# Structural and Fluid Characterization of the Shahumyan Polymetallic Epithermal Vein Deposit, Kapan District SE Armenia

**D Yarra[1], A Miskovic[1], C Hart[1]**

[1]Earth Ocean Atmospheric Sciences-Mineral Deposits Research Group (MDRU), University of British Columbia, Vancouver, British Columbia

The Kapan District is located in the Syunik province of SE Armenia. The district consists of multiple vein type deposits that have been dated to the Middle-Upper Jurassic. Shahumyan is the only actively-producing deposit within the district with an indicated and inferred resource of 15.87 Mt at 2.72 g/t Au, 48.5 g/t Ag, 0.5% Cu, 1.82% Zn and 0.1% Pb cut-off. The deposit provides a unique opportunity to study and characterize an extensive vein system similar in character to the world class Creede, Acupan or Morococha vein districts. Mineralization paragenesis within Shahumyan veins can be broken into two main economic stages, a base metal-rich (Cu, Zn ± Pb) and a precious metal-rich phase (Au, Ag, Zn, Cu, Pb). Currently, over 120 veins of varying thickness (20 cm to 3 m) have been recognized at the deposit. The vein geometry of mineralized veins is characterized by sub-vertical, south-dipping and E-W-trending domains that contrast N-S to NW-trending Central, Eastern and Western Shahumyan faults. The Shahumyan veins are anastomosing and comprise of small bends, extensional jogs, soft and hard linked step-overs, pinch and swell structures and cymoid loops. Kinematic analysis based on these features reveal a normal-dextral sense for vein propagation. These structural features are accompanied by increased metal grades relative to the rest of the vein. These features are observed along both strike and down-dip of individual veins. A detailed chronology of fluid-inclusion assemblages with respect to mineral stages was established. The resulting data indicate hydrothermal fluids temperatures between 270ºC and 150 ºC ($T_h$) and average fluid salinity of 4.8 wt% NaCl were responsible for the base metal stage. Fluids responsible for precious metal stage are characterized by higher salinities and relatively lower temperatures (up to 13.31 wt % NaCl; 150-130°C, $T_h$). Increased mixing and dilution of hydrothermal fluids with cooler fluids begins at 140 ℃ ($T_h$), and results in a correlated drop in salinity and temperature of hydrothermal fluids to 1.56 wt% NaCl and 120-70ºC ($T_h$) precipitating Stage 3 calcite, quartz and minor sulphides. Fluid inclusion assemblages indicate localized boiling to be the primary control during the precious metal phase, while simple cooling to be responsible for precipitating the base metal phase.