ethyl-5-methylalkanes, 3-ethyl-3-methyl-alkanes, 5-butyl-5-ethylalkanes and 3,3,ω3,ω3-tetraethyl-alkanes. Kenig et al. (submitted) showed on the basis of paleobiogeographic distribution that 5,5-DEAs are derived from microaerophilic sulfide oxidizing bacteria.

The presence of the diaromatic carotenoid isorenieratane, derived from the brown strain of green sulfur bacteria *Chlorobiaceae* indicates that these sediments were deposited under a stratified water column with a euxinic (sulfidic and anoxic) bottom water mass (Schröder-Adams et al., 2001). However, the presence of microaerophilic sulfide oxidizing bacteria indicates that these periods of euxinia were interupted by periods of water column oxygenation (probably dysoxic) during which mats of microaerophilic sulfide oxidizing bacteria can establish themselves at the interface between anoxic-sediments and microaerated-water. These novel compounds will, thus, provide a tool for a more accurate reconstruction of palaeo-oxygen concentration in ancient environments.

References

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