

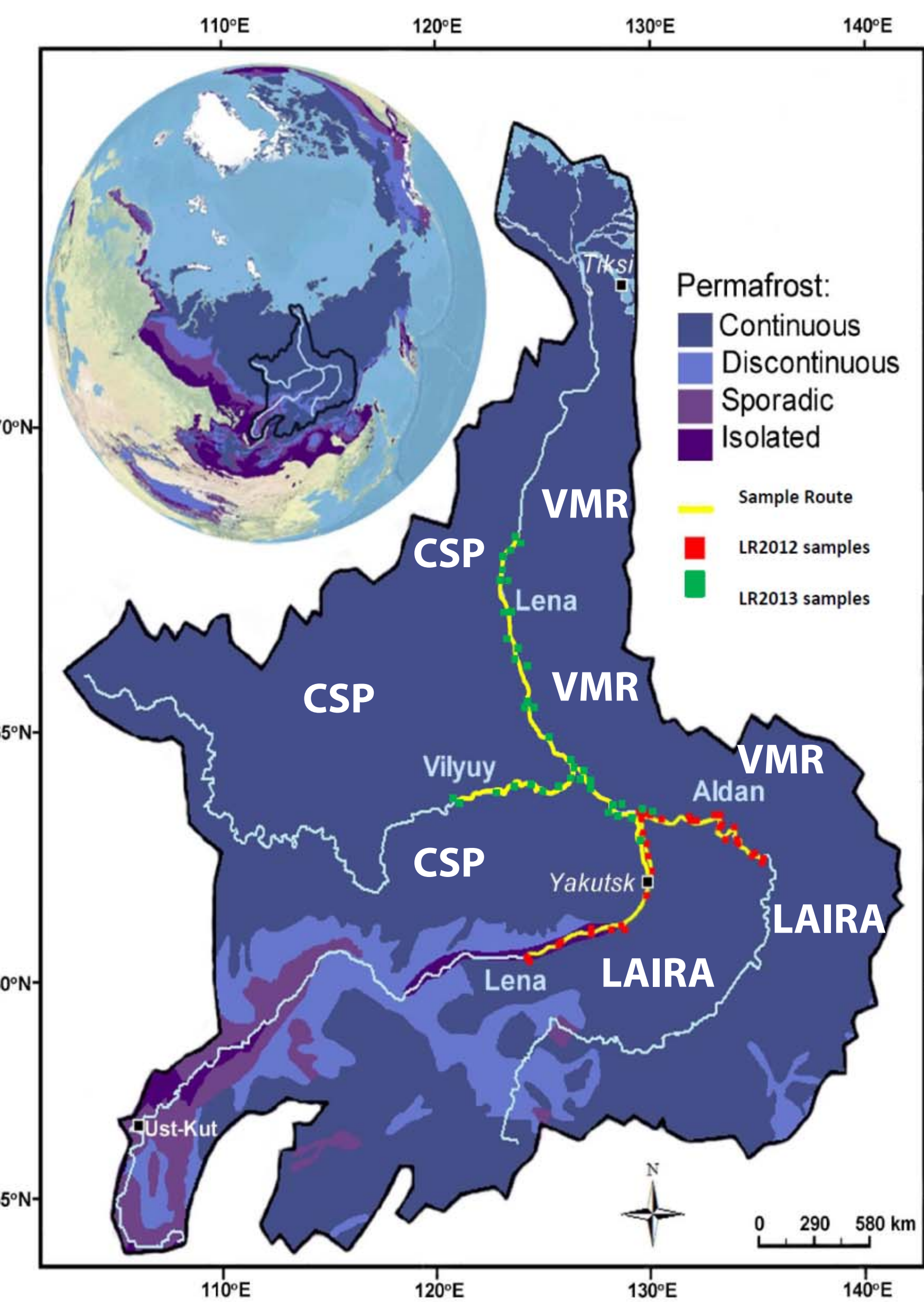
A Spatial Characterisation of the Major Iron Bearing Phases in the Lena River Catchment Area, NE Russia.

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1. The Lena River



Iron is an important nutrient in the oceans. It enters the ocean via rivers, icebergs, wind blown dust and hydrothermal systems.

This study investigates the forms of particulate and colloidal iron in the Lena River Catchment Area. Samples were collected in period June 2012 and July 2013 - following the the spring flood.

