

Characterization of Dust and Weathering Products from the Karabash Smelter area, Ural Mountains, Russia

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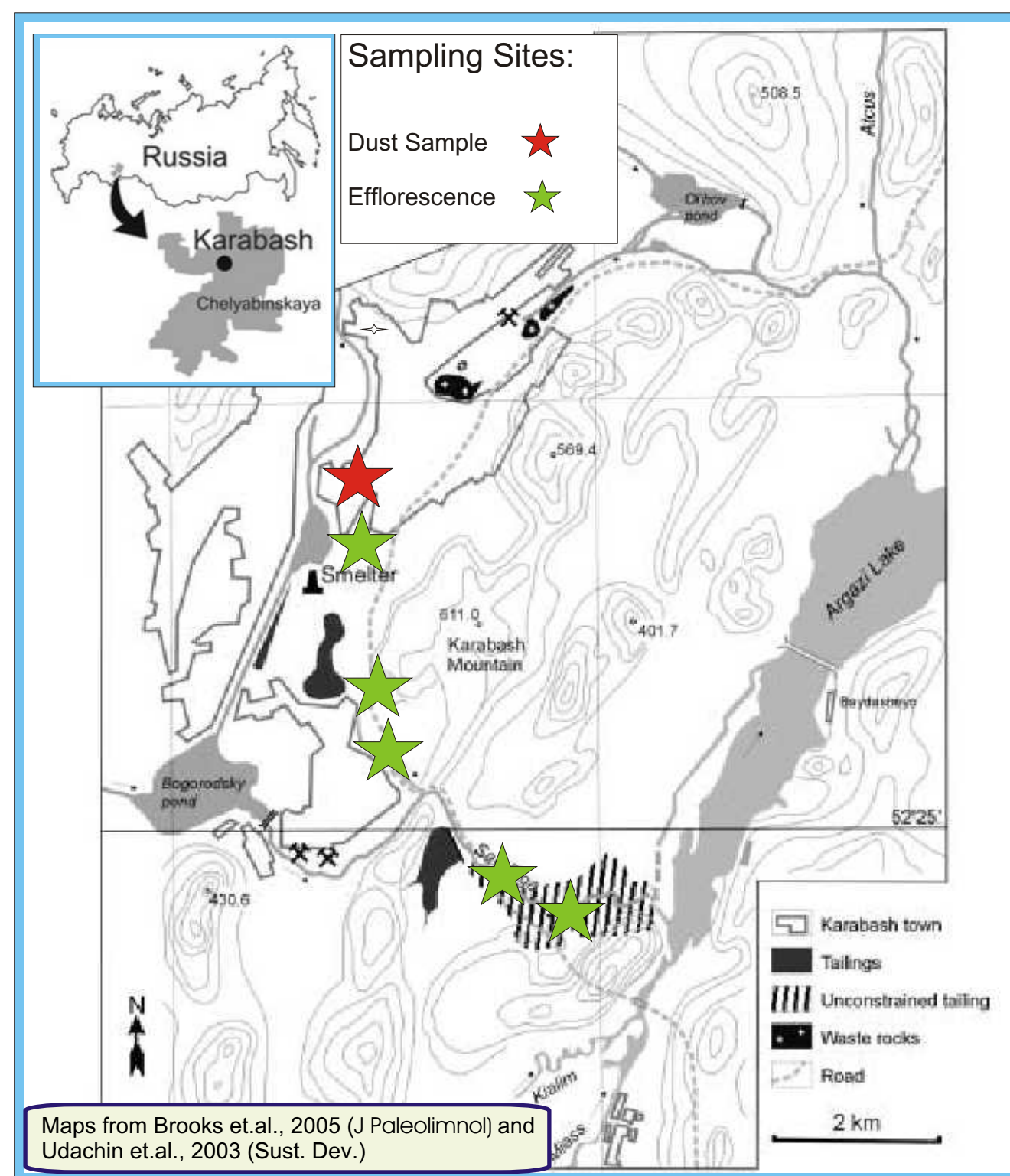
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Introduction

Karabash is a copper smelting town in the Chelyabinsk District of the southern Ural Mountains of Russia. The town and surrounding areas are affected by sulphur dioxide emissions, deposition of metal-rich particulates from the smelter, acid drainage from old mine workings, and leachates from waste dumps and tailings dams.

