Wildfire-driven release of metal(loid)s from topsoils in a smelter-polluted semi-arid area: an experimental approach

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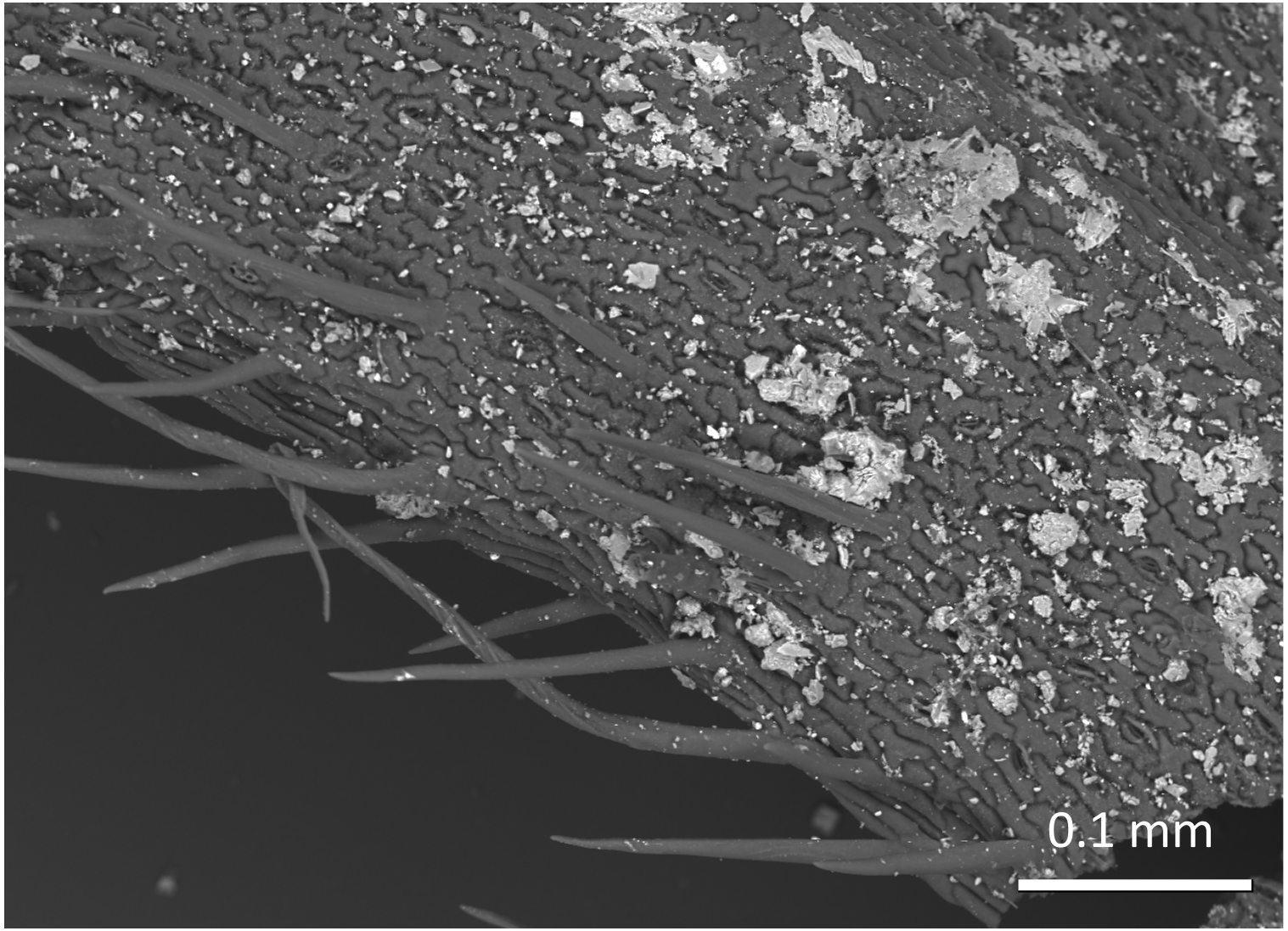
Introduction

- Biomass is a sink for contaminants
- Geogenic particles
- Anthropogenic particles
- Topsoil enriched in contaminants by litter



Tsumeb (Namibia)