The annual Lena River discharge is 581 km³ - second to the Yenisei, in its contribution to the Arctic. Ocean.

The Lena River catchment area is divided into subcatchments. These are concordant with the geological units of the region. The Lena River, an ancient antecedent stream, divides these units.

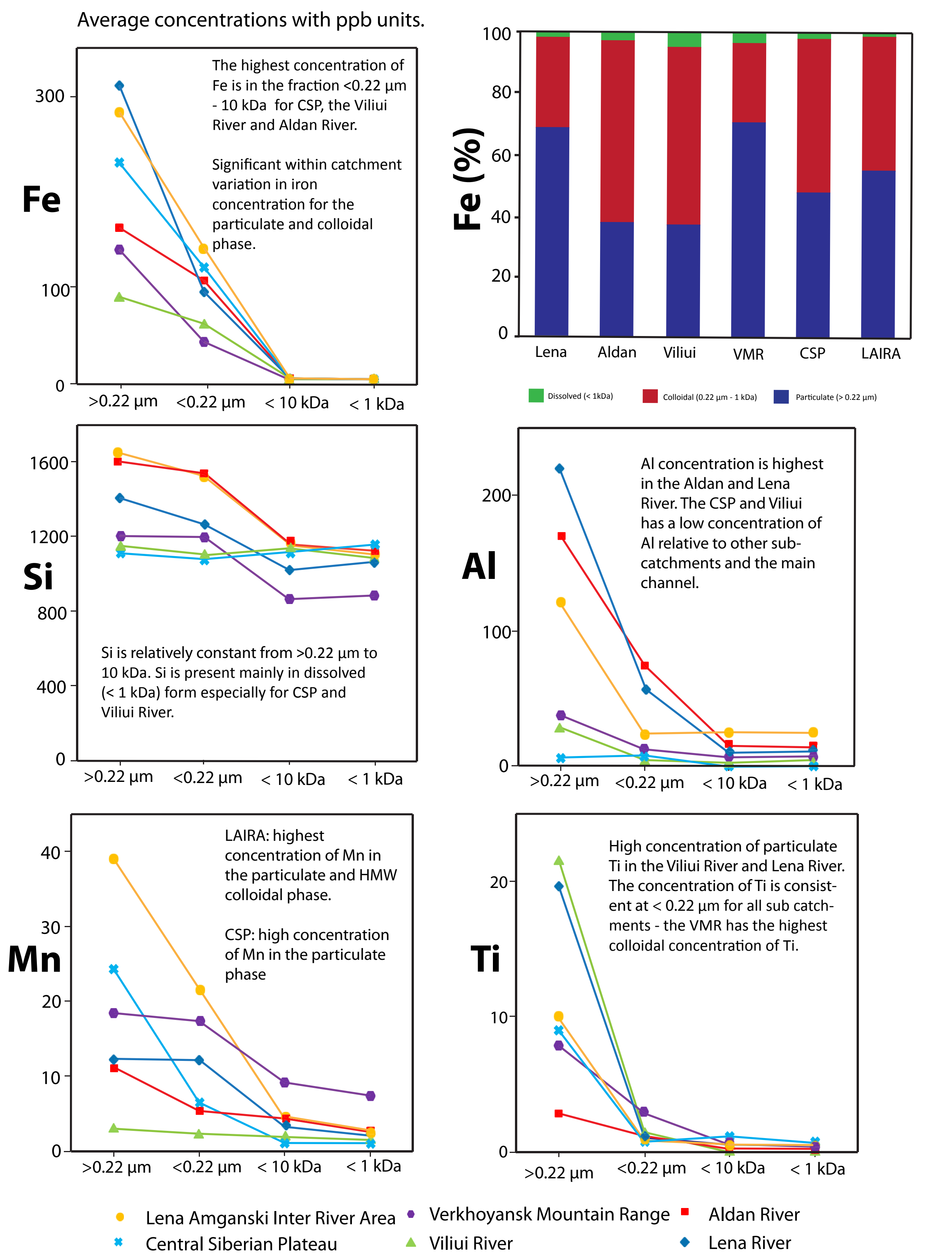
Two major sub basins:

- Aldan River
- Viliui River.