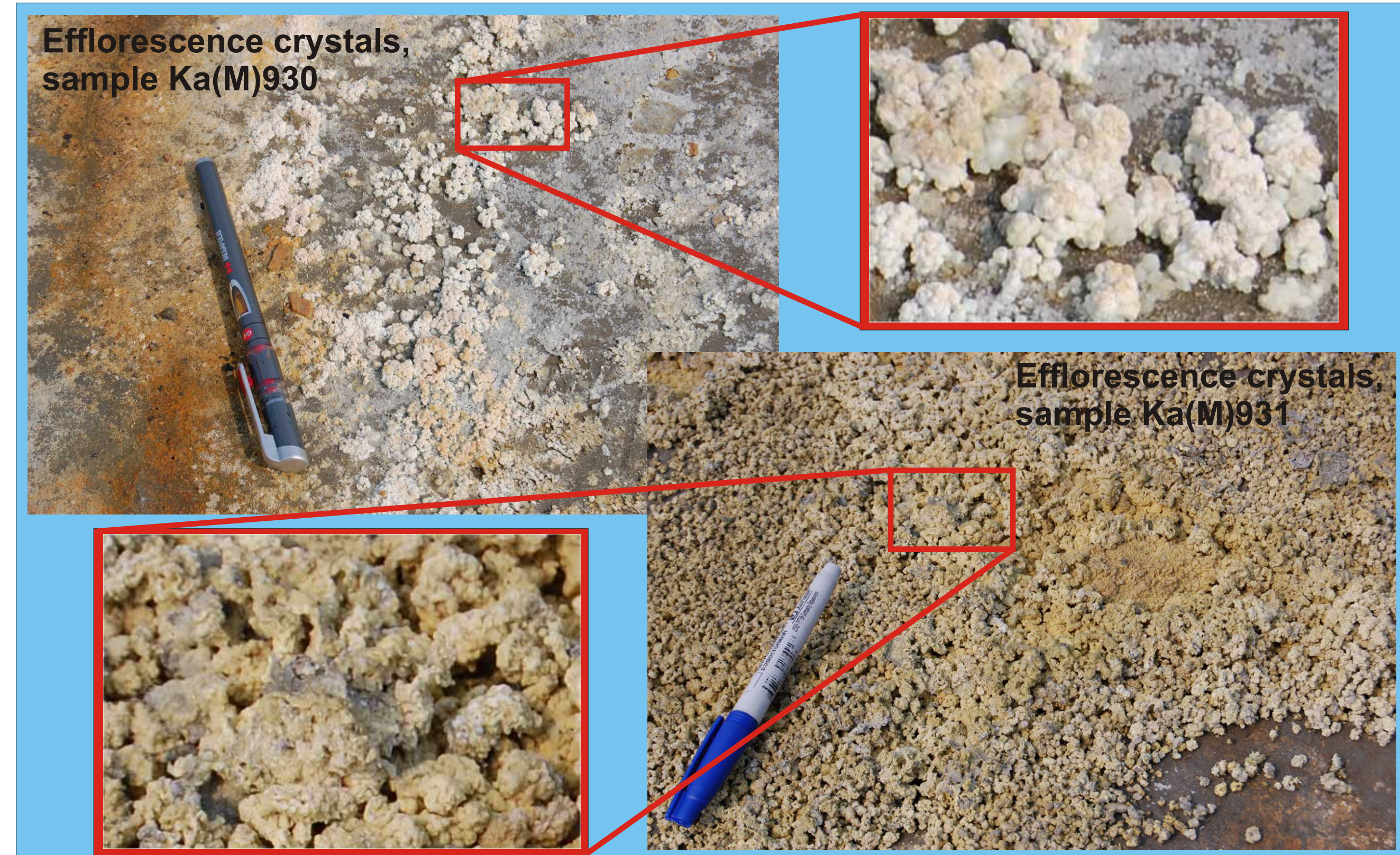
Several samples, including smelter emission dusts and efflorescent crystals were collected in 2010 and analyzed by Scanning Electron Microscope (SEM) and X-ray Diffraction (XRD) techniques.



