
Structure of the Rambler Dome, Baie Verte Peninsula, Newfoundland: inversions using UBC-GIF GRAV3D and Mag3D

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The Rambler rhyolite dome is hosted within the Pacquet Harbour Group (PHG) on the Baie Verte Peninsula of north-central Newfoundland. The PHG is one of several ophiolite and island-arc-related volcanic packages within the Baie Verte Oceanic Tract of the Dunnage Zone. The lower PHG comprises a fragmented ophiolite including pillowed boninites and felsic volcanic rocks in the south, and the larger Rambler rhyolite to the north. The Rambler rhyolite is ca 487 Ma felsic dome of felsic tuffs, flows and subvolcanic felsic intrusive rocks. The upper footwall of the rhyolite dome hosts Cu ± Au volcanogenic massive sulphide deposits (e.g., Rambler and Ming mines). The upper PHG, and immediate hanging-wall to the ore deposits, is an ophiolite cover sequence consisting of a lower black chert, magnetite iron-formation and magnetic tuffs. These are overlain by a thick sequence of calc-alkaline basalts, volcanoclastic and epiclastic rocks, pillowed tholeiitic basalts and interbedded thin felsic volcanic rocks dated at ca. 470 Ma. Abundant tholeiitic gabbro sills and dykes, likely feeders to overlying flows, cut the Rambler rhyolite and VMS mineralization.

The PHG is affected by multiple phases of deformation, two of which are well-displayed in the Rambler area. The earliest

phase (D₂) is associated with south-directed thrusting of the Rambler rhyolite onto its cover along the Rambler Brook fault, and thrusting of lower ophiolite crust onto the upper PHG along the Scrape thrust to the north. As a result of this deformation, the Rambler rhyolite and VMS mineralization plunge roughly 35° to the northeast. Broad, northeast plunging upright cross folds (D₄) fold the Rambler rhyolite and its ore. The ore bodies lie in the hinge zone of an F₄ synform, whereas the Ming ore body lies in the hinge of an adjacent F₄ antiform; both ore bodies occur in the same, upper part of the rhyolite dome.

Geophysical inversions utilizing recently acquired high resolution gravity and magnetic data have been implemented to determine the extent of the dome at depth. Potential field data such as gravity and magnetics, however, are mired by an inherent non-uniqueness. The inclusion of a geophysical reference model incorporating all known geologic constraints can greatly improve the quality of inversion output. A physical property database from drill-holes and surface maps of the Rambler property has been produced for use in reference model development. Employing University of British Columbia Geophysical Inversion Facility software, constrained inversions have been carried out depicting the Rambler dome in 3D. The rhyolite is imaged dipping roughly 40° to the northeast as a series of voxels with density values ranging from 2.71–2.75 g/cm³. While current ore models parallel this structure in the near surface, results from these inversions suggest deeper exploration may be favourable. Magnetic inversion modeling does not provide any insight into dome morphology; however, it does serve to outline the distribution of gabbroic dykes surrounding the dome.