Spatial correlation of magnetic properties, deformation fabrics, and paragenesis: insights from the Athabasca granulite terrane, northern Saskatchewan

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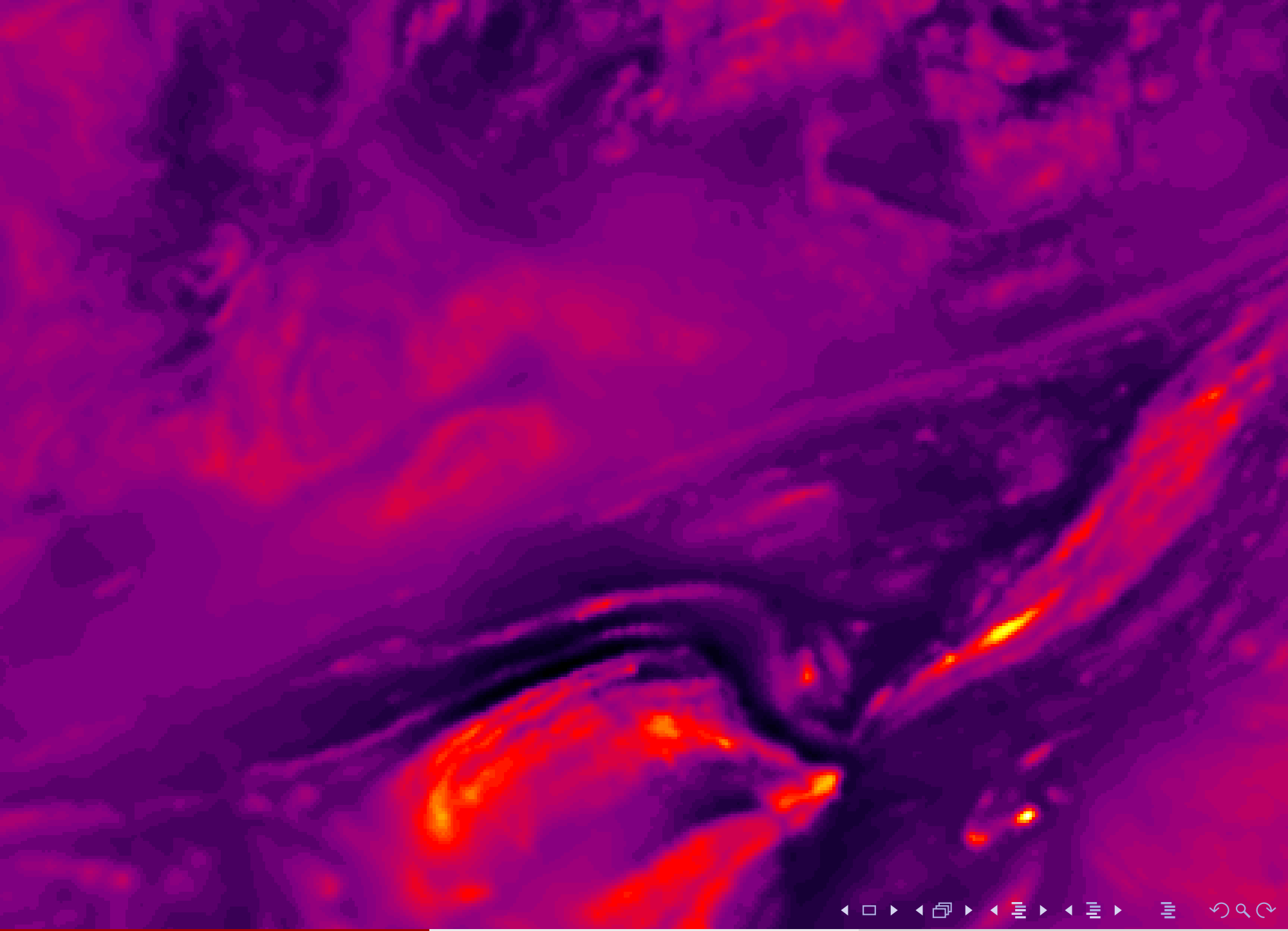
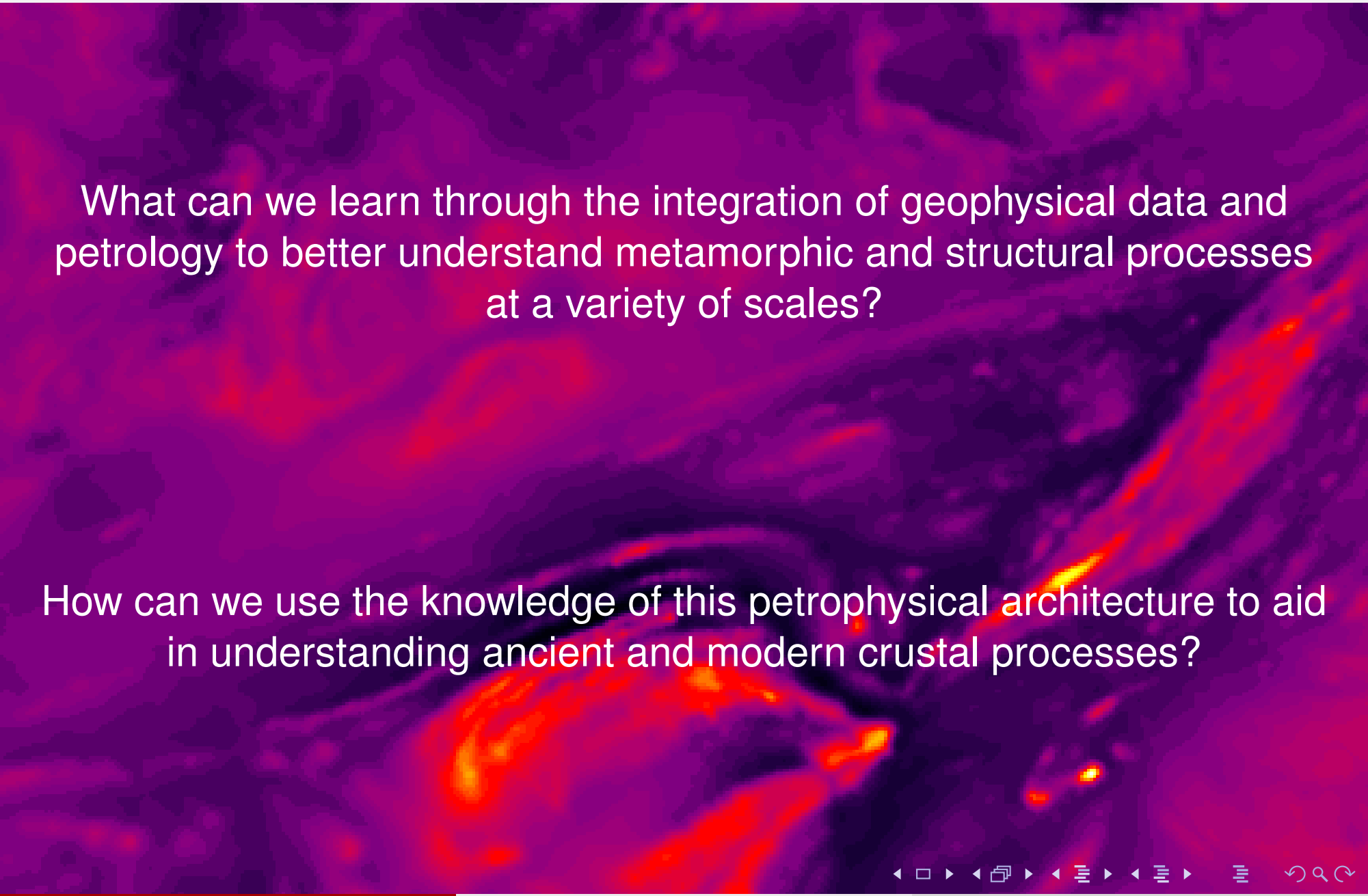
UMASS AMHERST