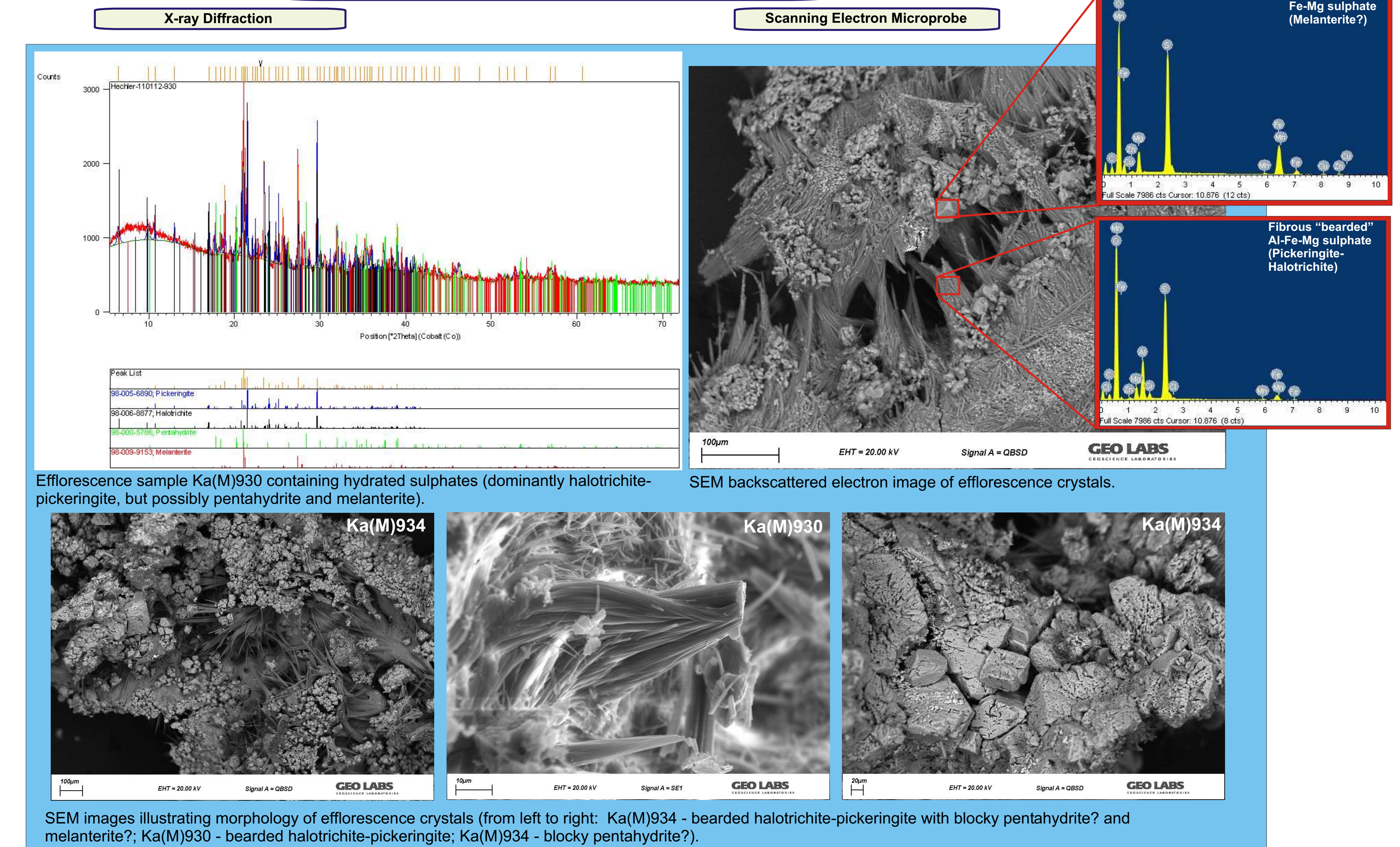
Karabash Smelter Impacted Landscapes



Efflorescence Crystals



Efflorescence Crystals



Methodology

Sample Collection

Six samples were collected in 2010:

A smelter emission dust sample a few km from the smelter.
1. D-Kd Karabash

Efflorescence crystals collected from the top of a mine tailings area, near the outwash stream from below a large tailings impoundment.