Highly contaminated soils by mining and smelting activities -1920 ppm As; 5840 ppm Cu; 7.66 ppm Hg

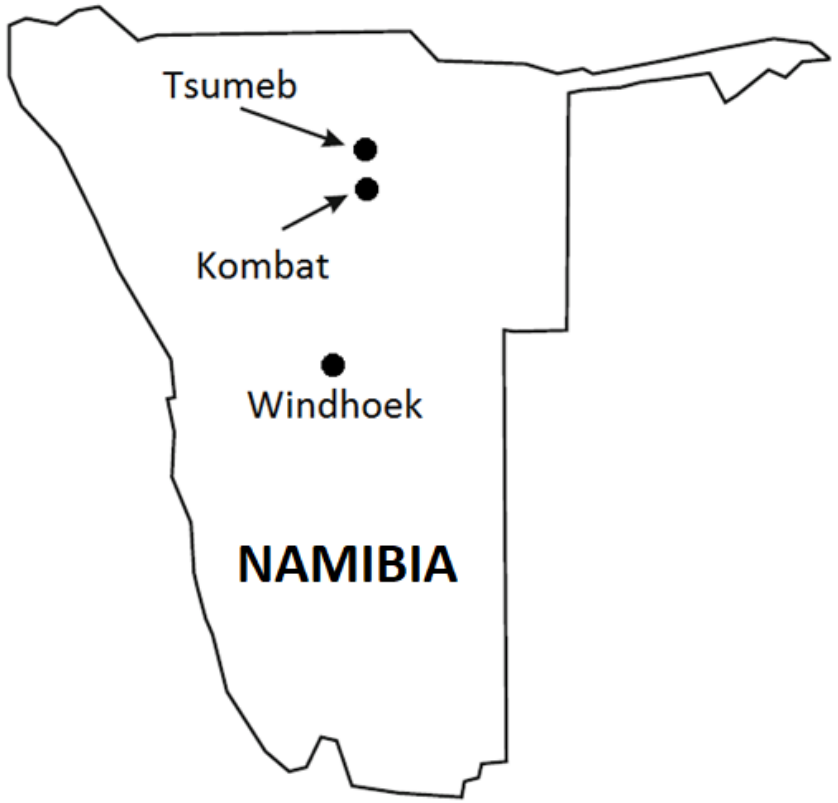
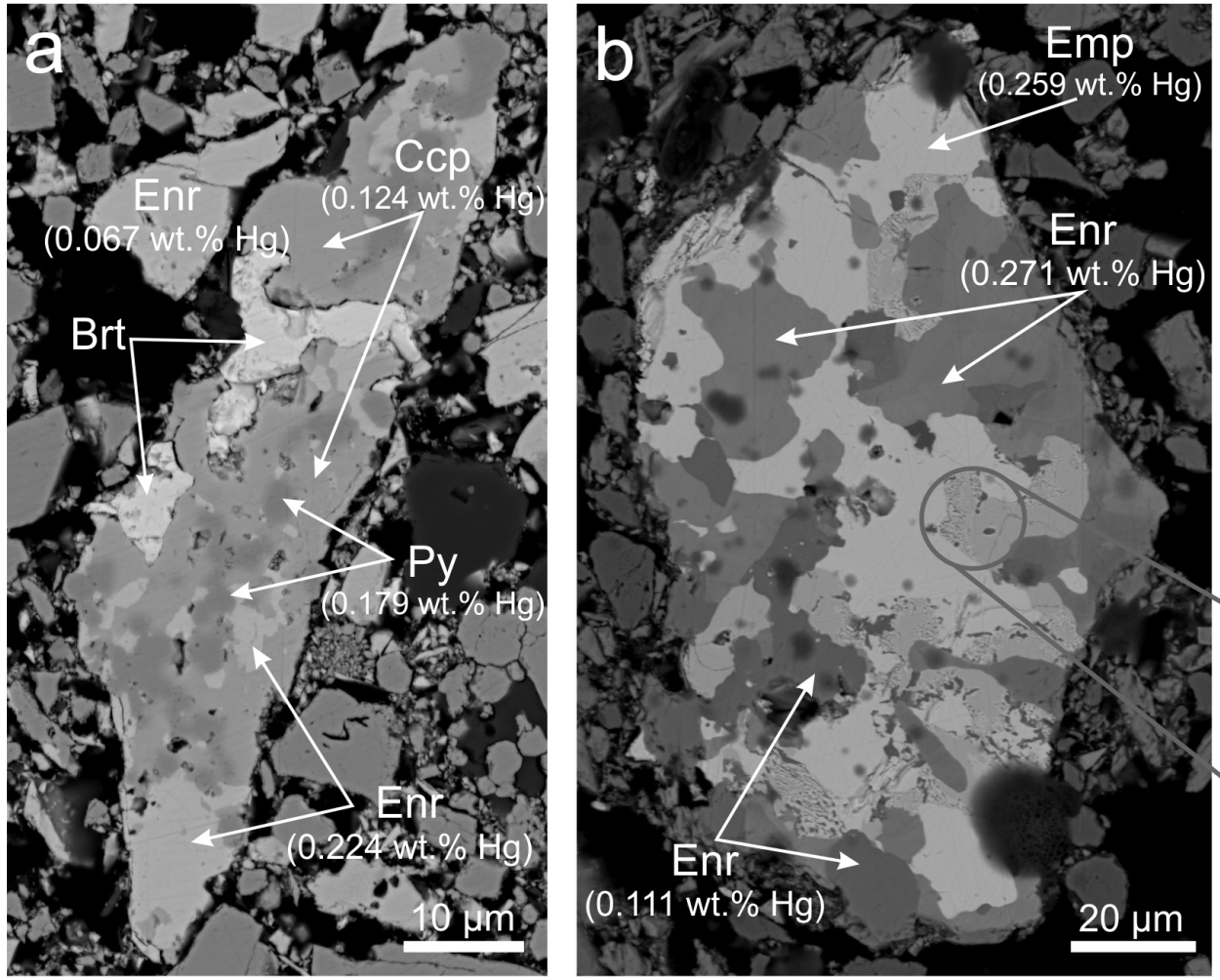


