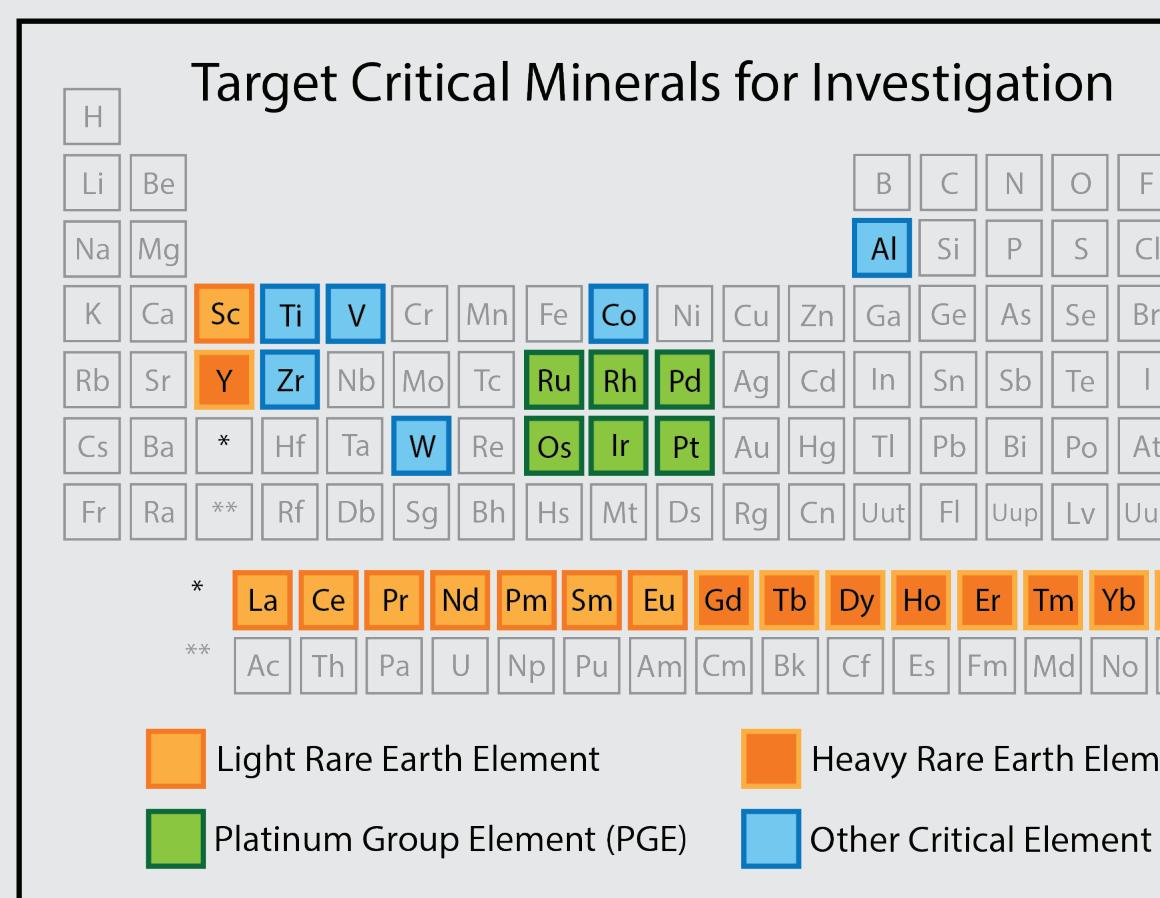


1. Why Study REE and CM?

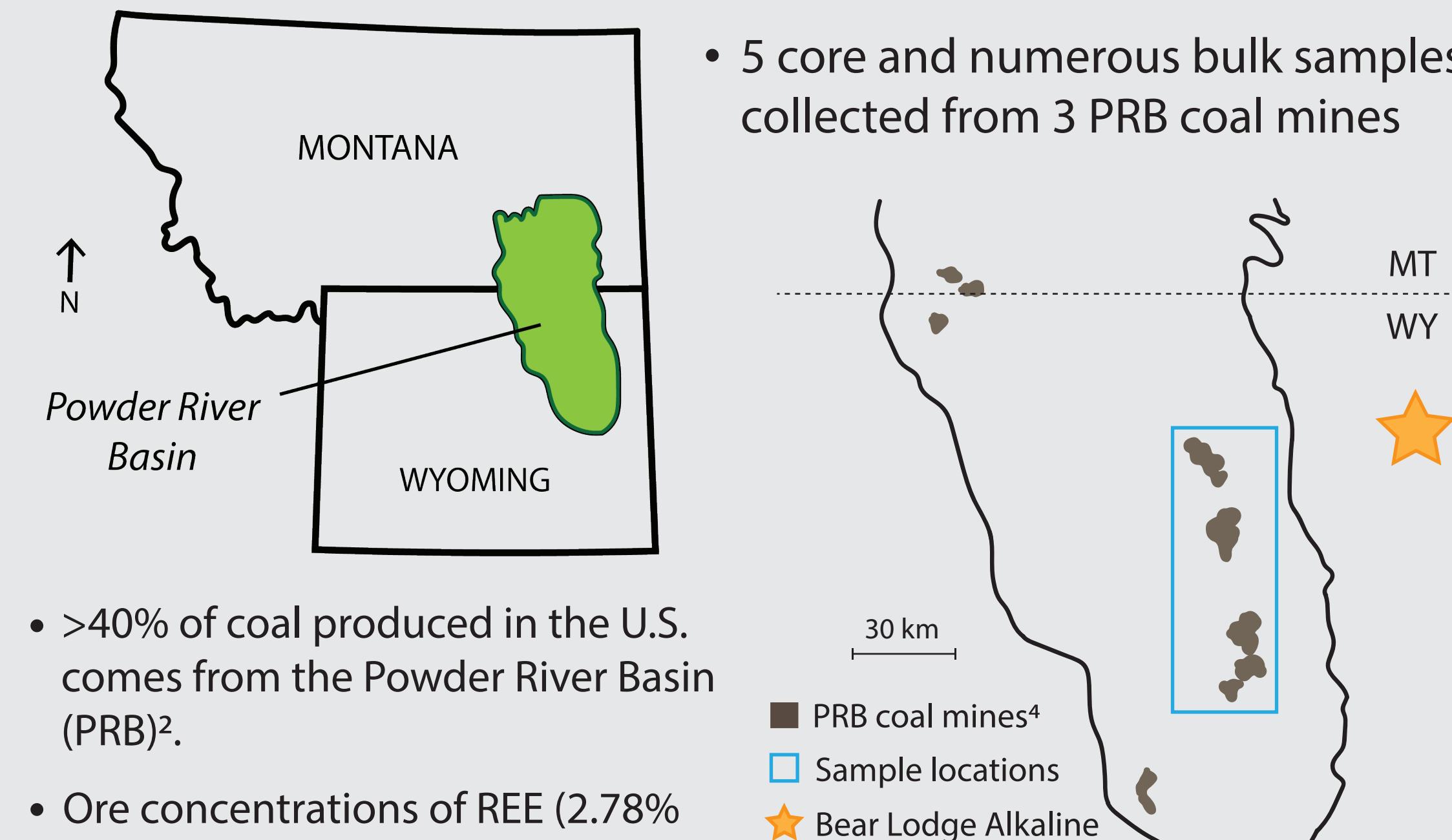
Rare earth elements (REE) and critical minerals (CM) are essential for energy transition technologies including:

- wind turbines
- solar cells
- electric motors and batteries

Coal and coal byproducts may be an unconventional source of domestic REE and CM¹.

