Spatial dynamics of bacterial community in response to acid mine drainage pollution gradients along the watershed of Dabaoshan Mining area (Southeast China)

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The Dabaoshan Mine is a multi-metallic mine located in southeast China. The acid mine drainage (AMD) produced from this mine area is characterized by a relatively low pH (<3.0), high concentrations of SO_4^{2-} (>2000 mg/L) and Fe^{3+} (>300 mg/L), and a number of heavy metals, which severely impacts on aquatic ecosystems and degrades the quality of surface water downstream. In this study, water, sediment and soil samples along the AMD-contaminated watershed were collected for geochemical, mineralogical and microbiological analyses. Results revealed a spatial gradient change of physico-chemical conditions and mineral composition along the watershed. High-throughput Illumina Miseq sequencing further showed that a wide array of microorganisms survived and thrived, and a shift in microbial community composition was linked to the spatial gradient of physico-chemical conditions. In particular, a number of Fe- and S-metabolizing bacteria related to Fe and S biogeochemical cycling were found, including FeOB (*Acidithiobacillus*, *Gallionella*, *Leptospirillum* and *Ferroplasma*), FeRB (e.g., *Acidiphilium*, *Geobacter* and *Geothrix*), SOB (*Acidithiobacillus*,*Thiomonas* and *Sulfolobus*), and SRB (*Clostridium* and *Desulfosporosinus*), Higher abundance of *acidobacteria* (33.5%) were also detected in the paddy soil along the AMD-affected watershed.