Photo: Ettler

Feed concentrates in Tsumeb

Predominantly Bulgarian and Chilean Cu concentrates – rich especially in As, Hg



Bulgaria

- py 67%, cpy 11%, tnt 11%, eng 7%, qtz 5%

Chile

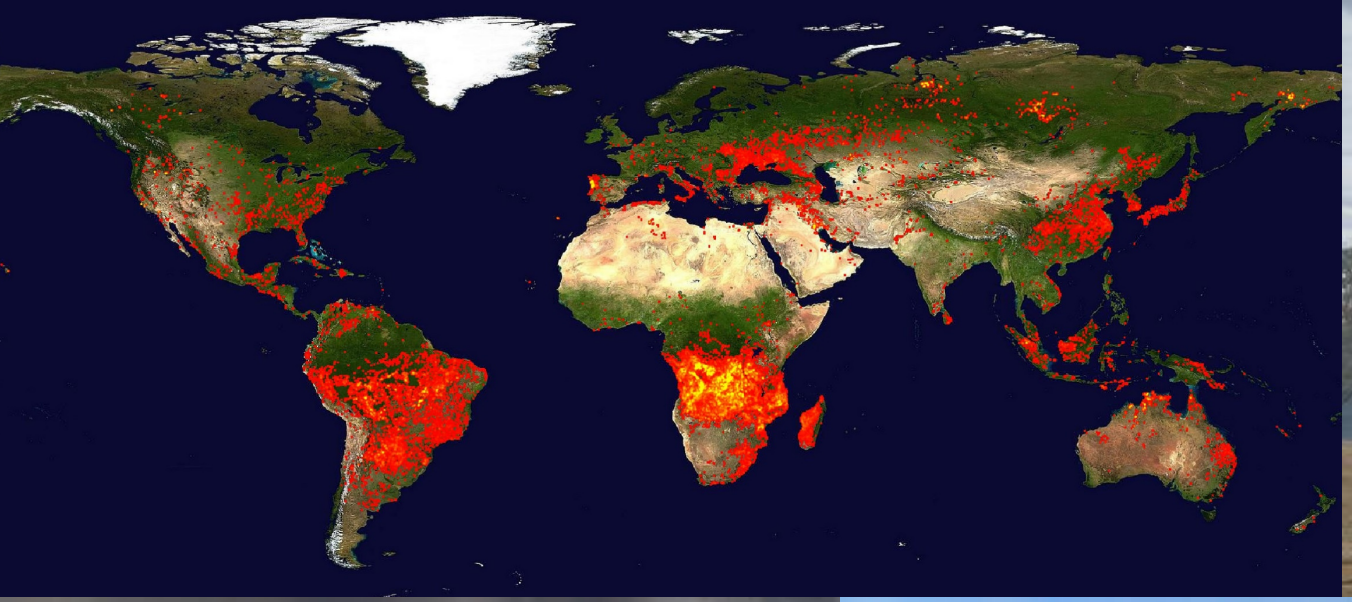
- py 43%, eng 37%, cpy 9%, pnt 8%, qtz 4%