Motivating questions

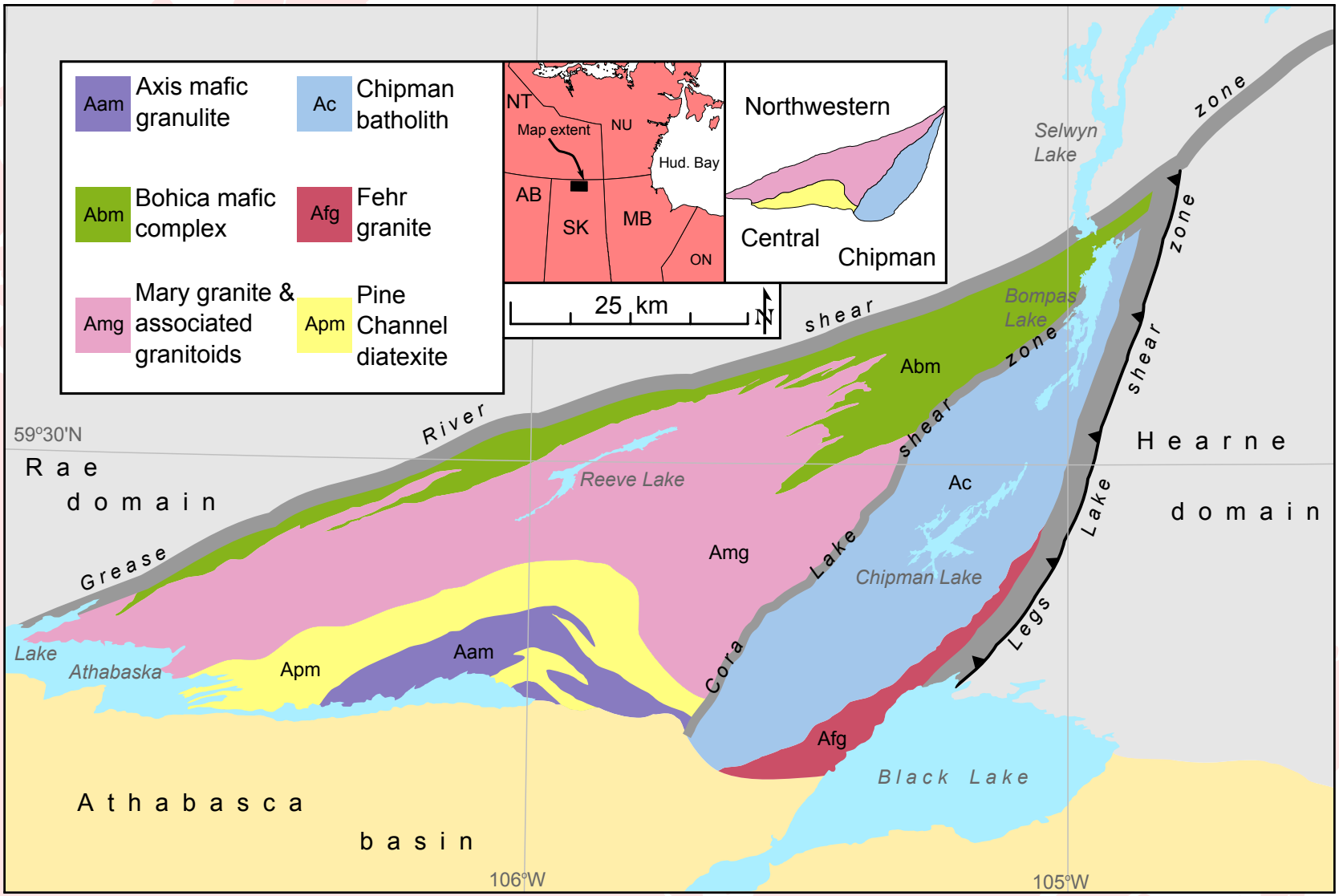


What can we learn through the integration of geophysical data and petrology to better understand metamorphic and structural processes at a variety of scales?