Three major sub catchments:

- LAIRA: Lena Amganski Inter River Area
- VMR: Verkhoyansk Mountain Range
- CSP: Central Siberian Plateau

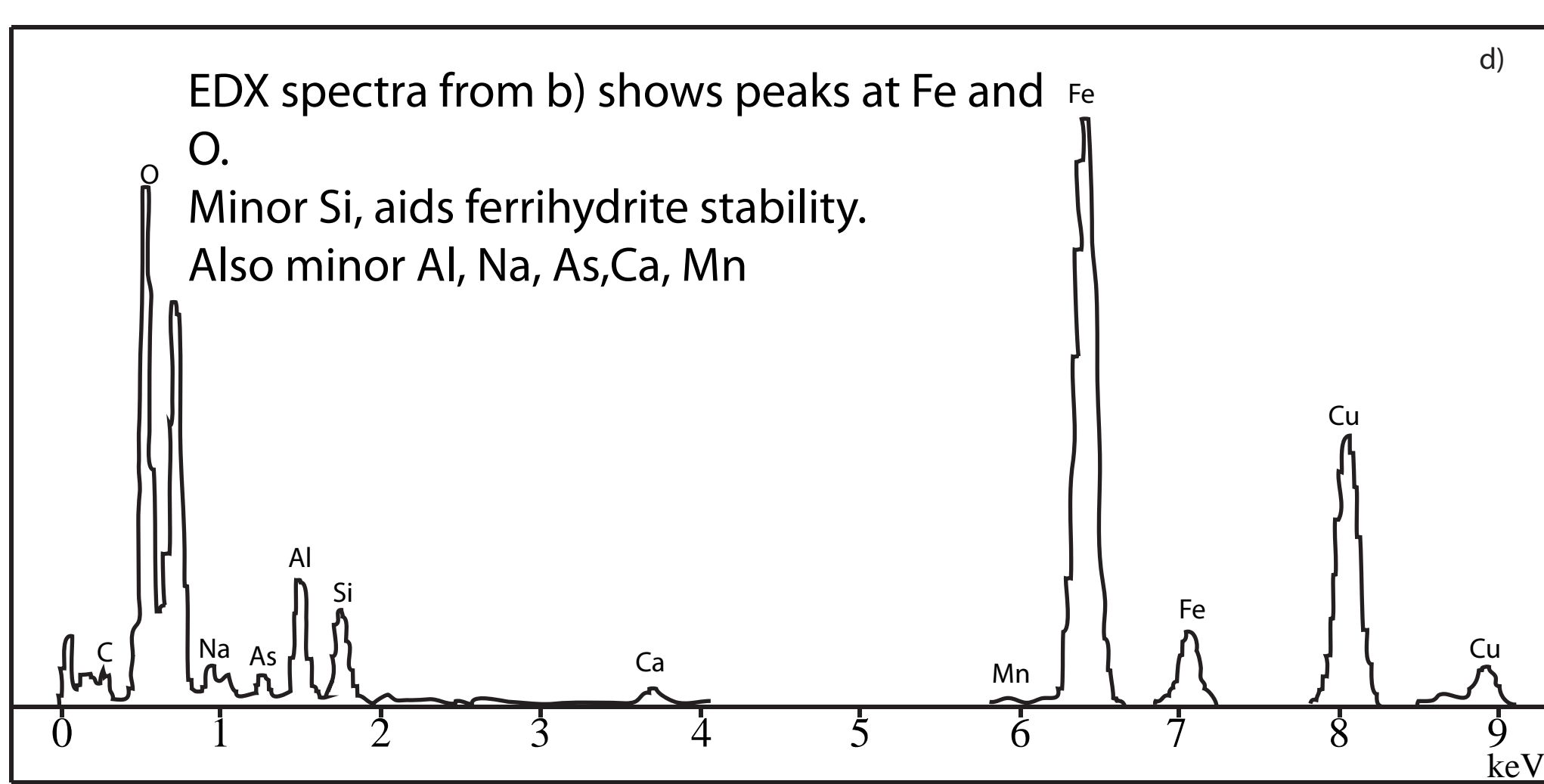
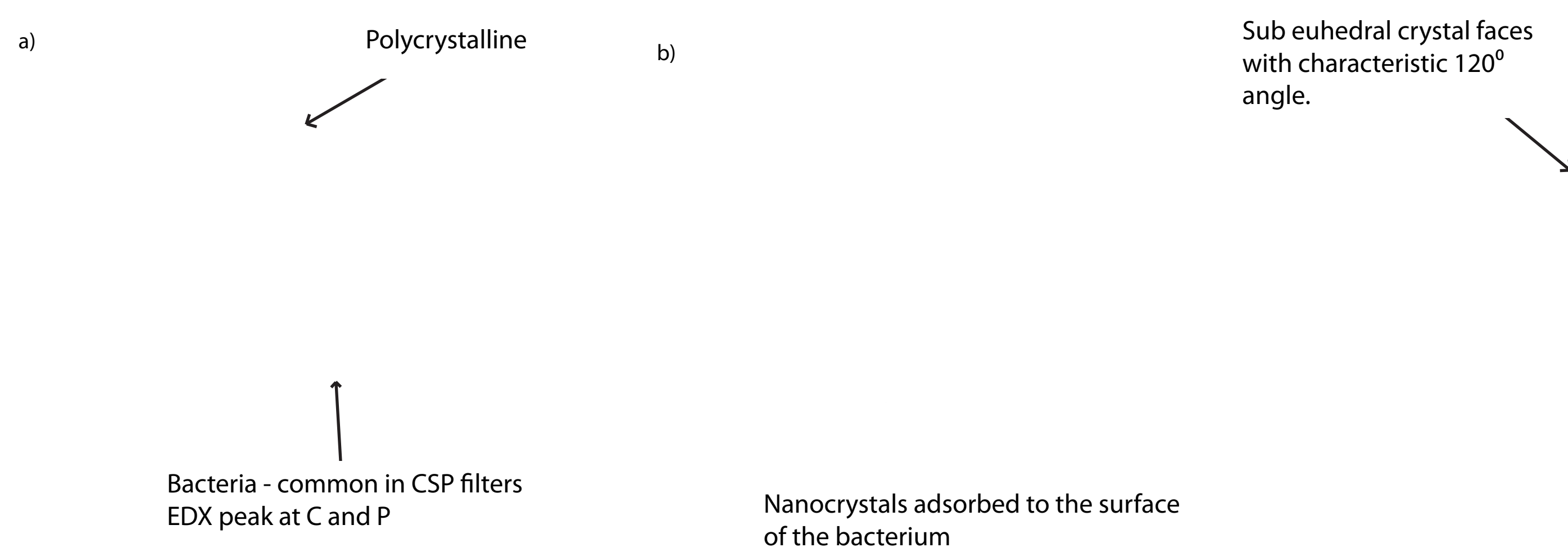
2. Size Separation Analysis