Wildfires

- Common at 30 % of land (Chuvieco et al. 2008)

- Contaminants might be mobilized or concentrated in ash residue
- Depends on contaminant speciation and wildfire temperature
- Only topsoil layer is heated

Photo: Ettler



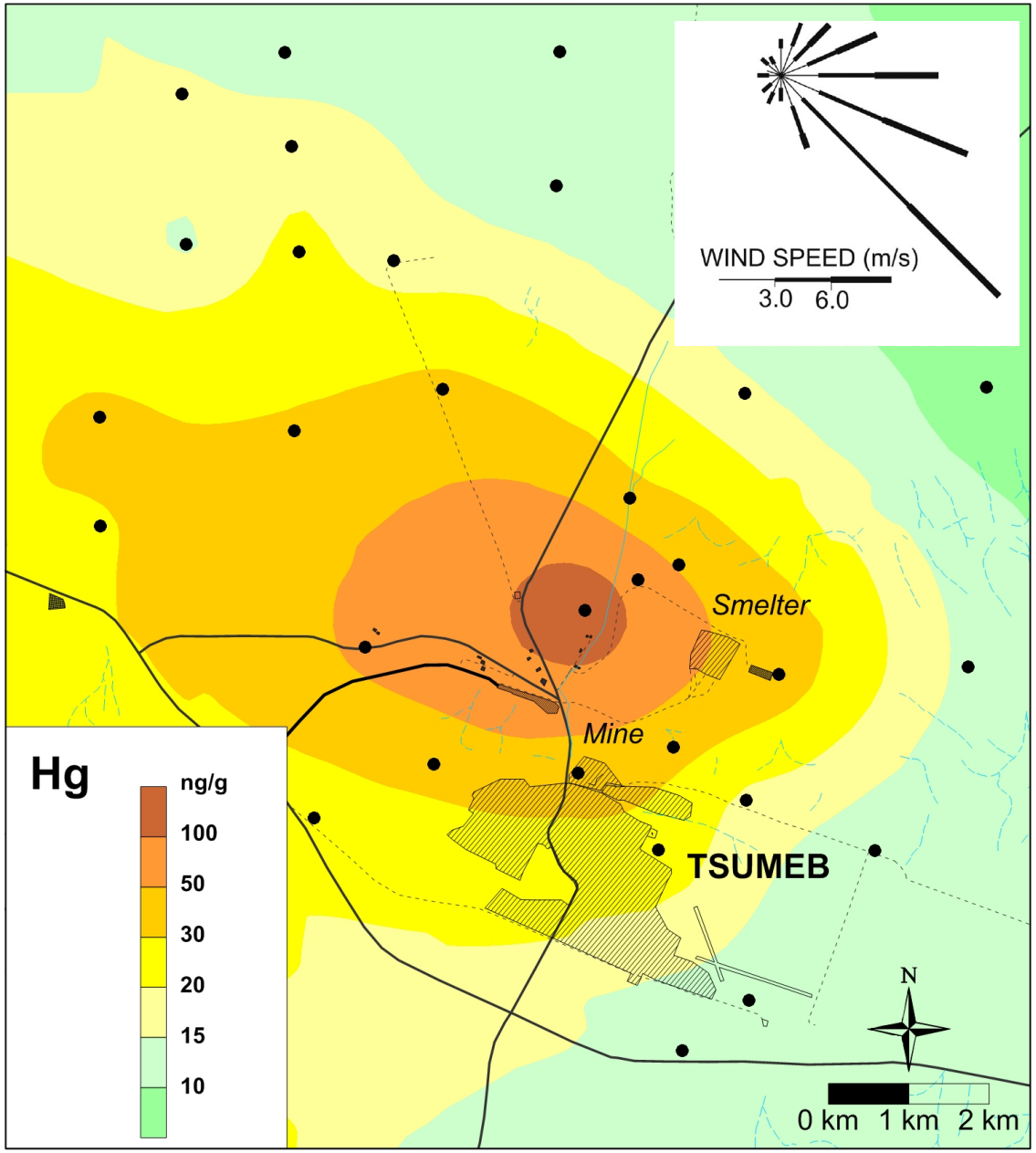
Source: Modis; qz.com; theconversation.com; princeton.edu

