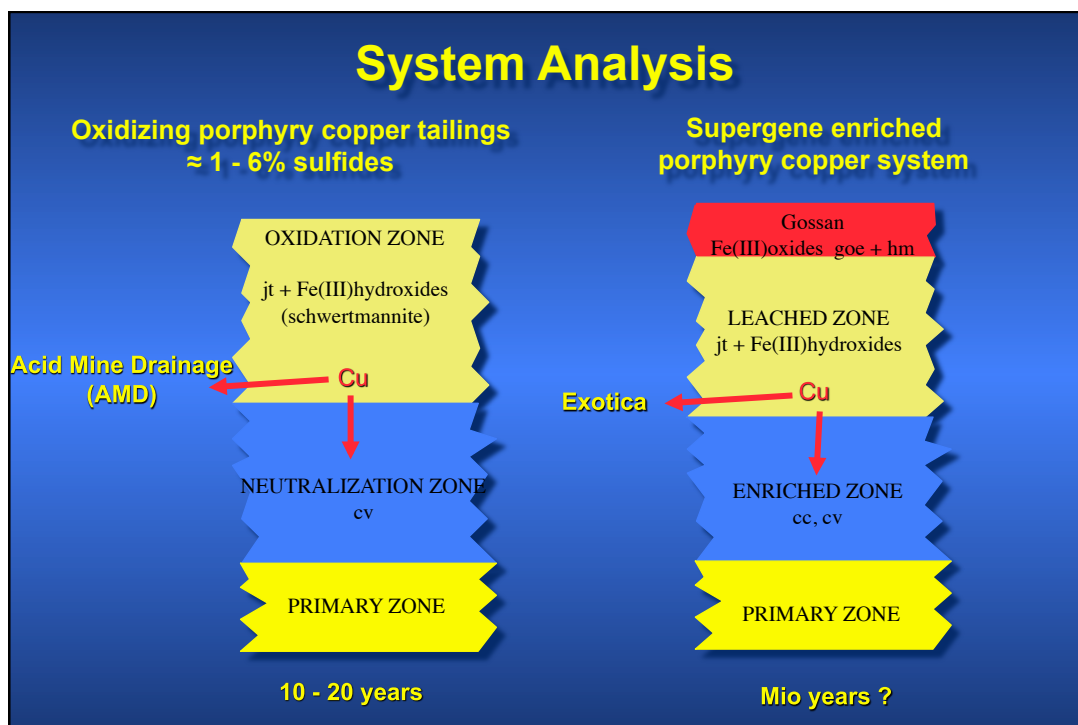
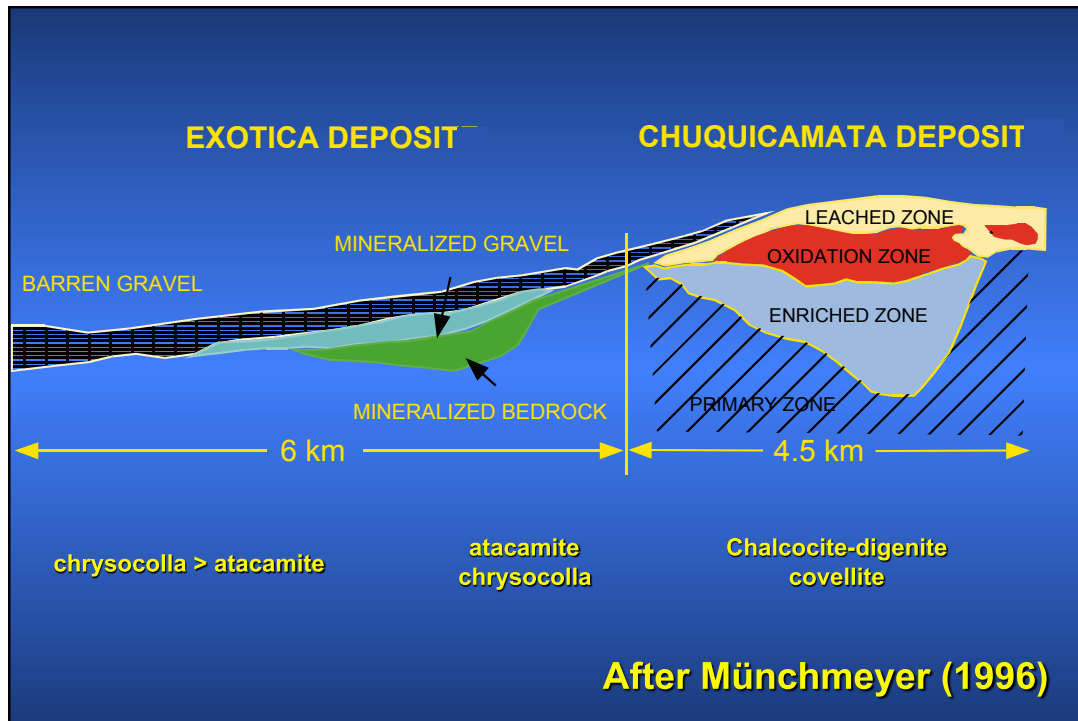