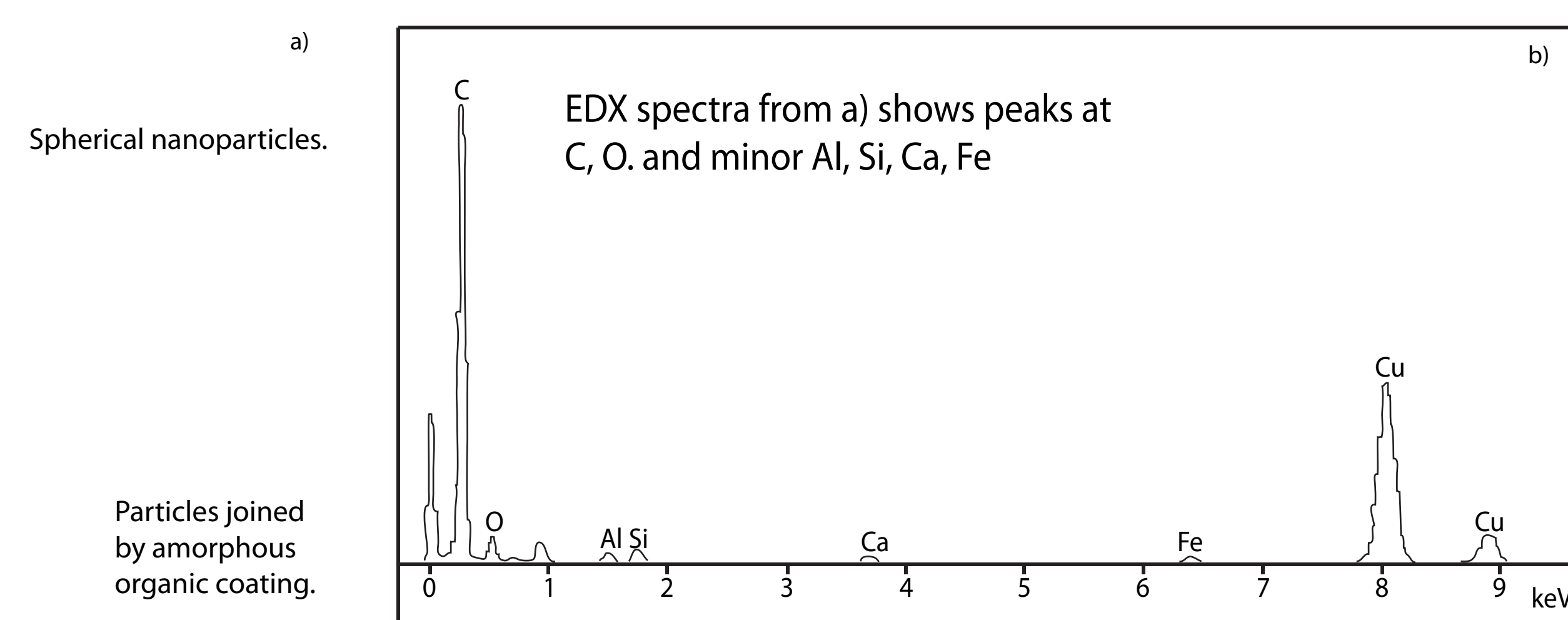
Particulate: > 0.22 μm HMW Colloidal: < 0.22 μm - 10 kDa LMW Colloidal: 10 kDa - 1 kDa Dissolved: < 1 kDa

