

Arsenic occurrence and geochemical evolution of the abandoned ore mine Kaňk in the Czech Republic



- mining since 13th century (1/3 of European production of silver)
- probably the 1st mine in the world that reached the depth of 500 m
- gothic Prague was partly built for wealth of Kutná Hora silver mines



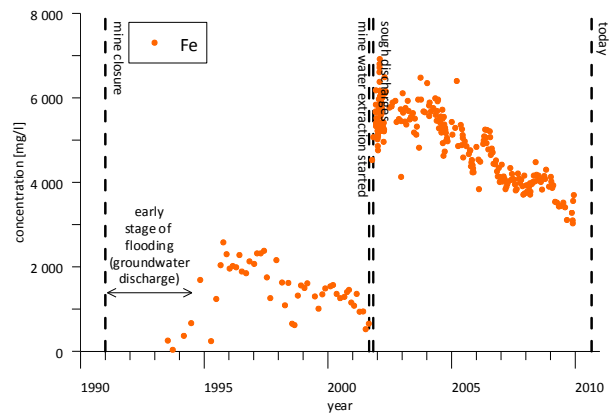
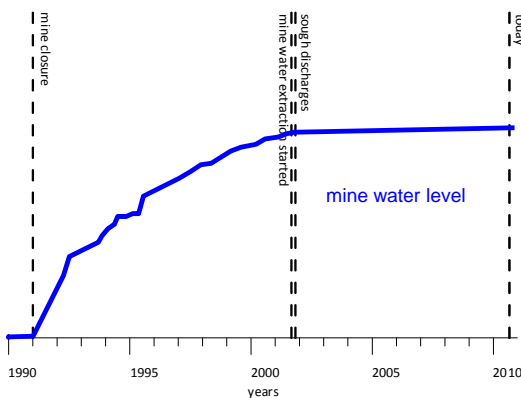
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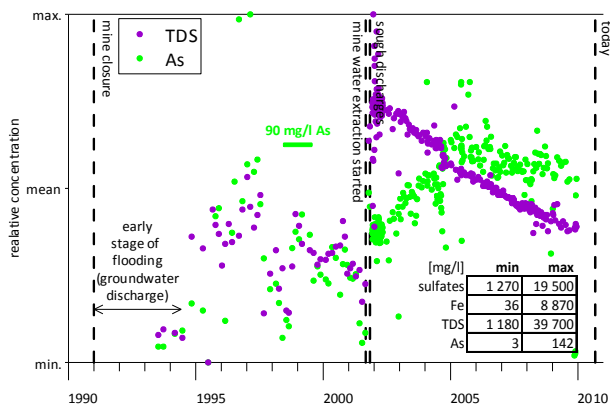
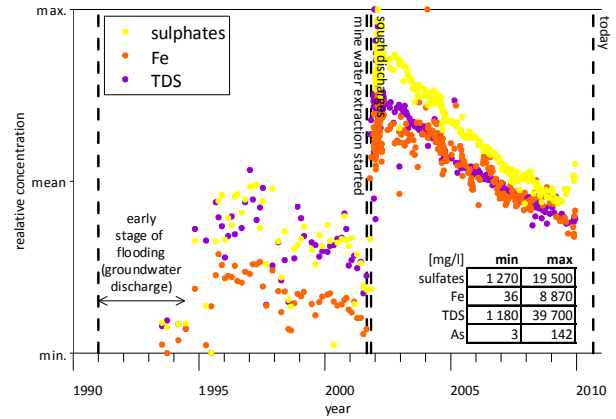
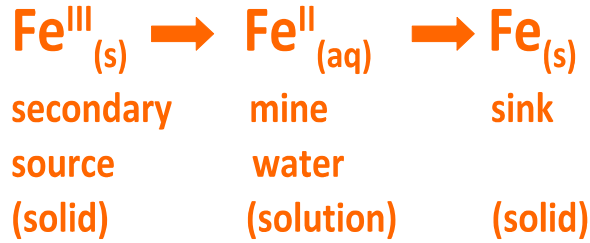


- 556 m deep
- crystalline rocks; cretaceous and quaternary sediments
- polymetallic mineralization
- arsenopyrite, As-pyrite
- mining: Ag; later Zn, Pb
- Kankite: $Fe^{3+}AsO_4 \cdot 3.5(H_2O)$