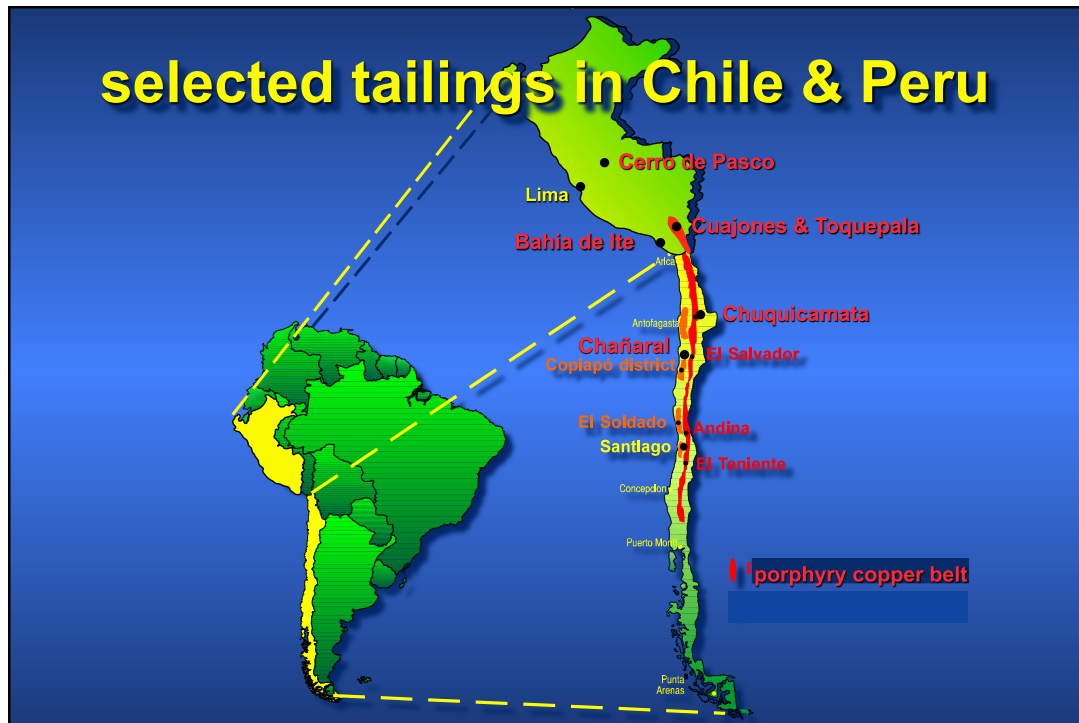


Geochemical Modeling of the Exotic Mineralization of the Exotica Deposit at Chuquicamata, Chile

