

Revised version of [Kampai project joint meeting \(March 1, 2017\) ppt](#)

Lead content and isotope measurements in groundwater samples around mine tailing area in Kabwe

A SUB-GROUP OF GROUP 3 (GSES, Hokkaido Univ.)

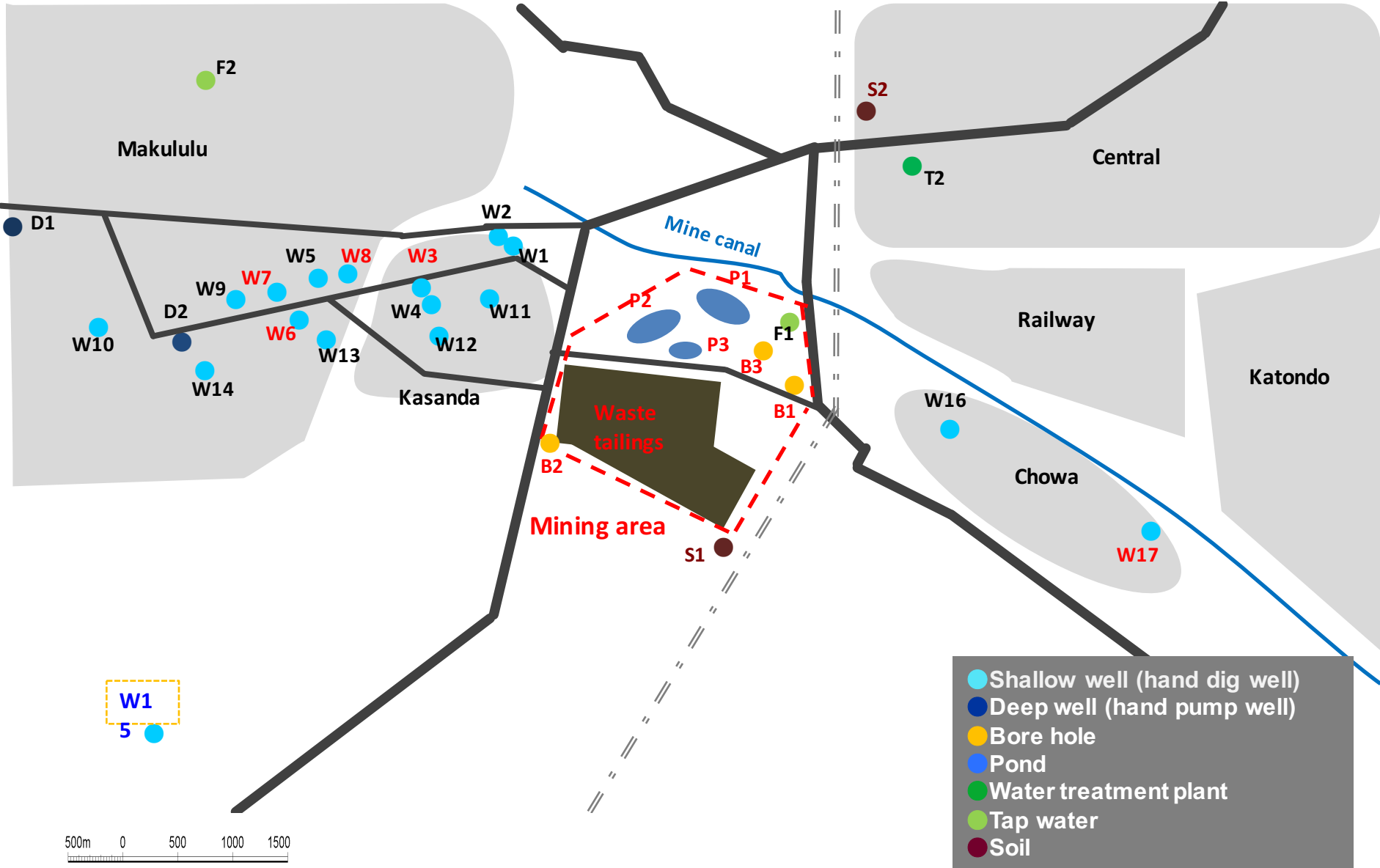
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KAWAWA BANDA (UNZA)

GROUND WATER SAMPLING SITES (2016 JULY)



WATER SAMPLING SITES (2016 JULY)