1) Fe-Mn HMW colloid in CSP 2) Al, Fe, Si HMW colloid in the Aldan, LAIRA and Lena River

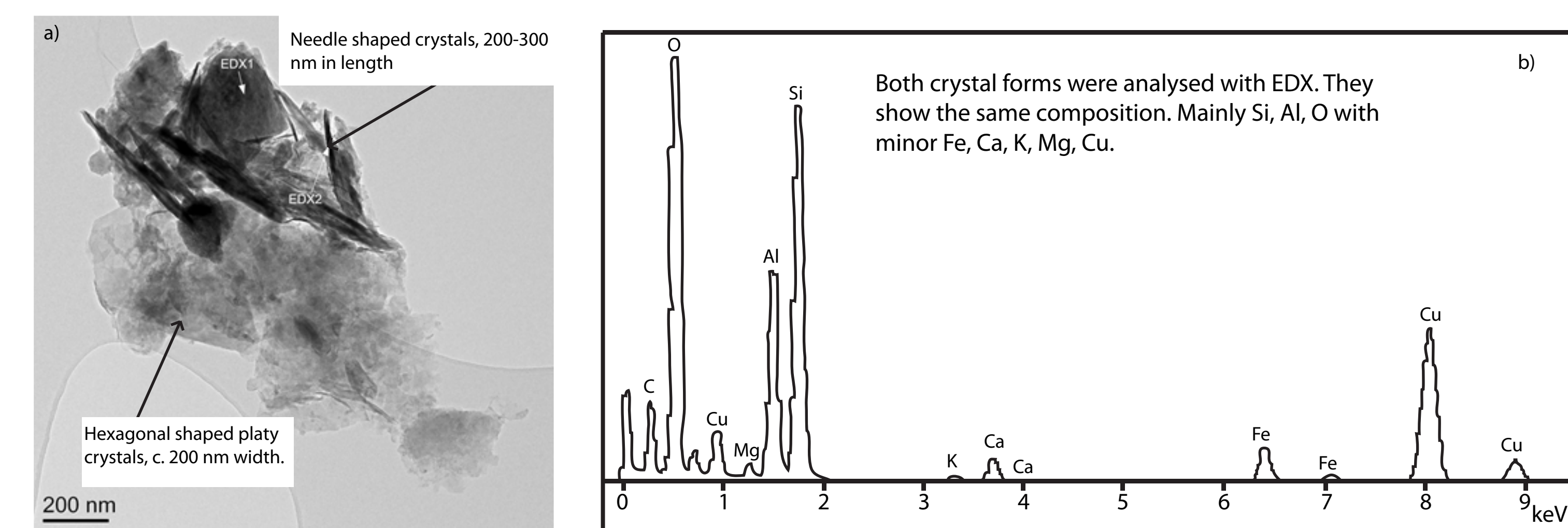
2. TEM: Iron Oxide (Ferrihydrite)