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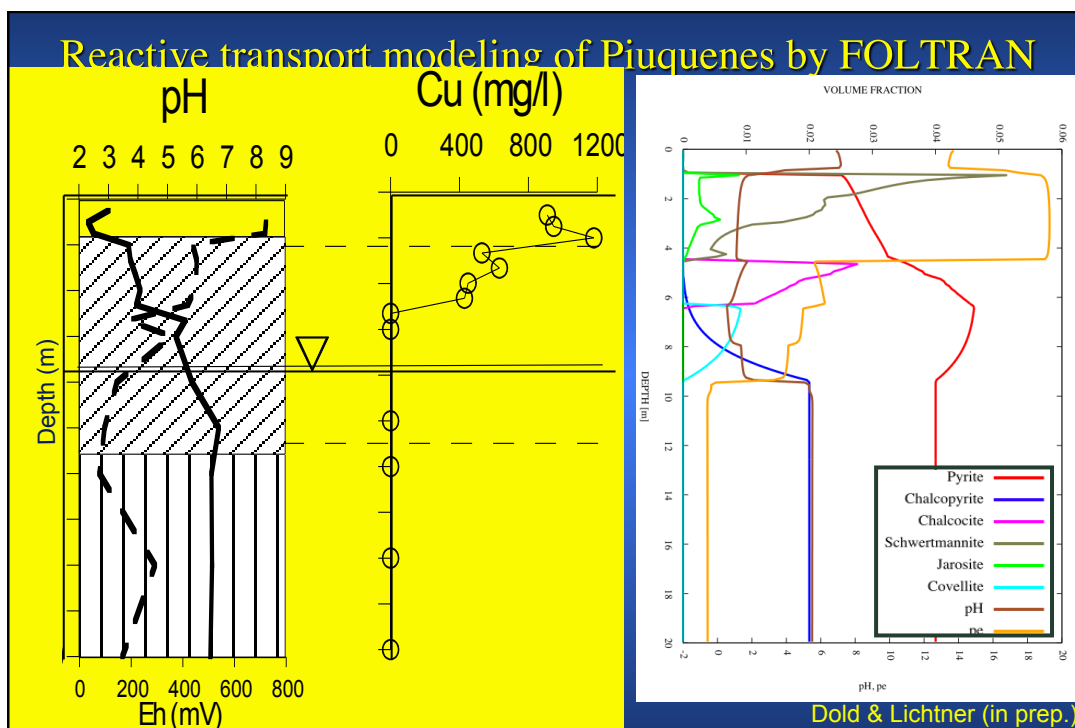