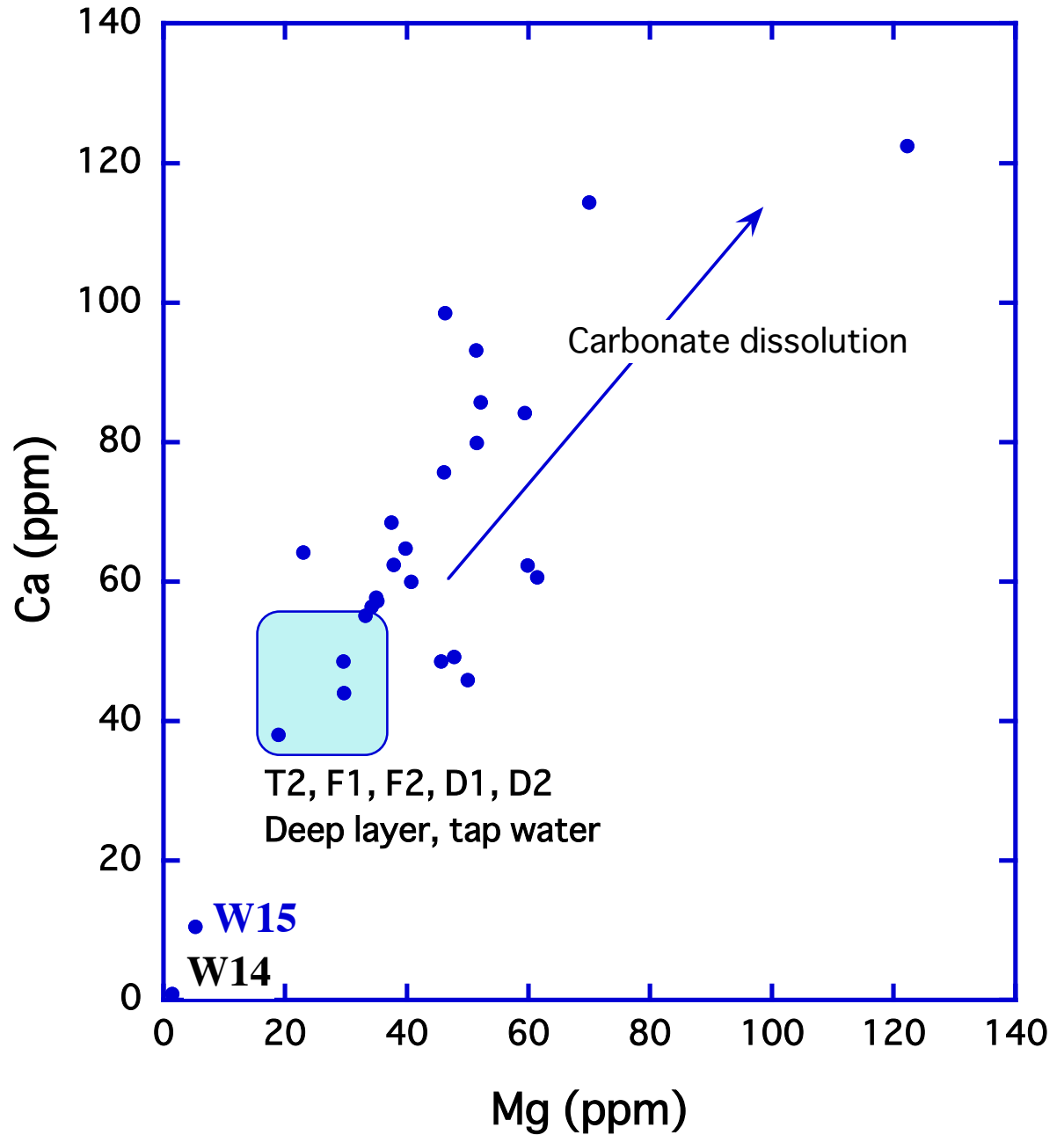
ONLY two Soil sampling by Dr. Nakayama :2015, October