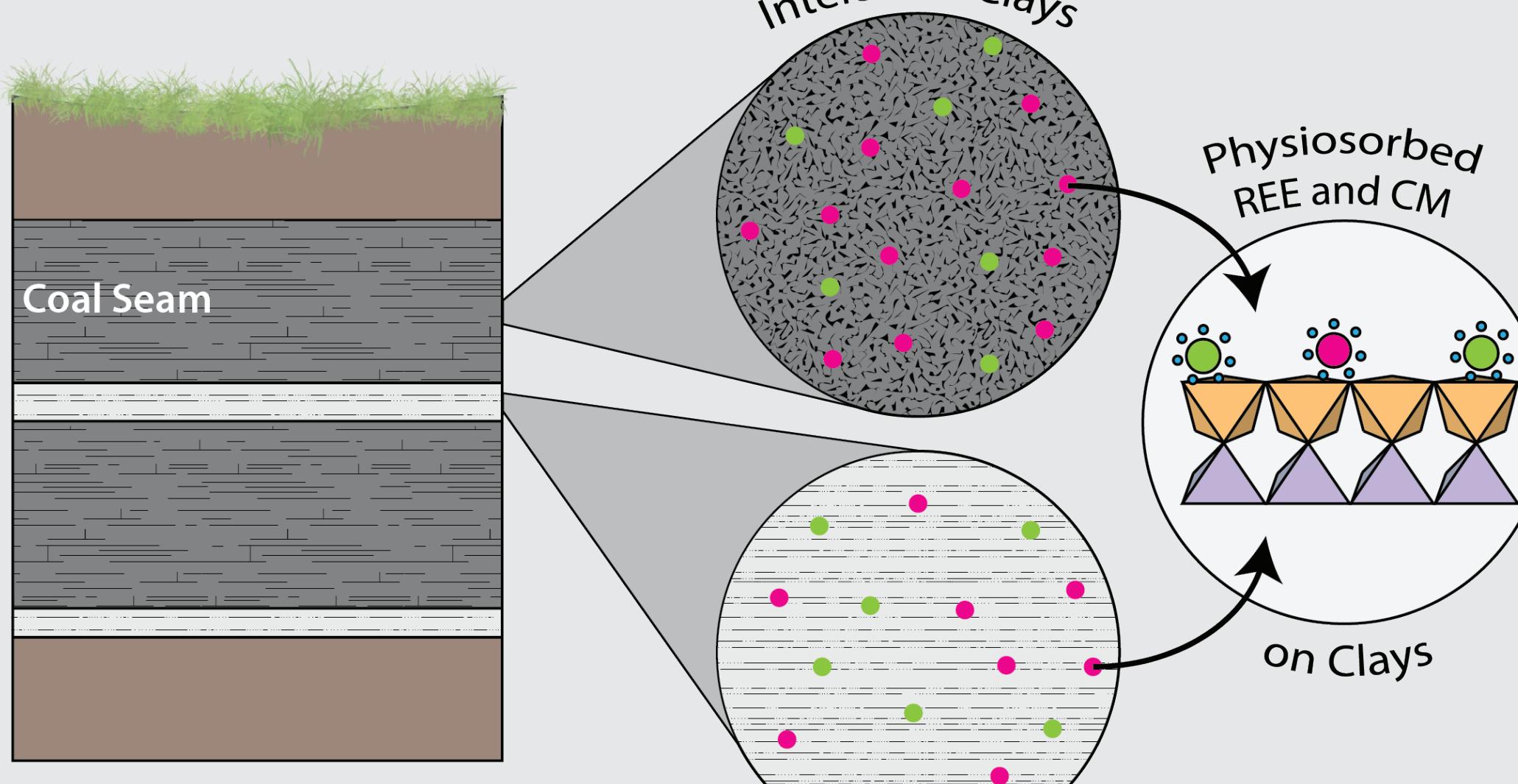


2. Location and Sampling



3. Coal-hosted Clay Minerals

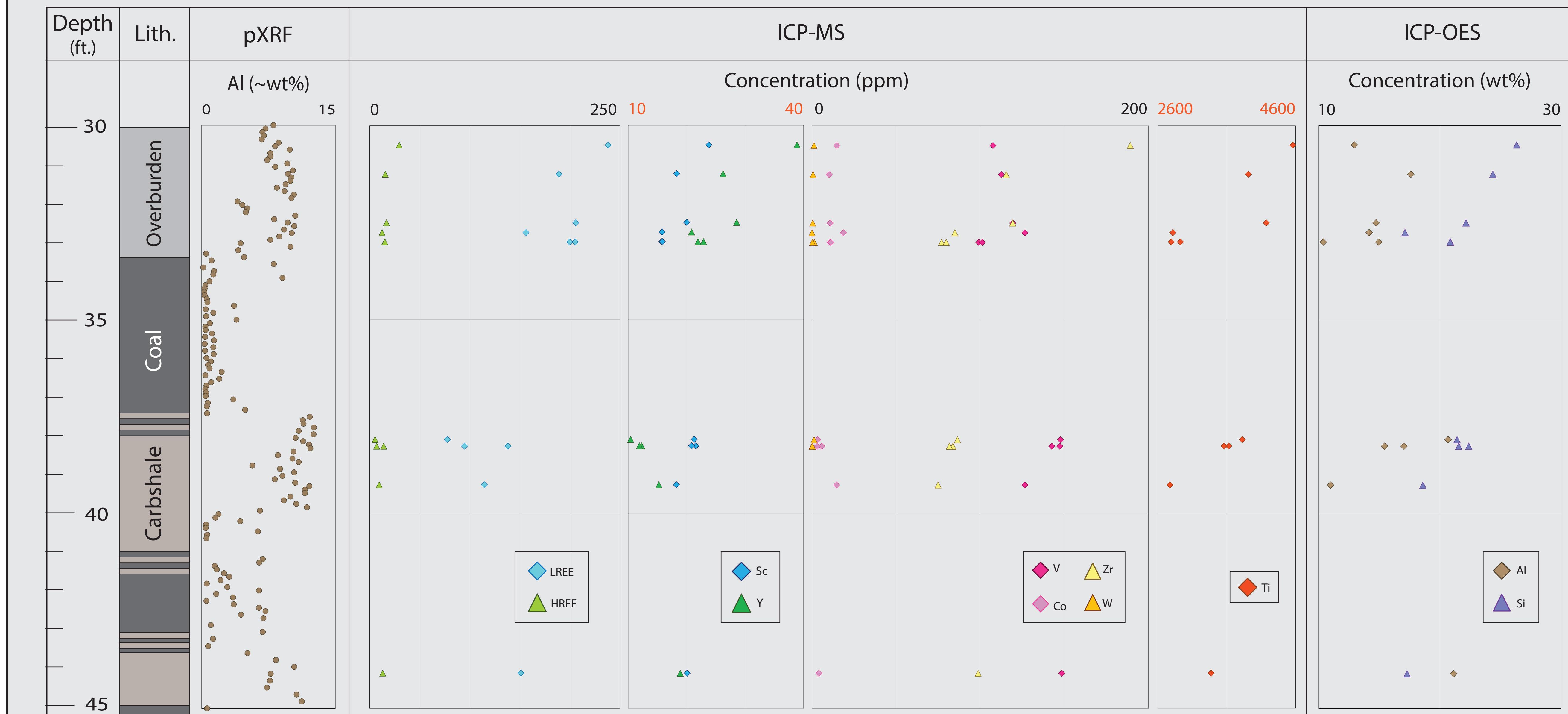
How do REE and CM fractionate into clay minerals within PRB coal deposits?



Hypothesis: REE and CM (pink and green) will preferentially sorb to the surfaces of clay minerals (aluminosilicates) (orange and purple) in clay-rich sections of the coal deposit.