How can we use the knowledge of this petrophysical architecture to aid in understanding ancient and modern crustal processes?

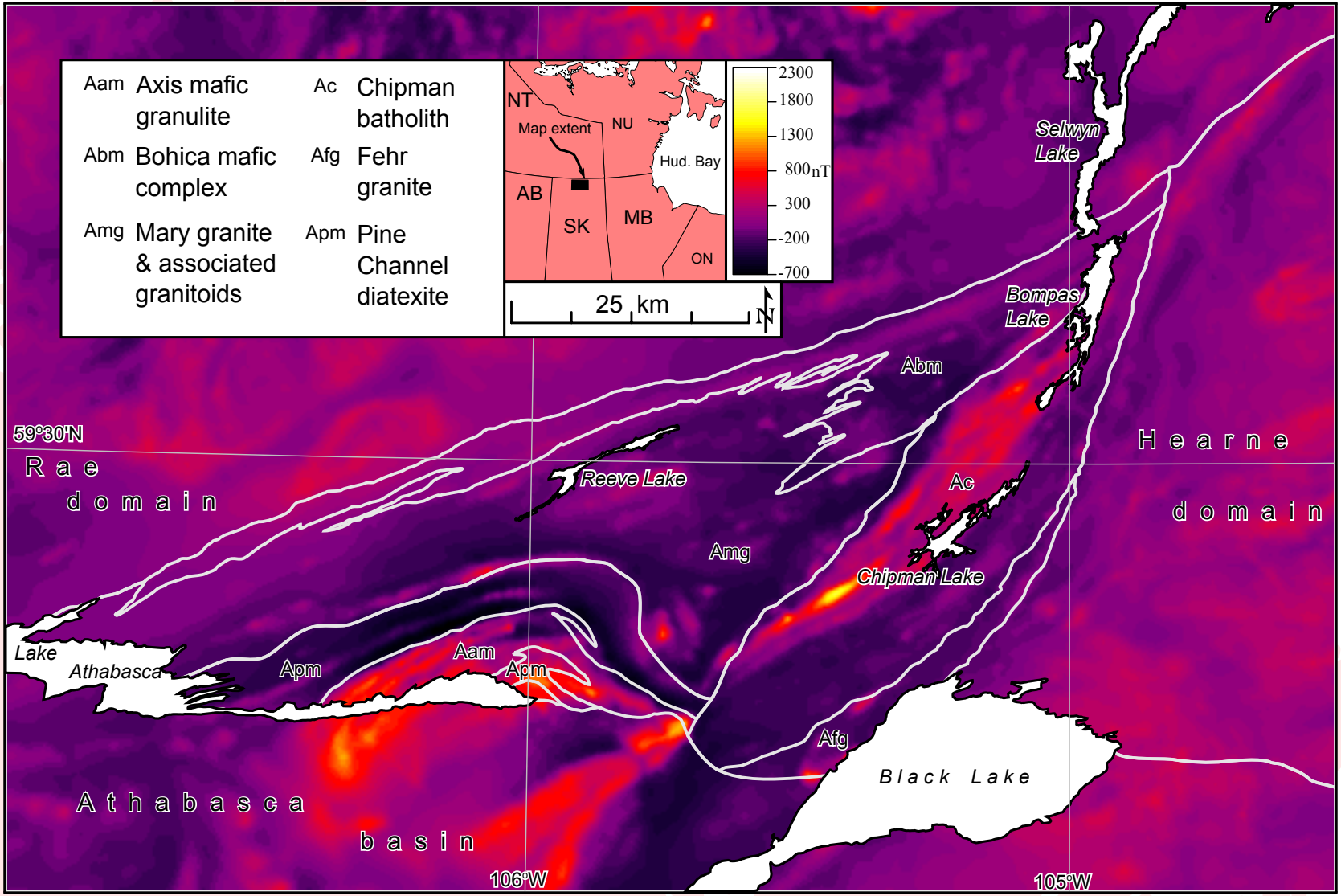
Geological context of the Athabasca granulite terrane