Map of around mining area and sampling points of water sample in Kabwe, Zambia

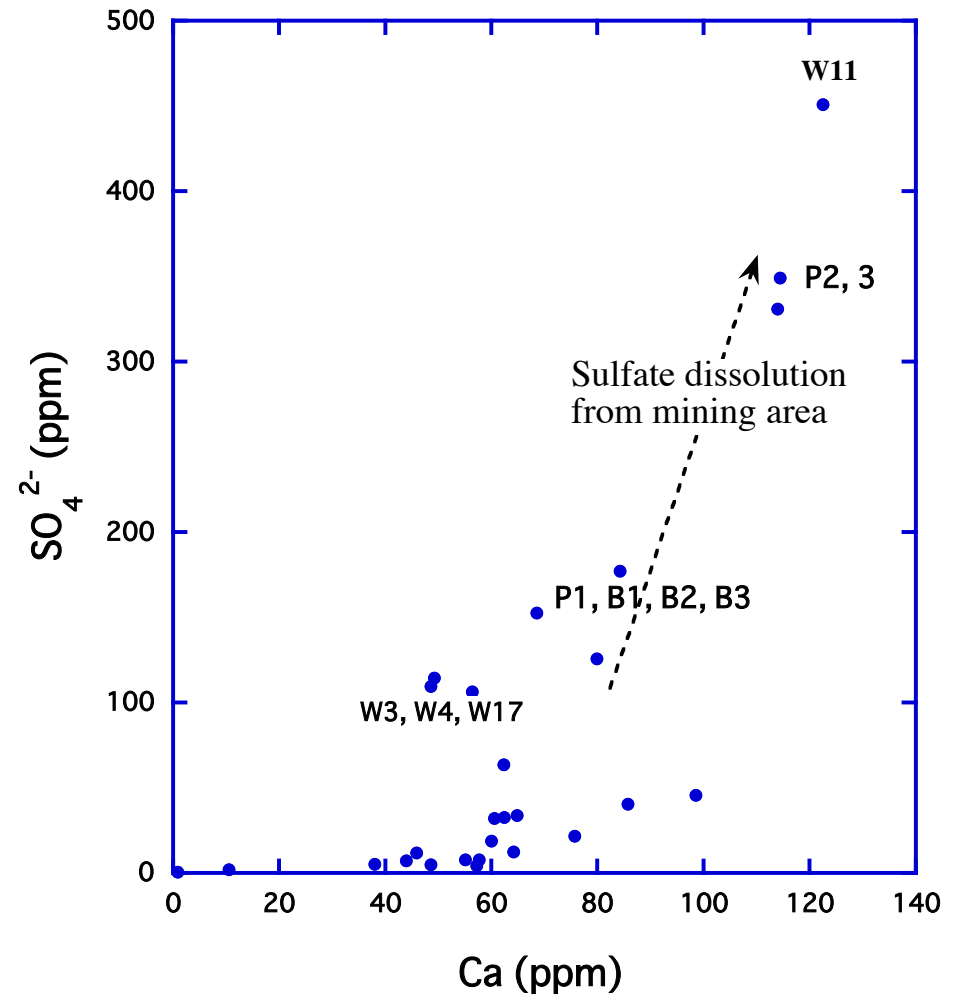
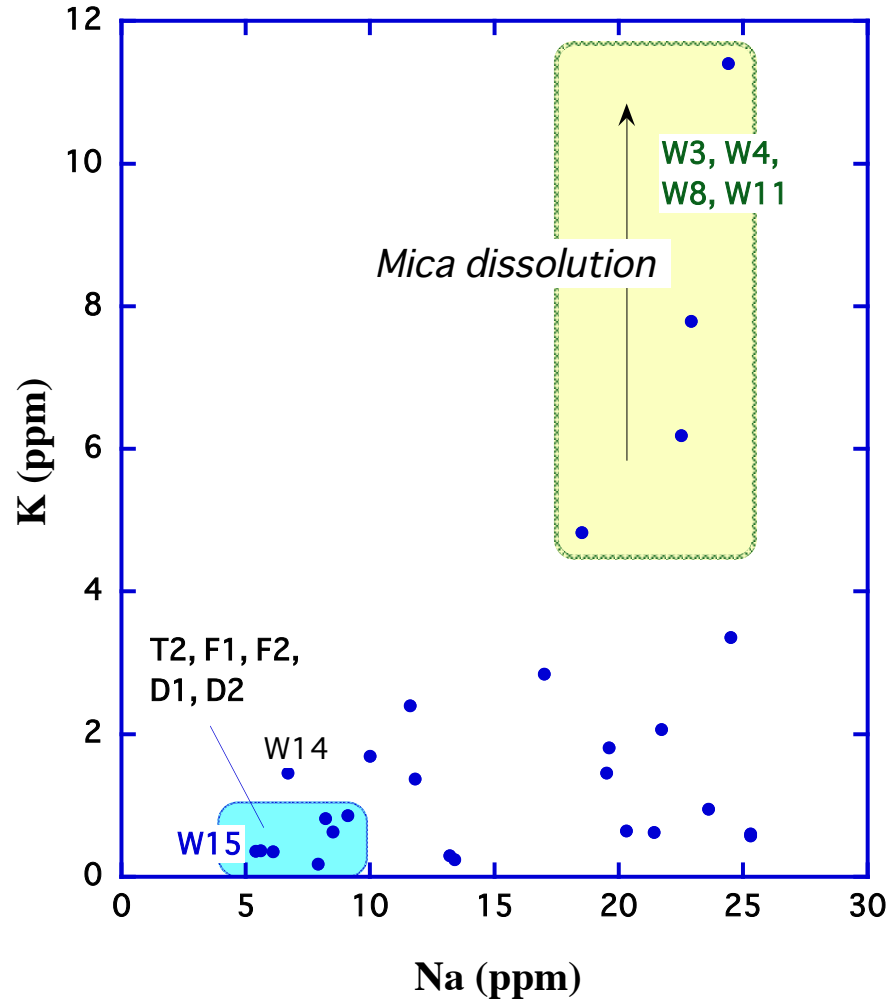
Chemical analysis

