

Gas transport in waste rock piles, Diavik Diamond Mine, Northwest Territories

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The removal and storage of waste rock is often a problem encountered with open pit and underground mining. Waste rock is usually stacked in an unsaturated pile proximal to the mine site. If these piles are not properly maintained then air and water can freely react with the material, creating the potential for acid mine drainage. Gas transport in 15m high test-scale rock piles were measured in 2013 using an automated logging system at the Diavik Diamond Mine, Northwest Territories, Canada. Internal gas pressure and barometric measurements were recorded within the pile at 1 minute intervals. Wind speed and direction was recorded every 10 minutes and was manipulated into north-south and east-west wind vectors. Previous studies on non-covered rock piles at the mine showed a strong relationship between external wind speed and internal gas flux, concluding that wind driven advection is a major variable in controlling the rate of acid mine drainage. In contrast, this study examines a waste rock pile that consists of a low permeable till cover, which is designed to buffer temperature fluctuations and thus interior gas transport. Results reveal that the correlation between wind vector and internal gas transport is weak, suggesting that the wind does not affect this rock pile to the same degree as the previous non-covered piles. However, these correlations also suggest that seasonal differences may be an important factor in place of wind driven advection in the till covered pile as the relationship is stronger during certain months. The strength of this correlation is also proportional to depth within the pile. Results show no correlation between surface and internal pressure, which is further evidence that the till cover can successfully attenuate gas transport. The relationship between barometric and internal pressure is linear during certain months and nonexistent during other months. The strength of this correlation coincides with the same months as the trends seen in the wind vector relationships.