Hg in topsoils

- Litter with the uppermost soil layer
- **<7.66 ppm**

Hg in vegetation

- Savanna grass samples
- **<0.186 ppm**



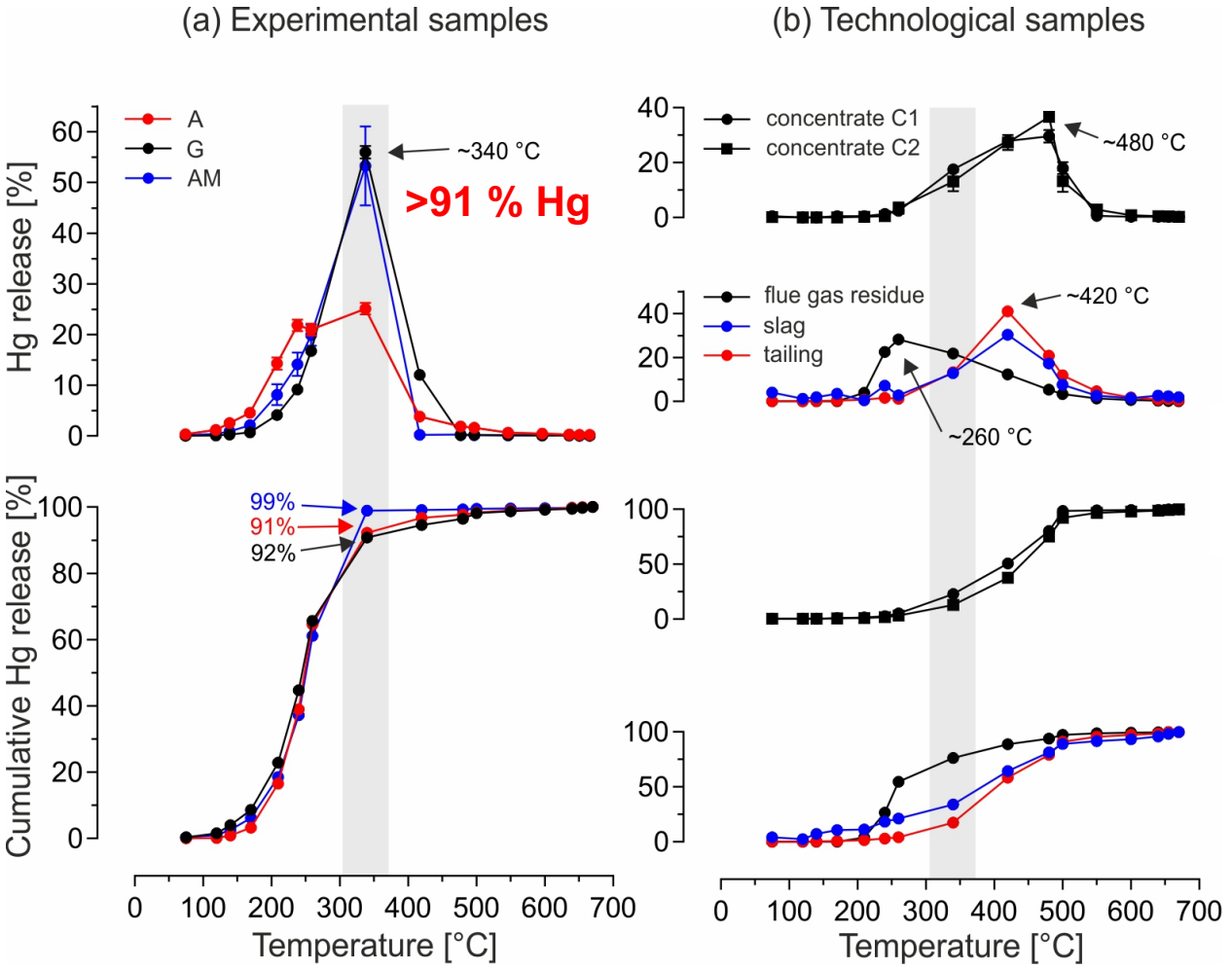