1. Filtered water samples:
 - pH and ion chromatogram measurements (Cl^- , NO_3^- , SO_4^{2-} , etc.)
2. Filtered (0.45 μm pore size) and acid-added water samples (final 0.4 M HNO_3 soln.):
 - Dissolved Pb concentration and Pb isotopic ratios measurement by ICP-QMS
 - Major cation measurements (Na^+ , K^+ , Ca^{2+} , Mg^{2+} , etc.) by ICP-OES
3. Unfiltered acid-added (final 0.7 M HNO_3 soln.) and then incubated at 80°C during two days for digestion of suspended mater in water samples → Particulate (+dissolved) Pb concentration and Pb isotopic ratio measurement by ICP-QMS

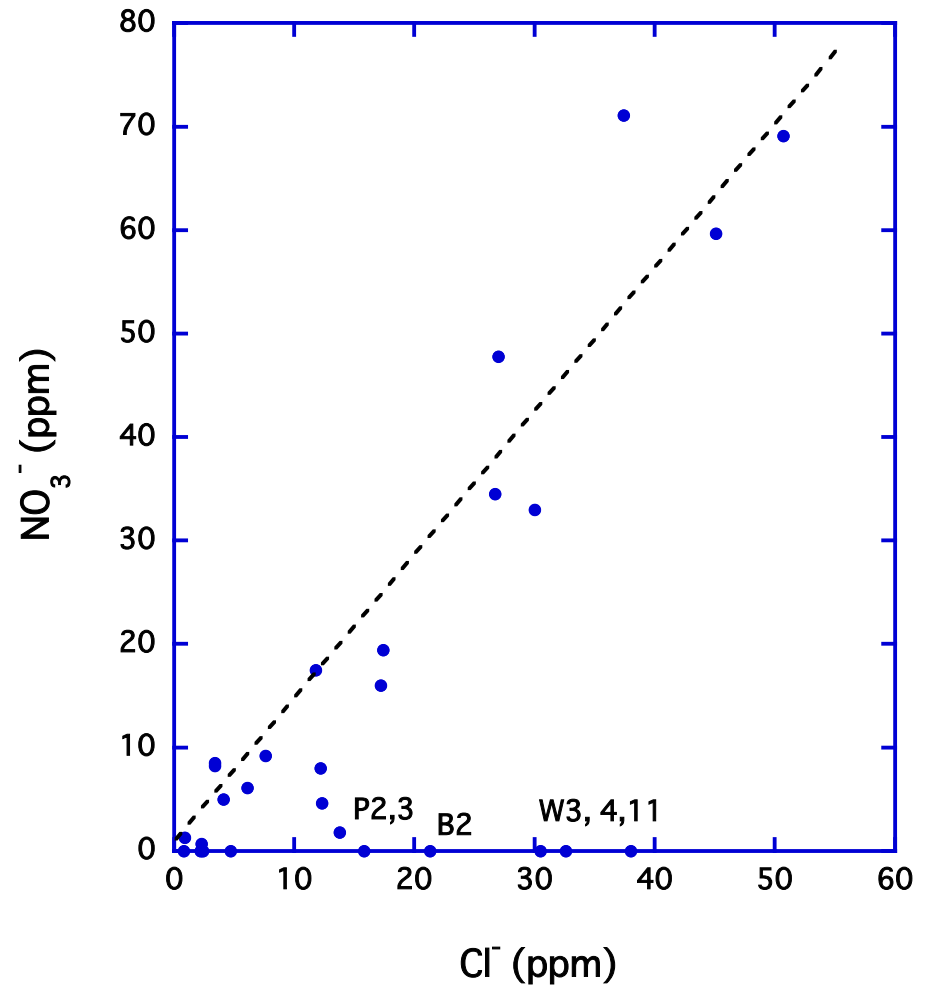
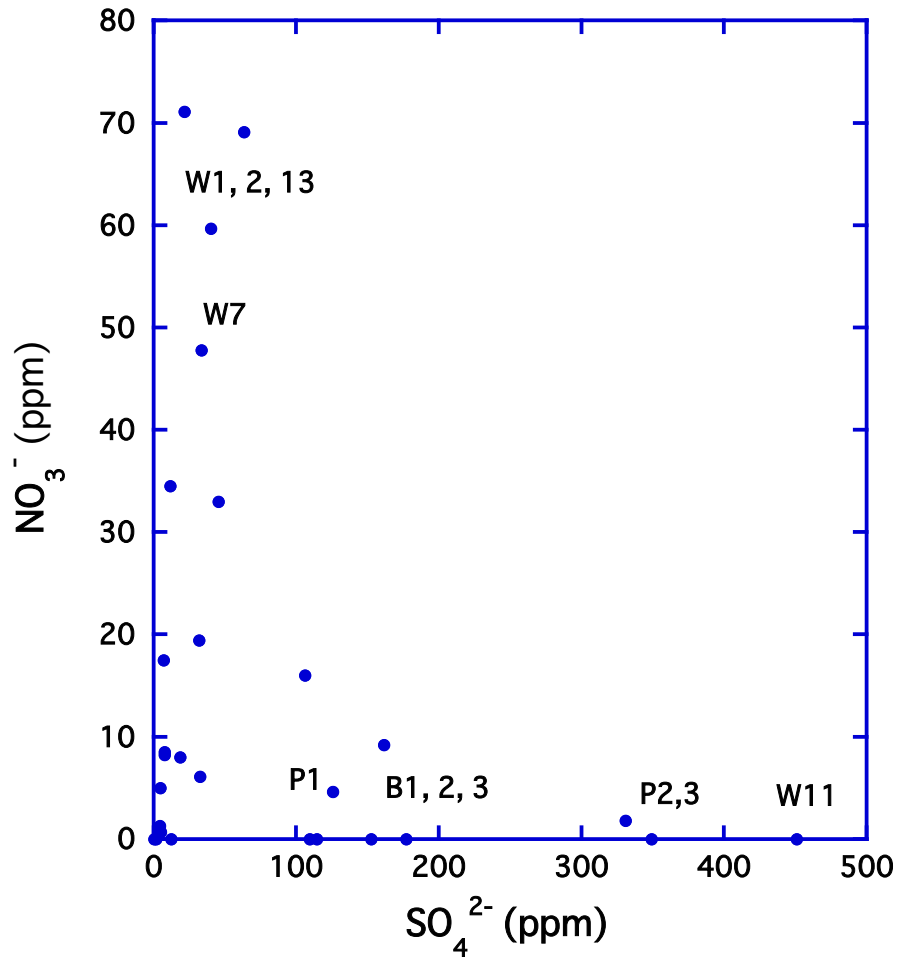
Chemical composition of filtered water samples (2016 JULY)