4a. Geochemistry*

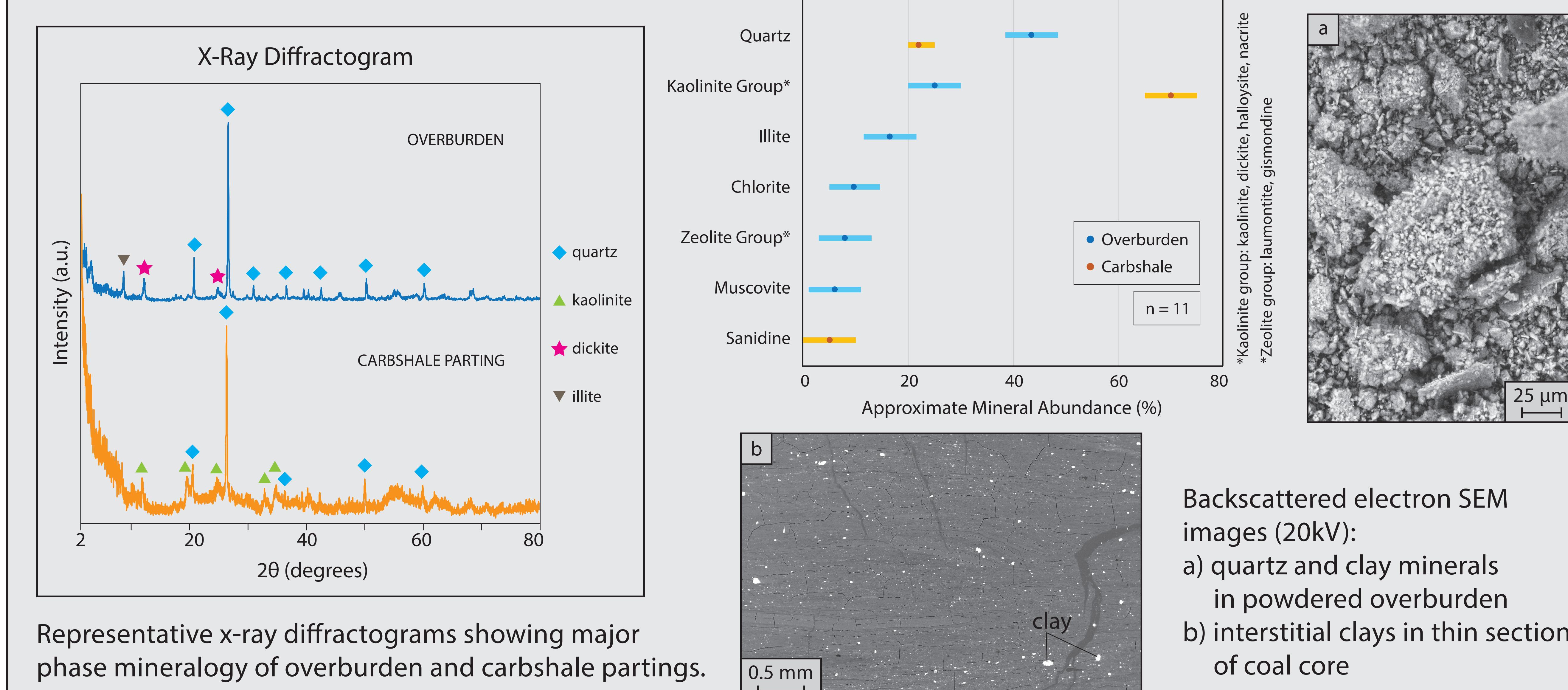
Range of total REE 120 - 330 ppm (n=11); PGEs negligible



*Critical element geochemistry of whole rock samples. Size of data points encompasses uncertainty values.

