# THEME 4:
# THE EARTH'S SURFACE:
## Pollution, climate, anthropogenic effects

## Session 4.62:
## Contaminant Transport and the Water Cycle

CONVENED BY:

MARIO SCHIRMER (SCHIRMER@PRO.UFZ.DE)

RICHELLE ALLEN-KING (RICHELLE@GEOLOGY.BUFFALO.EDU)

GREG MALINA (G.MALINA@IS.PCZ.CZEST.PL)

PER AAGAARD (PER.AAGAARD@GEOLOGI.UIO.NO)

*INVITED SPEAKERS:*

*PETER GRATHWOHL (GRATHWOHL@UNI-TUEBINGEN.DE)*

*JAROSLOW KANIA (JKANIA@UCI.AGH.EDU.PL)*

*MARGOT ISENBECK SCHROETER (MISCHROE@UGC.UNI-HEIDELBERG.DE)*

Clean water plays a pivotal role in the ecosystem and the quality of human life. Tremendous effort, mostly in developed countries, has been directed toward reducing industrial effluent releases into lakes and rivers, optimising waste water treatment and producing safe drinking water. Still, pressure on water as a resource continues to rise. With growing population and accelerated urbanisation, water demand increases while good quality water at reasonable cost is limited in many parts of the world. This session will bring together fundamental and applied researchers who study the processes controlling contaminant fate and transport in the water cycle. We seek papers that: 1) describe catchment and regional contaminant mass balance in a variety of hydrologic contexts, e.g. urban watersheds, arid and semi-arid areas; 2) define and model contaminant sources, migration pathways and removal processes, including natural attenuation; 3) present analytical and toxicological methods for contaminant identification; 4) determine the behaviour of emerging pollutants; 5) show new approaches such as active and passive surface and groundwater sampling techniques.

## 4.62.11

# Contaminants transport through the drainage system of one active tailings impoundment

O.L. GASKOVA

Institute of Mineralogy and Petrography SB RAS, Novosibirsk, Russia (gaskova@uiggm.nsc.ru)

The Salair mine has been working since the 1930's, and at present exploits gold- and silver-bearing barite-polymetal-lic sulfide ore bodies. The drainage system of the tailings impoundment of ore enrichment by gravimetric-floatation is located in the vicinity of Salair town, Kemerovo region (West Siberia). Above 30 million tons of wastes are stored. The sulfide content is 2-3% there; pyrite is the main mineral. Besides quartz, feldspars, micas and carbonates (up to 15%) barite is abundant in the mineral composition.

The field sampling and chemical analysis were carried out in the sludge pond, settling wells and drainage streams (planned and emergency channels of Berezovy and Vodopadny accordingly). Both macro- and micro components of surface waters and the content of heavy metals (Zn, Pb, Cu, Cd, Fe) in suspended particles (>0.45μm) and bottom sediments have been determined by the standard methods of atomic absorption and x-ray fluorescence.

The contents of metals in the sludge pond water (pH=8) are 30 times more than the background content; Zn and Cd are 65 and 36 times more, correspondingly. At the first stage the suspended particles are most important for Fe and Cd transfer and least important in the transfer of Cu. The settling wells are situated on the northern slope of the safety dam. In settling wells pH goes down to 6.1-6.4. The reduction of red-ox environmental potential similar to all buried waters causes partial dissolution of iron (hydr)oxides and iron inevitably goes into solution as ferrous species and its concentration increases 167 times. Distribution coefficients clearly reflect the tendency of all metals release into solution. This contradicts the applicability of wells only for mechanical settling of suspended particles.

Small streams from sludge pond traverse material of the safety dam and flow into Talmovaya River. Vodopadny streambed is covered by thick red amorphous sediment and Berezovy streambed is gray and covered by tailing sands, which have been carried out as a result of the dam break. Relative coefficients of pollution ($lgK_{pollution} = [Me_{sample}]/[Me_{background}]$) have shown that the expected reduction of contents of toxic components does occur neither in a solution, nor in suspended particles on a way of movement: sludge pond – settling wells – drainage streams. Concentrations of Zn are more than two times higher than the maximum permissible concentrations for drinking water along the streams flow; Cd concentrations are approximately two times higher than MPC at the estuary of Berezovy stream.

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