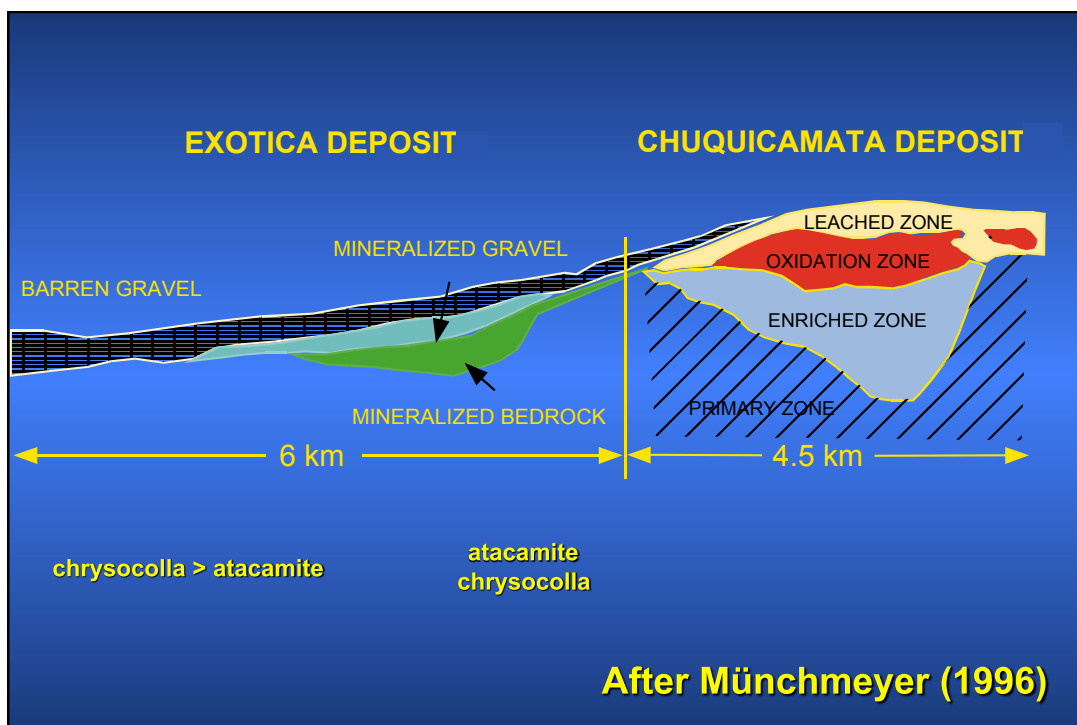
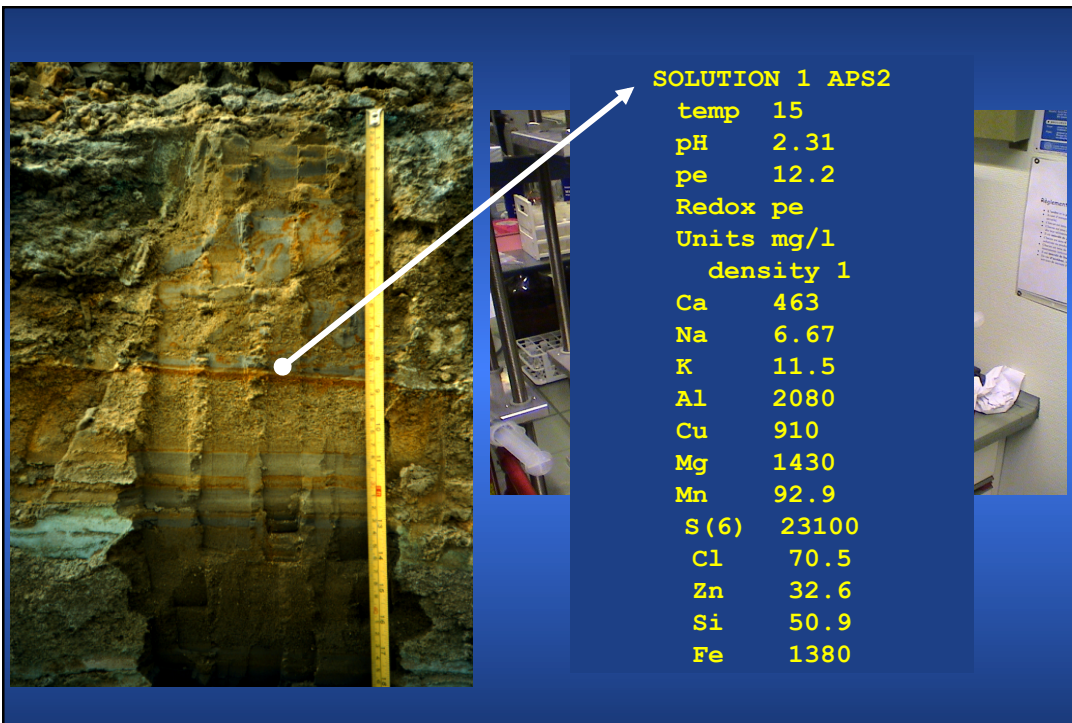


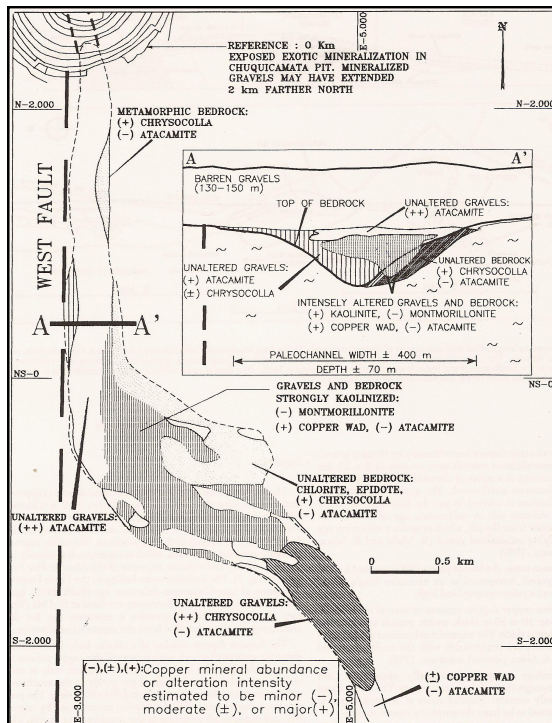
Piuquenes / Andina parameters:

- mineralogy: qz, py, cp, cc, cv, mb, sl, gn, ca, sid, ank, gy, bio, ab-K-feld, mt, hm, tour, ep
- ABA: pyrite eq. 1.7 wt.%, calcite eq. max. 3.8 wt.%
- climate: alpine (2150 m)
- operation time: 1970-1980, 83.7 ha surface
- flotation: alkaline circuit (pH 10.5)

Cu 0.22%

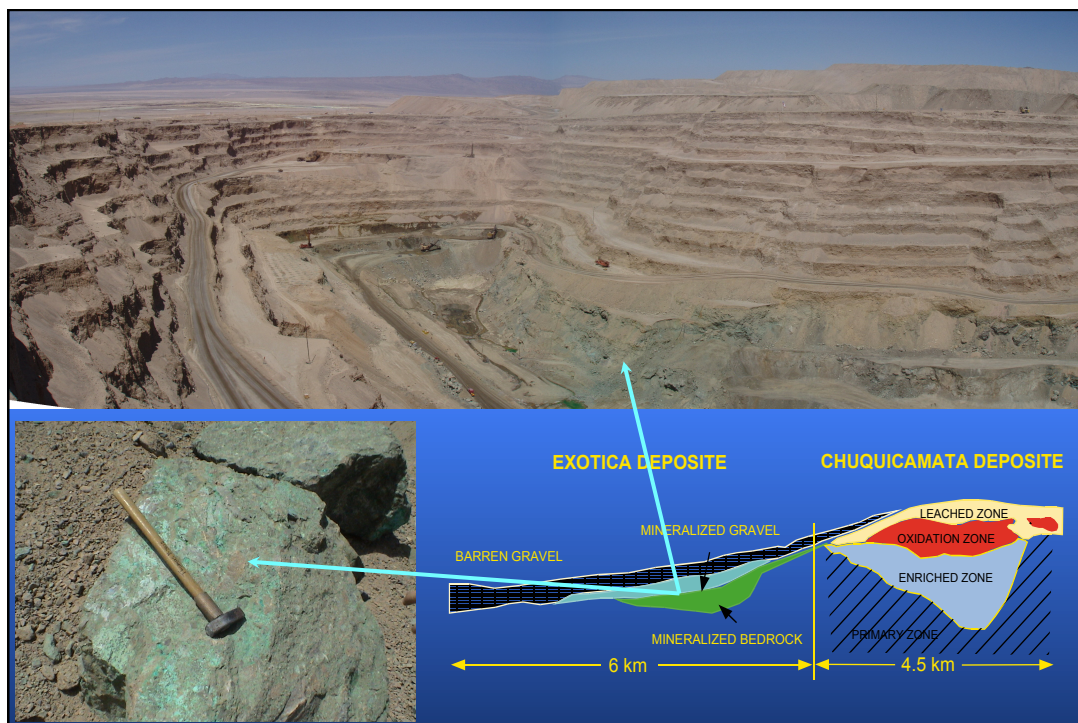


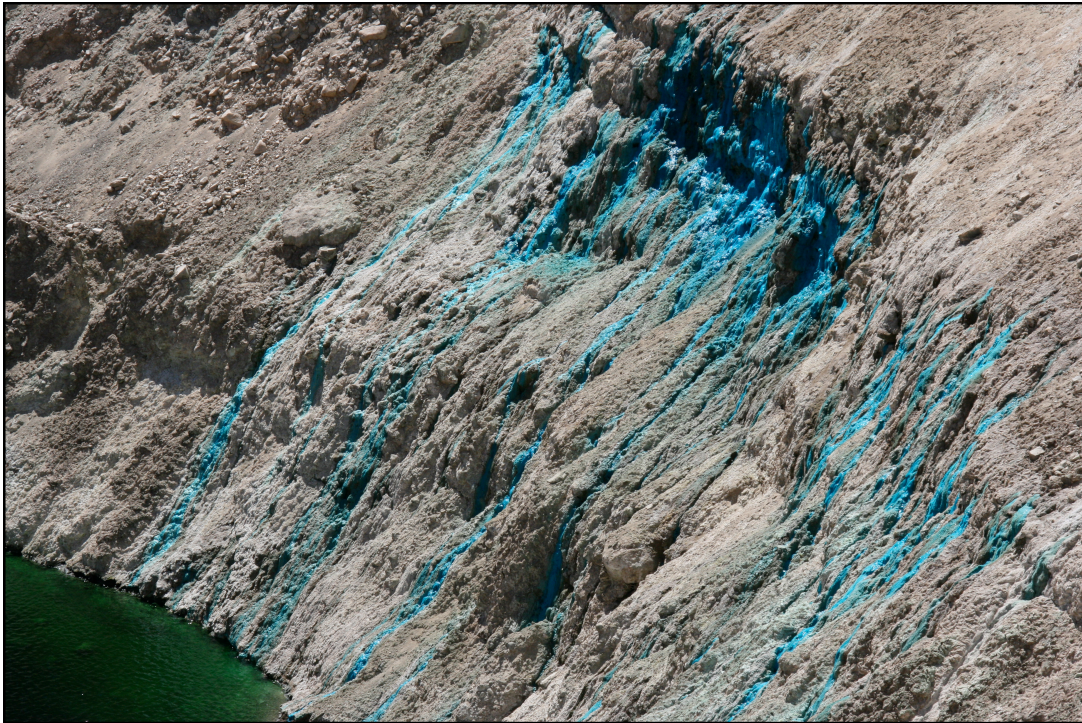


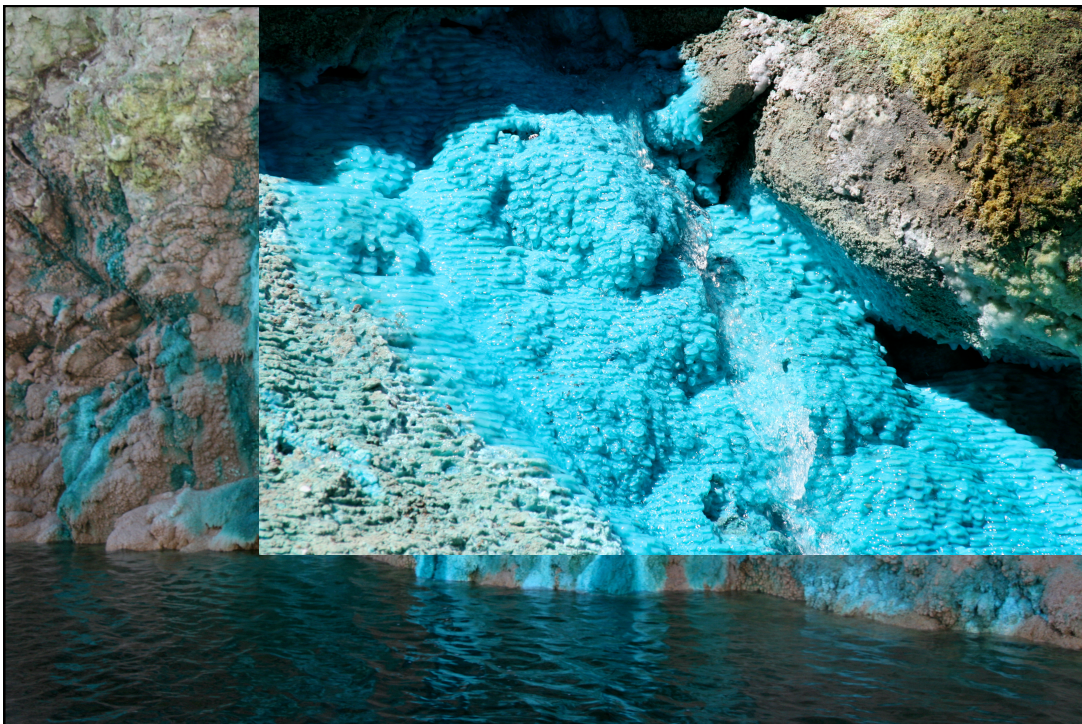


Exotica Chuquicamata

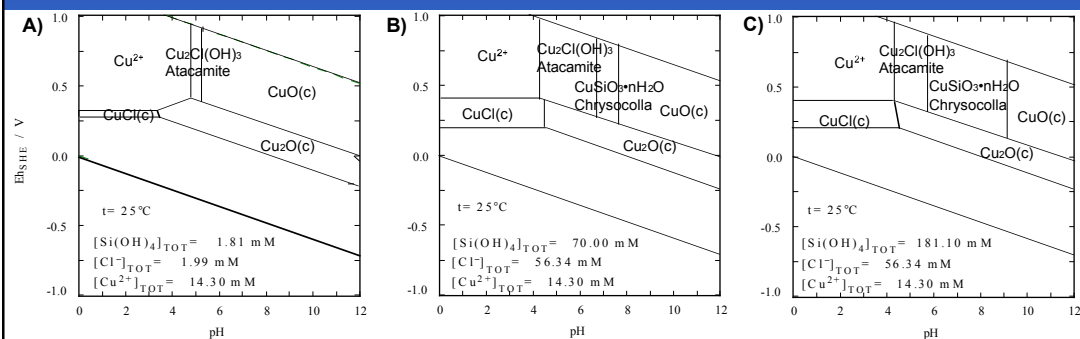
from Münchmeyer (1996)





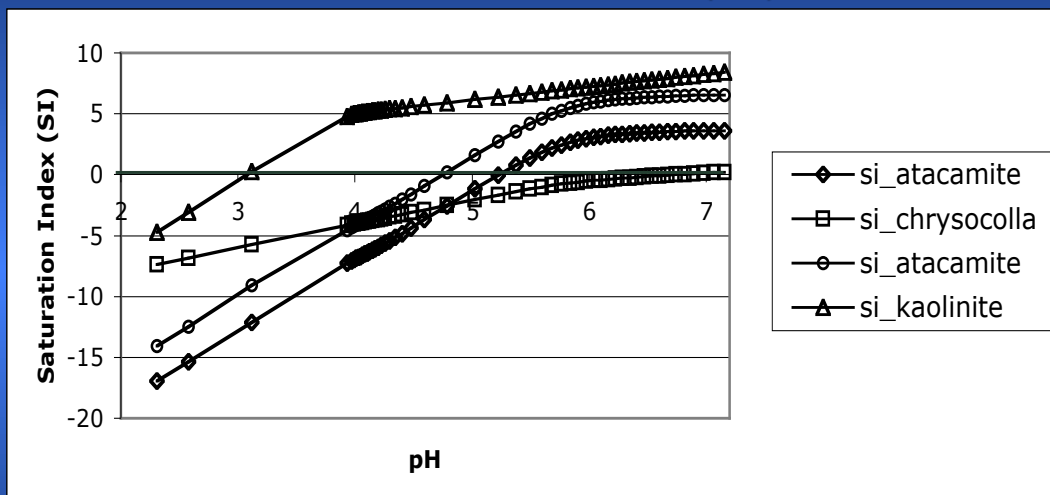


