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Title: DISTRIBUTION AND ORIENTATION OF VEINS IN THE BINGHAM PORPHYRY CU-MO-AU DEPOSIT, UTAH

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Author 1 (CONTACT AUTHOR)
Name: Gillian Grün
Org: ETH Zurich
Country: Switzerland

Author 2
Name: Christoph Heinrich
Org: ETH Zurich
Country: Switzerland

Author 3
Name: Driesner Thomas
Org: ETH Zurich
Country: Switzerland

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Abstract: The Bingham Canyon ore deposit near Salt Lake City, Utah, is one of the largest, best exposed and most intensely studied porphyry Cu-Au-Mo deposits throughout the world. After its formation in late Eocene, the Bingham porphyry copper deposit has undergone a southeastward tilting by some 20 degrees.

The measurement of vein orientation and distribution in a porphyry-hosted ore deposit gives us information about the stress state, the flow pattern and the development of the fluids which formed the ore body. Surface mapping of vein orientation, vein type distribution and vein thicknesses throughout the Kennecott Bingham Canyon Copper Mine was combined with core logging predominantly along two profiles, vertical during formation of the porphyry. From oldest to youngest, the following three main vein types have been distinguished (Redmond et al., 2004): (1) stockwork veins, including barren quartz veins and mostly thin quartz-sulfide veins without any selvages, crosscutting and centered on the quartz monzonite porphyry which is spatially and temporally related to mineralization, (2) quartz-moly veins, with molybdenum clearly as the dominant sulfide, crosscutting also the later but still potassically altered latite porphyry dyke, and (3) quartz-sericite-pyrite veins, namely QSP veins, often with a strong pyrite centerline and diffuse sericite selvages overprinting all earlier alteration events, crosscutting all intrusive rock types.

Spatial analysis of the structural data at the mine scale revealed a three-dimensional geometric distribution of veins around the quartz monzonite porphyry stock. Vein density measurements laterally display a maximum around this northeast oriented intrusion containing the highest-grade Cu-Au ore, decreasing with radial distance from its center.

Once such a geometric model has been established, it will be used as input for a numerical process model to investigate the history of fluid flow in space and time (see abstract by Weis et al., this volume), incorporating structural data and vein distribution.

Redmond, P. B., Einaudi, M. T., Inan, E. E., Landtwing, M. R., Heinrich, C. A. (2004): Copper deposition by fluid cooling in intrusion-centered systems: New insights from the Bingham porphyry ore deposit, Utah. Geology 32 (3): 317-220.

Weis, P., Driesner, T., Coumou, D., Geiger, S., Heinrich, C. A. (2007): Numerical Modelling of Multiphase Fluid Flow in Ore-Forming Hydrothermal Systems. This volume.