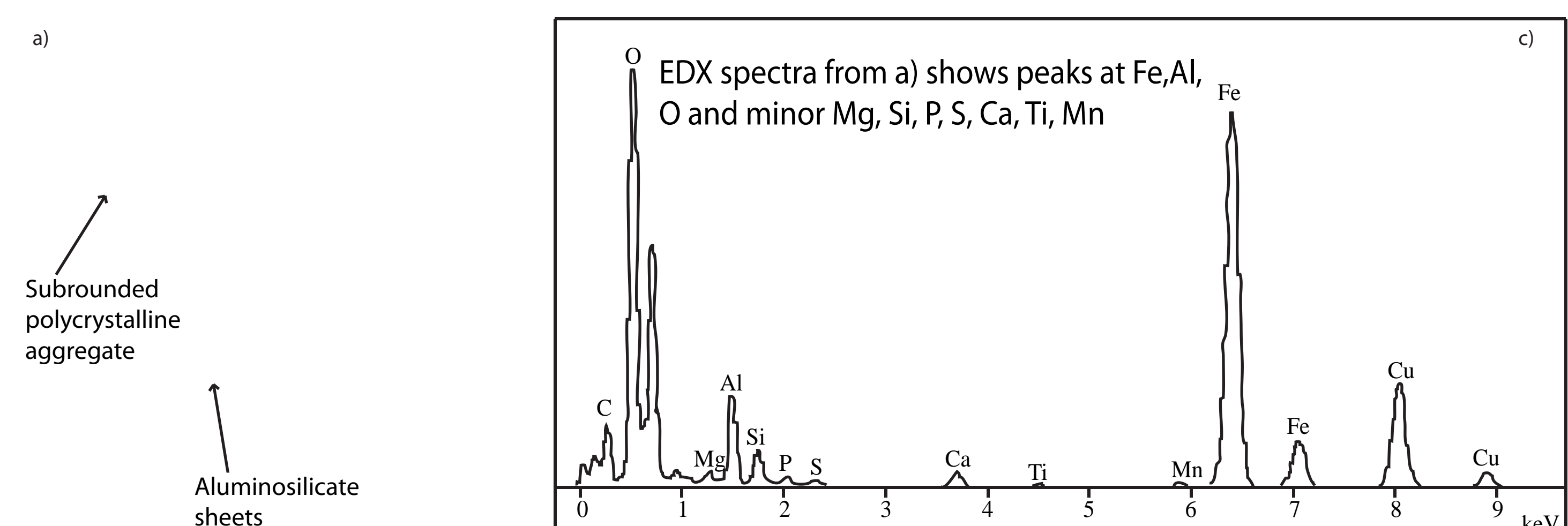
3. TEM: Organics



4. TEM: Aluminosilicate



5. TEM: Hematite & Aluminosilicate



6. Sequential Extraction of Particulate & Colloidal Matter

- 1) Weak HCl Leach : poorly crystalline iron
- 2) Residual dissolution : organic bound iron / silicate bound iron

Location	Weak HCl Leach Fe (μg Fe / L)	Residual Fe (μg Fe / L)	Total Fe (μg / L of river water)	% Non Crystalline/Amorphous Iron
Lena River	116	82	198	60
Aldan River	88	272	360	25
Viliui River	115	97	212	55
CSP	257	60	317	80
LAIRA	186	59	245	75
VMR	-	-	-	-

Acknowledgements

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7. Conclusions

1. In all sub-catchments, the highest iron concentration occurs in the particulate (>0.22 μm) and HMW colloidal (0.22 μm - 10 kDa) phase.
2. There are at least two different forms of colloidal iron in the Lena River catchment area : 1) Fe associated with Al and Si 2) Fe associated with Mn and organic matter.
3. 25 - 81% of the iron corresponds to amorphous / poorly crystalline Fe - highly reactive Fe (HR Fe). This is highest in the Central Siberian Plateau.
4. TEM analysis confirms the presence of this HR Fe. Ferrihydrite is observed in all sub-catchments. It is observed to be attached to the surface of bacteria (CSP) and organic fibrils (CSP) and clay particles (VMR, Aldan River). Other forms of iron include: hematite (VMR) and iron-alumino silicates (LAIRA).