Eh-pH Diagrams



HYDRA & MEDUSA

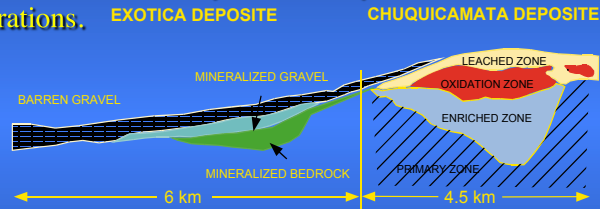
Saturation Index (SI)



PHREEQC titration of acid solution with 0.5 moles calcite
 -> geochemical speciation & saturation index

Conclusions

- The vertical mineral distribution in a oxidizing tailings profile can be modeled by reactive transport and corresponds to the mineralogy encountered in supegene enrichments in porphyry copper systems.
- The thickness of the enriched blanked is controlled by Cu mobility, which is controlled by pH-Eh and Cl concentrations.



- The exotic mineral paragenesis found at the Exotica deposit (kaolinite, atacamite, chrysocolla), could be modeled by the water-rock interaction process of acid rock drainage with the specific host-rock mineralogy. This results in a pH controlled precipitation sequence of kaolinite, atacamite, chrysocolla apparently controlled by the neutralization potential of the host-rock assemblage.
- The paleo solution, which formed Exotica were most likely acid rock drainage with increased Cl and Si concentrations.