Network Analysis Applications: Exploring Geosphere and Biosphere Co-evolution with Big Data Techniques

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We employ data analysis to explore, visualize, and quantify complex, multi-dimensional systems. Recent mineral ecology studies[1,2] have applied network analysis[3] to mineralogical systems to characterize the diversity and distribution of Earth's near-surface minerals. Here we use network analysis visualization and statistical techniques to explore the relationships among minerals, geological and geochemical environments, and microbial communities.

Bipartite networks illustrate relationships between two parameters, such as localities and minerals or microbial communities. Each parameter can be represented with multiple characteristics, such as chemistry, age, or temperature by correspondence to node color, shape, or size. This flexibility allows us to display multi-dimensional data in ways that reveal previously unrecognized trends.

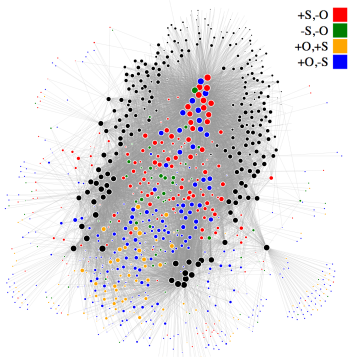

Figure: Bipartite Cu mineral network. Colored nodes = Cu mineral species; black nodes = Cu mineral localities.

[1] Morrison, S.M. et al. (2017) *Am Min, in review*; [2] Liu, C. et al. (2017) *Am Min, in review*; [3] Kolaczyk E. D. (2009) *Statistical Analysis of Network Data*. New York: Springer.