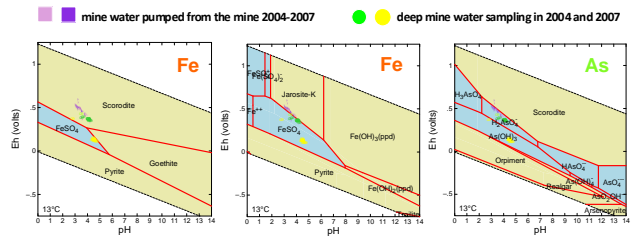


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Geochemical interpretation



Deep horizons:
 Fe controlled by Goethite (FeOOH)

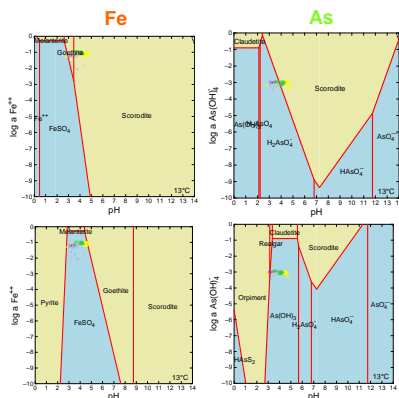
Shallow horizons:
 Fe controlled by Jarosite (KFe₃(SO₄)₂(OH)₆) and Scorodite

As controlled by Scorodite (FeAsO₄·2H₂O)

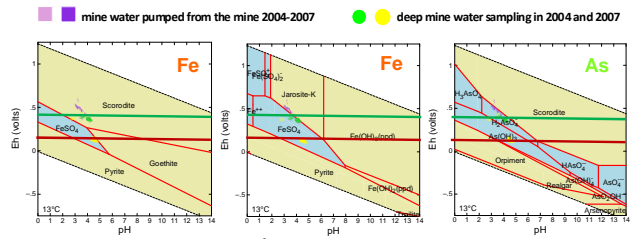
■ mine water pumped from the mine 2004-2007
 ● deep mine water sampling in 2004 and 2007

2004
 Eh = 450 mV

2007
 Eh = 150 mV




Geochemical interpretation



Deep horizons:
 Fe controlled by Goethite (FeOOH)


Shallow horizons:
 Fe controlled by Jarosite (KFe₃(SO₄)₂(OH)₆) and Scorodite

As controlled by Scorodite (FeAsO₄·2H₂O)



$As^V_{(s)} \rightarrow As^{III}_{(aq)} \rightarrow As_{(s)}$
 $Fe^{III}_{(s)} \rightarrow Fe^{II}_{(aq)} \rightarrow Fe_{(s)}$

| | | |
|--------------------------------|-----------------------------|-----------------|
| secondary source (solid) | mine water (solution) | sink (solid) |
|--------------------------------|-----------------------------|-----------------|



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Logging

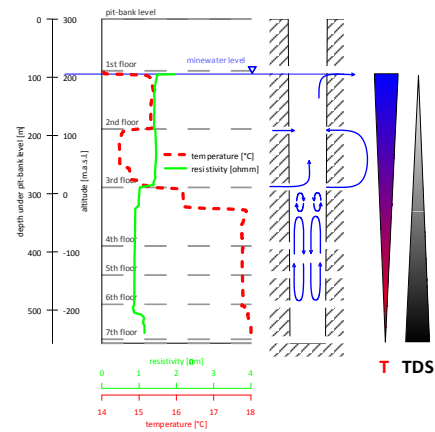
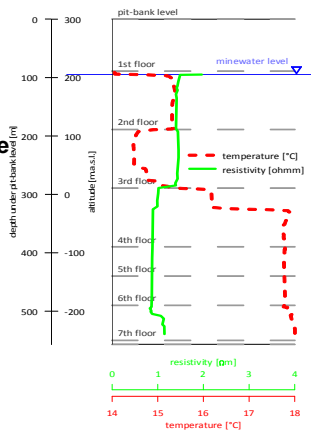
- temperature, resistivity
- TV inspection






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Resistivity and Temperature 2009



TDS



Stratification

- lower part:
density gradient
(geothermal gradient + concentration grad.)
- upper part:
advection

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