1. KA(M)930
2. KA(M)931
3. KA(M)932
4. KA(M)934
5. KA(M)935

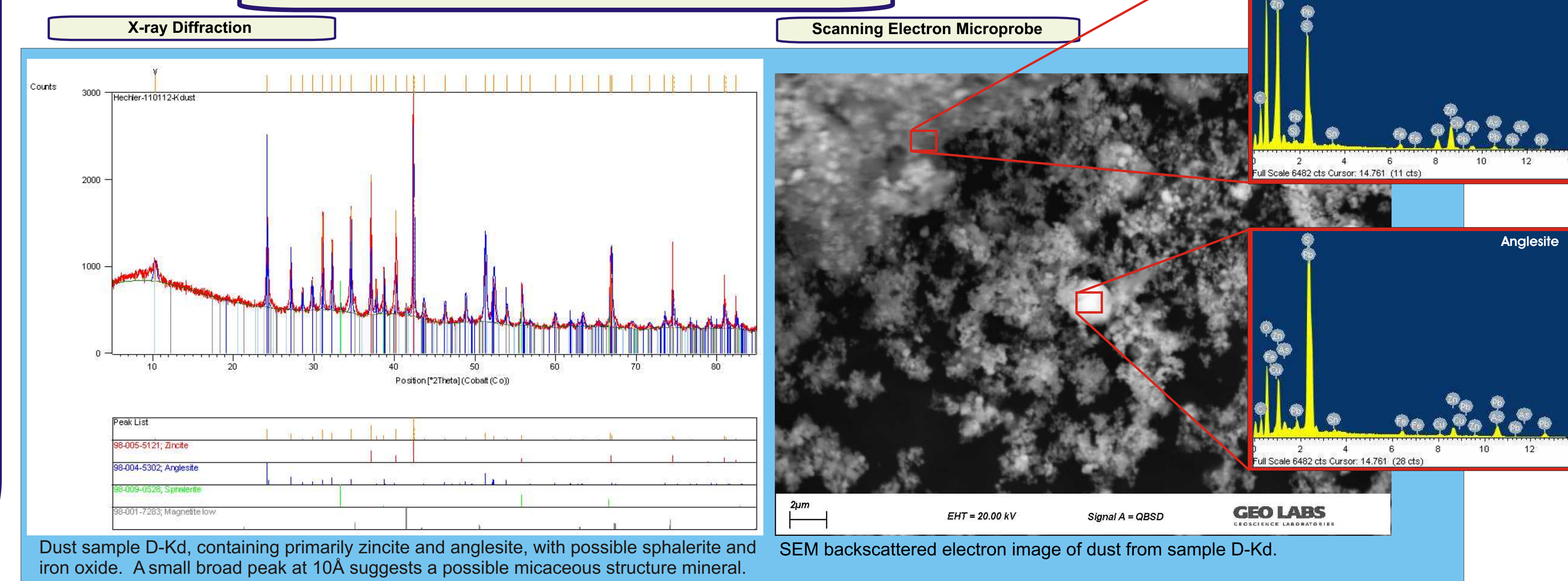
Sample Analysis

Samples were analyzed at the Geoscience Laboratories, Ministry of the Northern Development, Mines, and Forestry in Sudbury Ontario.

Samples were placed on carbon tape, carbon coated, and analyzed on a Zeiss EVO-50 Scanning Electron Microprobe. Where applicable, electron backscatter images and secondary electron images were collected. Quantitative and semi-quantitative values were obtained using an Oxford Energy Dispersive (ED) Spectrometer and INCA software.

Samples were pulverized using an agate mortar & pestle, mounted as smears on a silicon disc, and analyzed on the PANalytical X'Pert PRO XRD system with a PIXcel detector. Samples were analyzed using Co radiation, at 40 kV and 45 mA. Peak search results were obtained with both PANalytical HighScorePlus and MDI Jade software.

Smelter Emission Dusts



Conclusions

- The Karabash area, downstream from the smelting operations, has been heavily impacted by fugitive tailings discharge, leading to vegetation kill on the flood plain.
- Subaerial weathering of the tailings is producing obvious signs of acid mine drainage.
- The mineralogy of the smelter deposited dusts consists primarily of zincite and anglesite.
- The salt efflorescence crystals on the tailings-dominated outwash are a mixture of hydrated ferro-aluminous-magnesium sulphates.

Acknowledgments

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