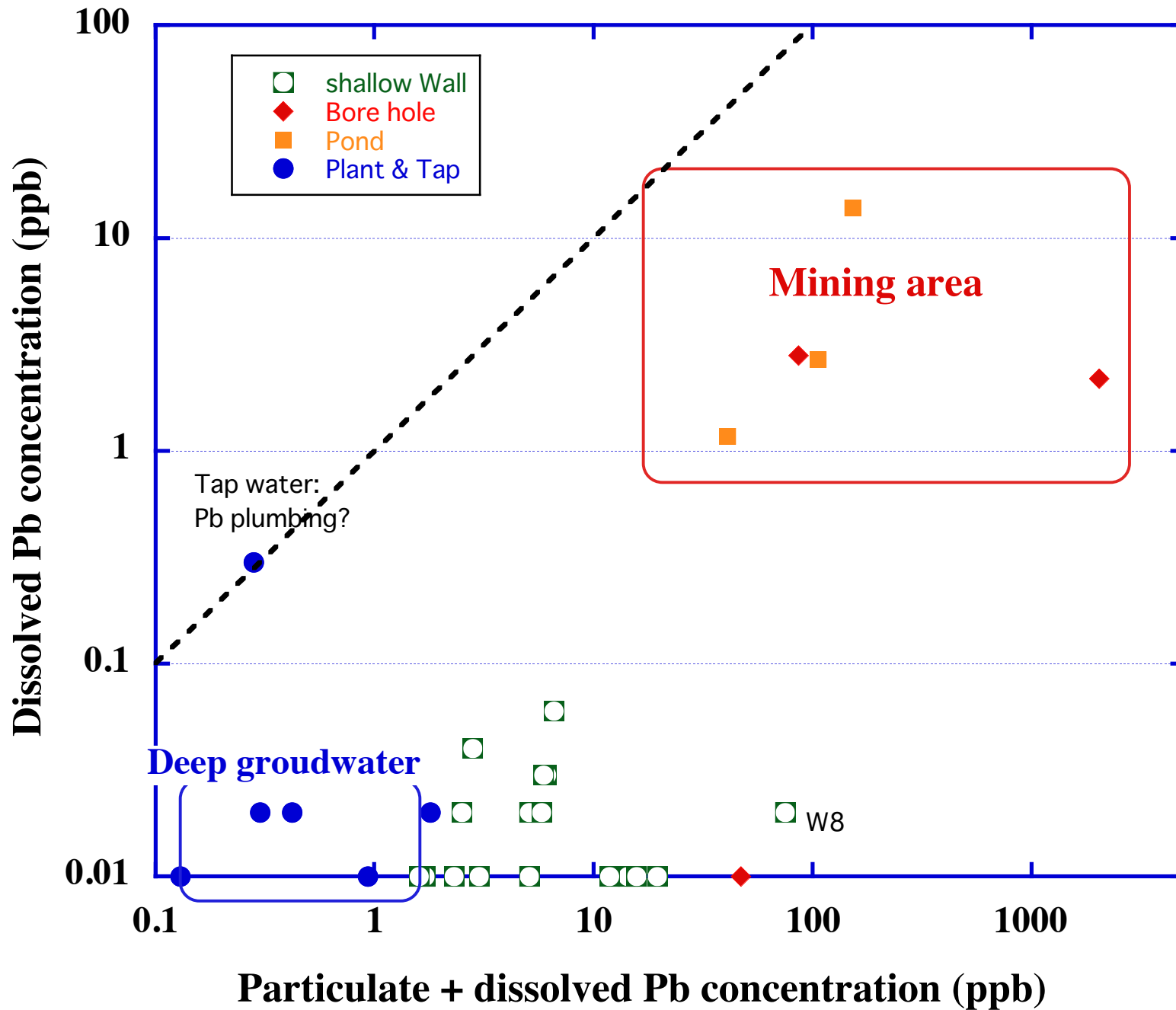


Chemical composition of filtered water samples (2016 JULY)