Hg termodesorption

- AMA 254
- Mobilization of Hg from samples in range: 75-700 °C

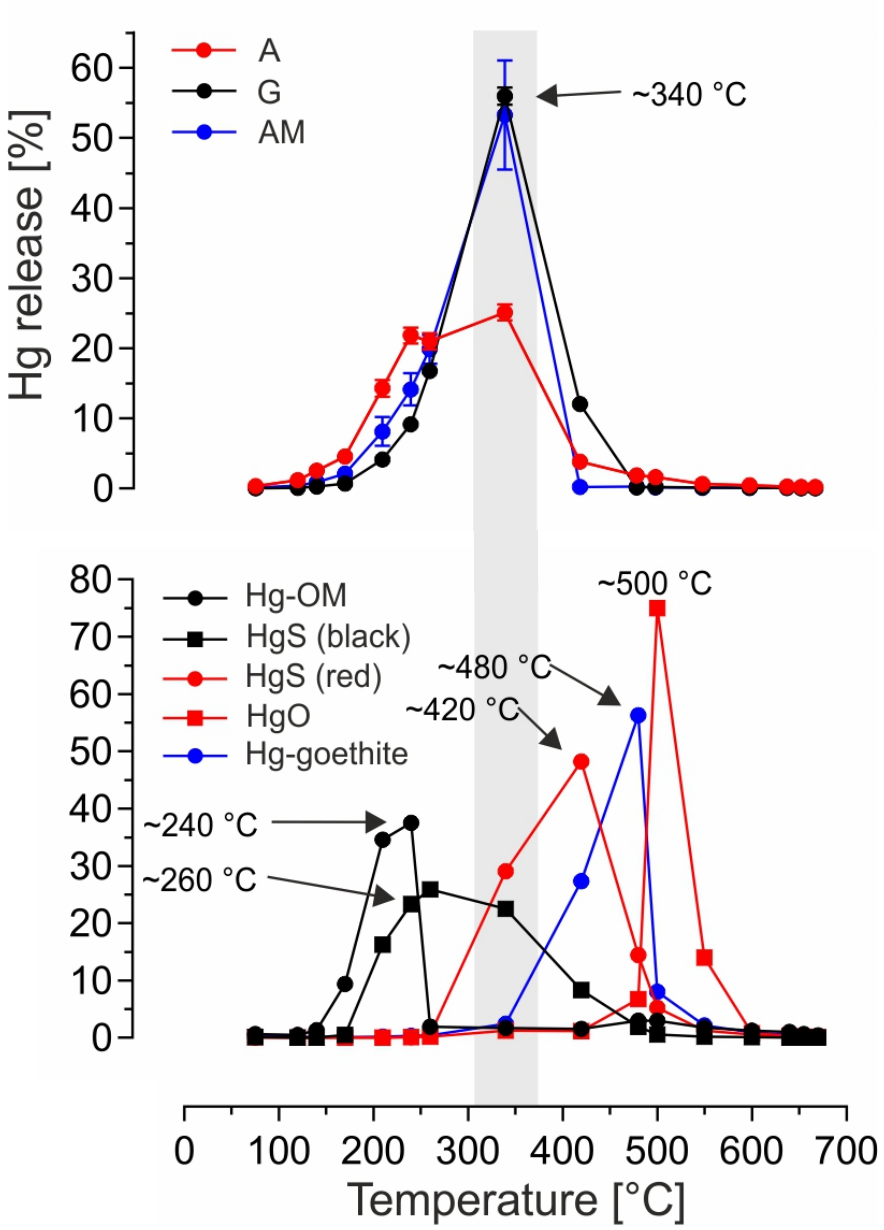
Biomass-rich topsoils (n = 3)

Concentrate (n = 2)