4b. Mineralogy and Morphology

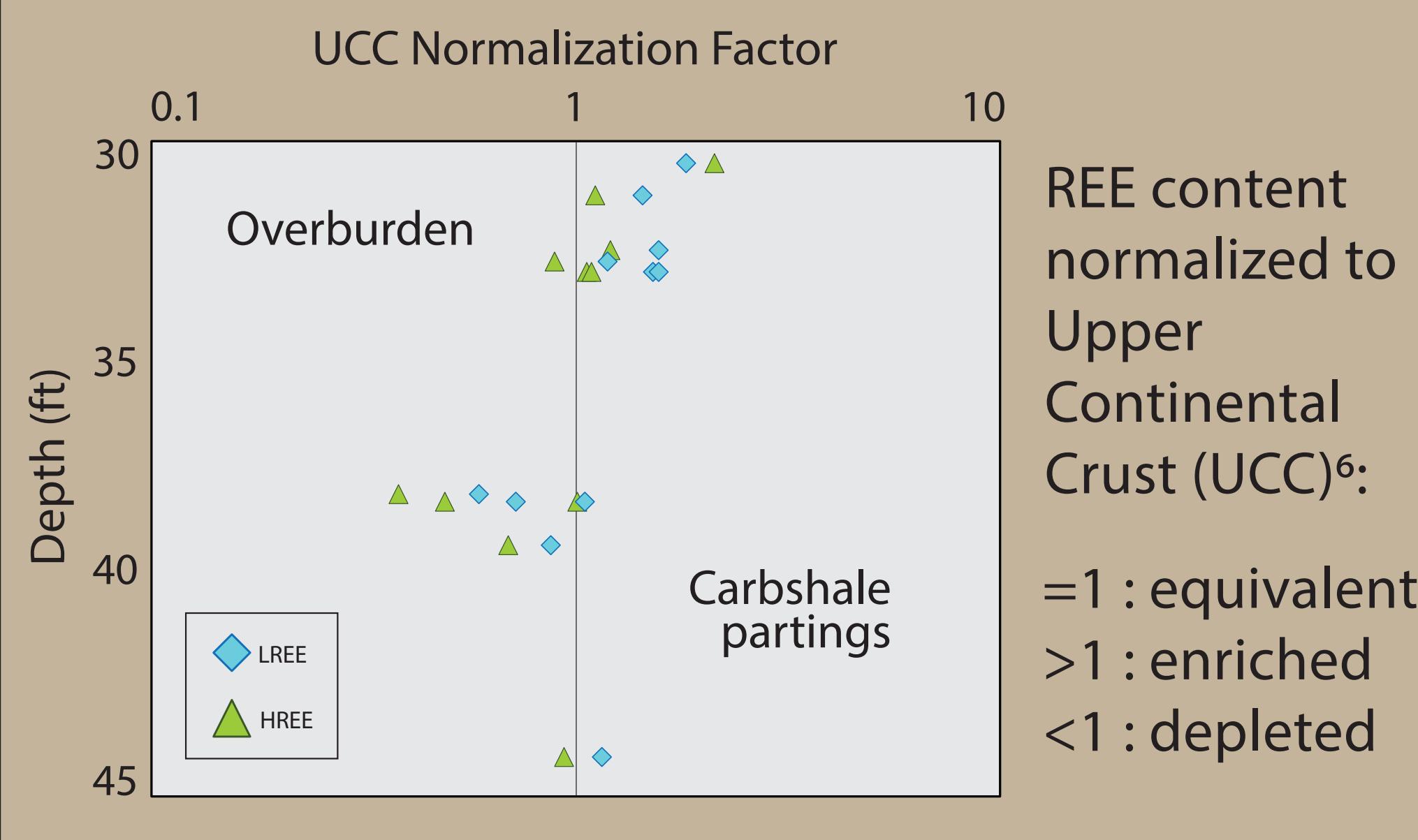
Range of mineral abundances in overburden and carbshale parting



5. Discussion

Known correlation between REE and Al content⁵
Similar concentrations of Al in overburden and carbshale parting

- Overburden enriched in LREE and HREE
- REE in carbshale at or below crustal abundance



- Physisorption may not be primary binding mechanism⁵

6. Next Steps

Isolate clay minerals

- Perform sequential extractions
- Quantify supernatant liquids

→ Determine relationship between clays and trace metal occurrence

Analyze additional clay samples for increased resolution

- Repeat for coal samples

7. References

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