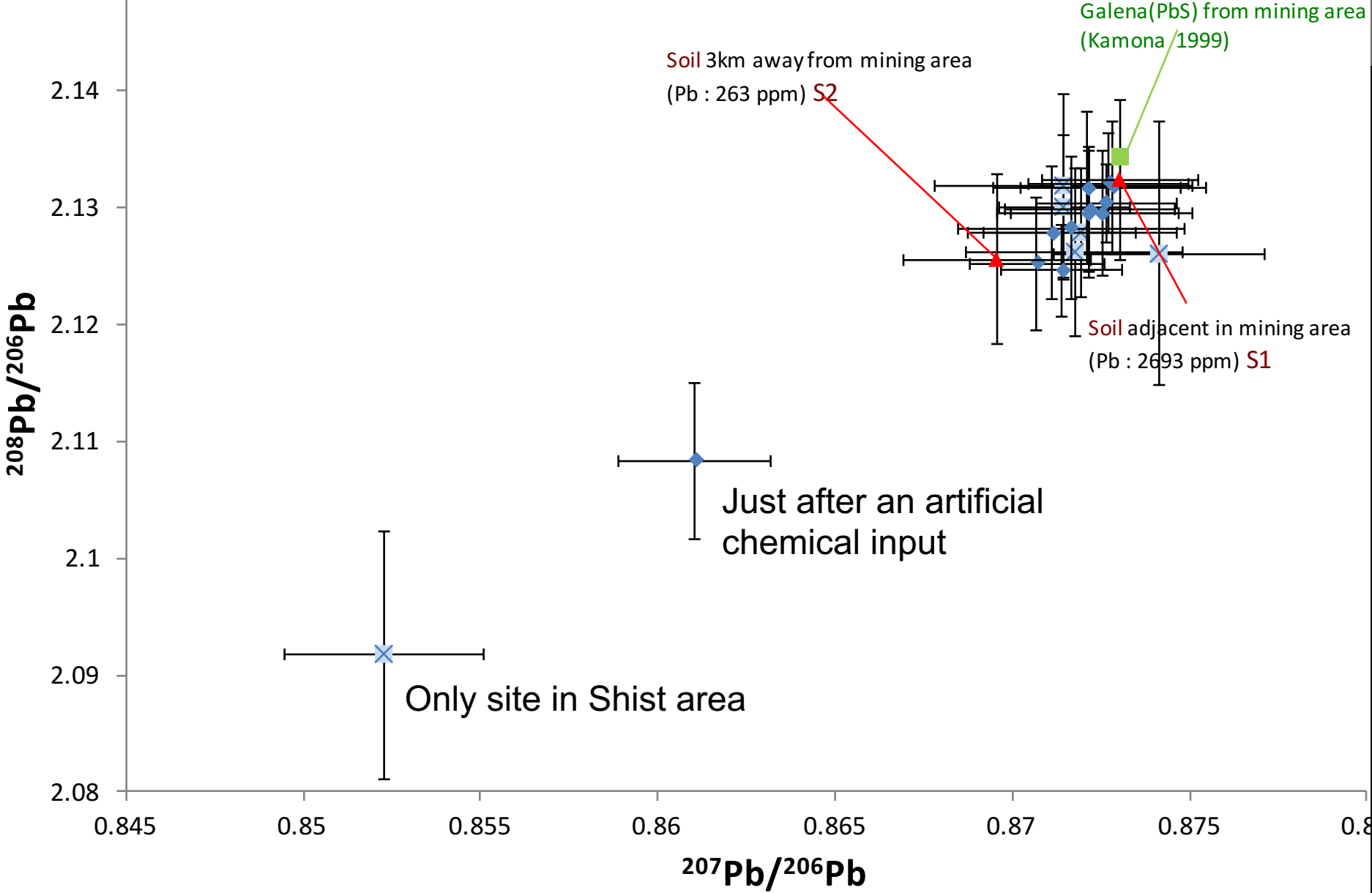


Chemical composition of filtered water samples (2016 JULY)





Lead isotope ratios of particulate Lead (> 5 ppb) in water samples



Discussion 1

- In pond and bore-hole water samples from the mining area, 1-20 ppb of dissolved Pb concentration ($<0.45 \mu\text{m}$) are found. This indicates the possibility of colloid-facilitated transport of heavy metals from the mining area to shallow and/or deep aquifers in near future.
- Low dissolved Pb concentrations ($< 0.1 \text{ ppb}$) are found in all shallow and deep well water samples and these are too low for Pb isotopic measurements. This might be due to relatively high pH (7.8–8.3) and hardness of the ground waters in the dolomite area.

Discussion 2

- Two interpretations for the consistency in Pb isotopic ratios between mining area and particulate Pb in shallow well water samples are probable: 1) migration of Pb from the mining area by the colloid-facilitated transportation; 2) A similarity in Pb isotopic ratios between mining area and the dolomite area where the sampling sites distributes.
- Relative high particulate Pb concentration (1–100 ppb) in shallow well water samples may be due to the high contents of suspended matters, e.g., clay, in the water samples. Usually, sediment contains several ppm of Pb.

Required supplementary measurements

- Estimation of suspended matter contents by major element (Si, Al, Fe etc.) determination of the digested water samples.
- Pb isotopic measurements of some background geological samples anterior to the mining activity.
- The other heavy metal elements (e.g., Zn, Cd, Cu, Co, etc.) measurements in these water samples.

We would like to submit the results for publication in an academic journal in collaboration with Prof. Nyambe and Dr. Banda so soon.