350 °C ~ “grassland fire“

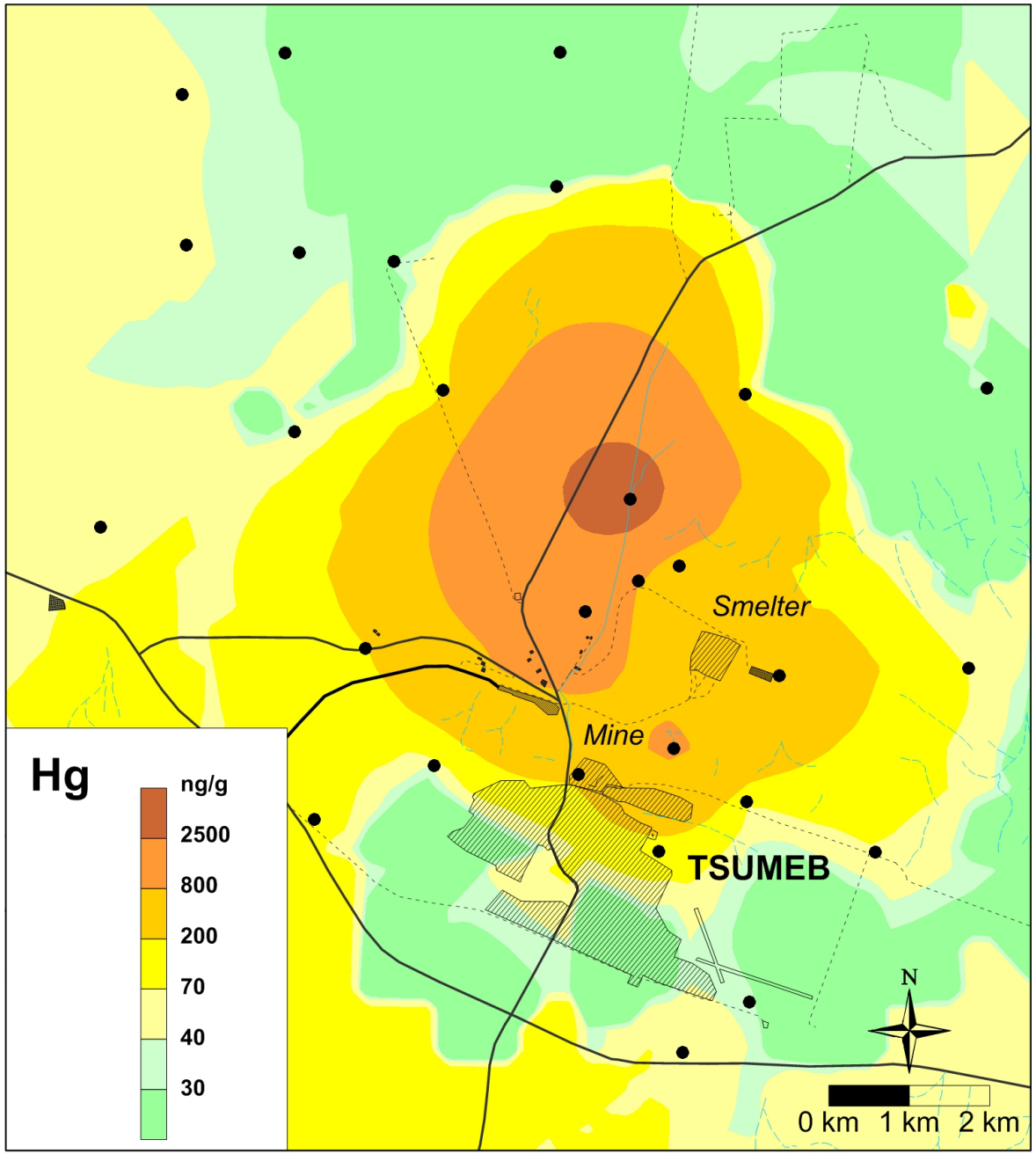


Hg TD – Comparison with reference materials



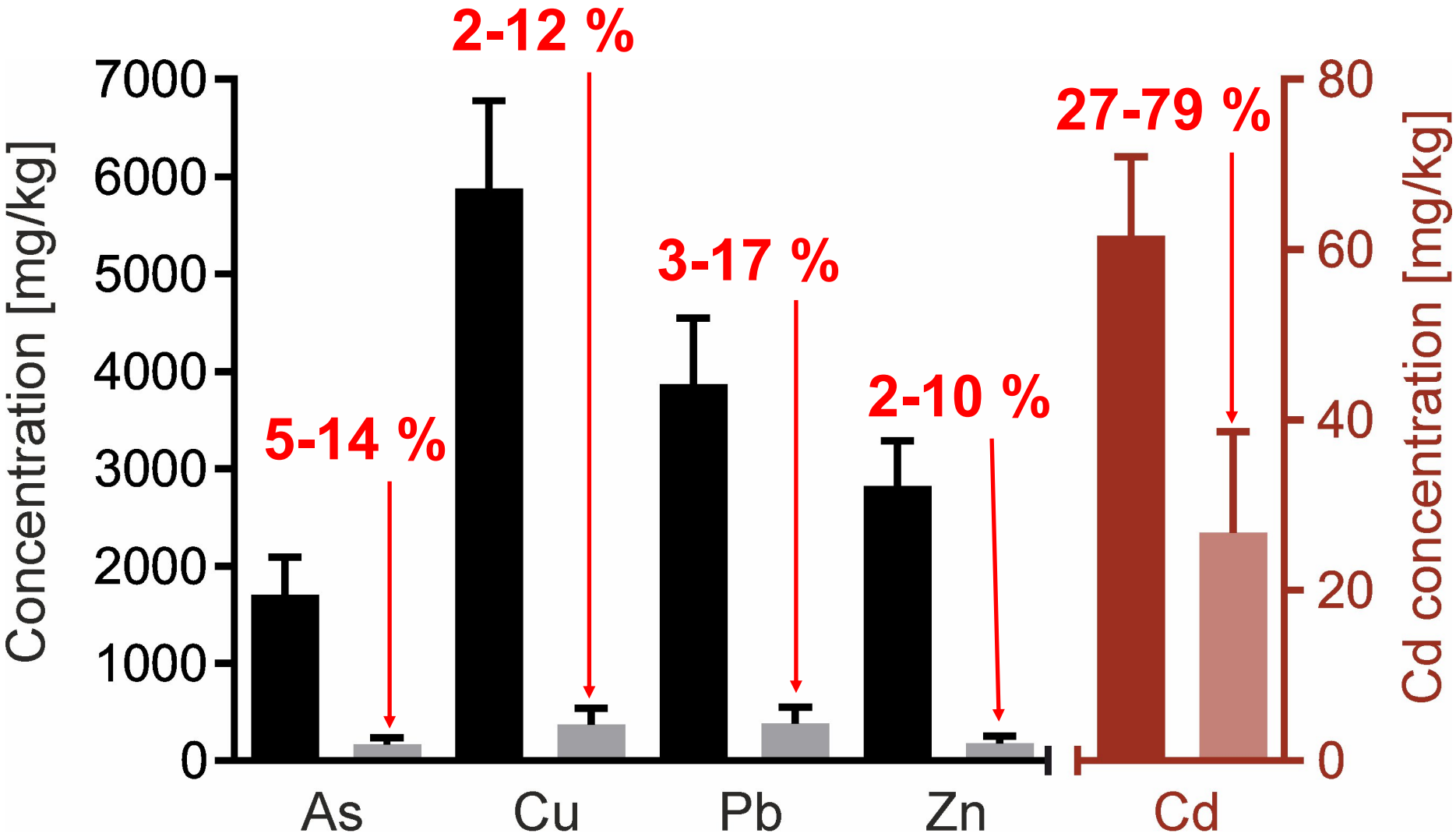
Wildfire emission predictions

- Up to 229 g/ha Hg remobilizable from hotspots
- Since 2015 drop of emission – sulfuric acid plant
- However legacy Hg pool remains till its complete burn out



Tuhý M et al., 2020: **Wildfire effects on mercury remobilization from topsoils and biomass in a smelter-polluted semi-arid area**. *Chemosphere* 247:125972.

Remobilization of other contaminants at 850 °C



Hg 100 %

Conclusions

1. Smelter surrounding significantly polluted by mining and smelting activities
2. >91% Hg remobilizable during wildfires (ca. 300 kg of Hg emmitable from studied area)
3. Wildfires might cause significant remobilization of As, Cd, and Hg into the atmosphere and Cu, Pb, Zn are predominantly concentrating in ash residue

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Thank you