Simplified map modified from Hanmer 1994

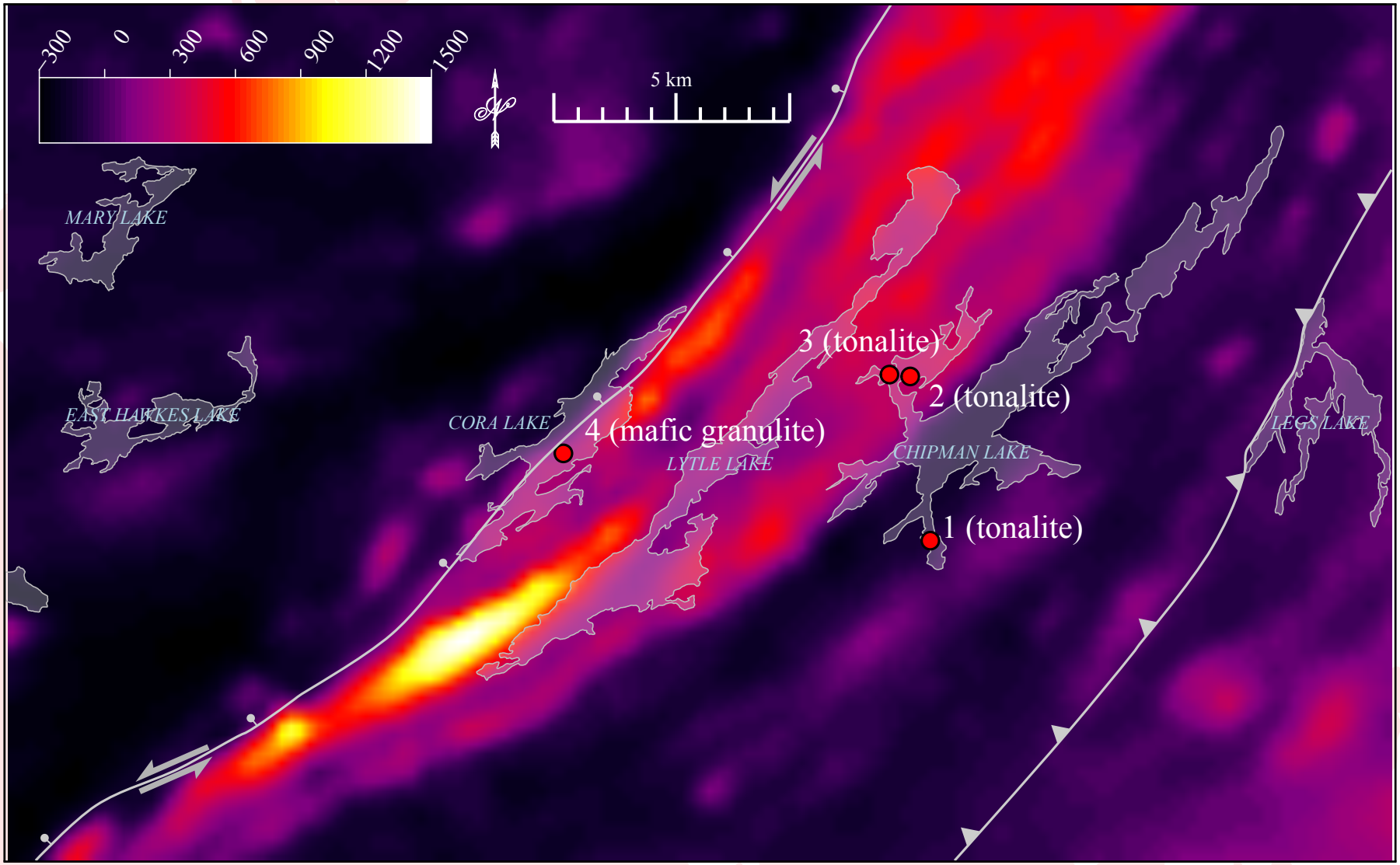


Magnetic patterning of the Athabasca granulite terrane

Raw data provided by the Geological Survey of Canada

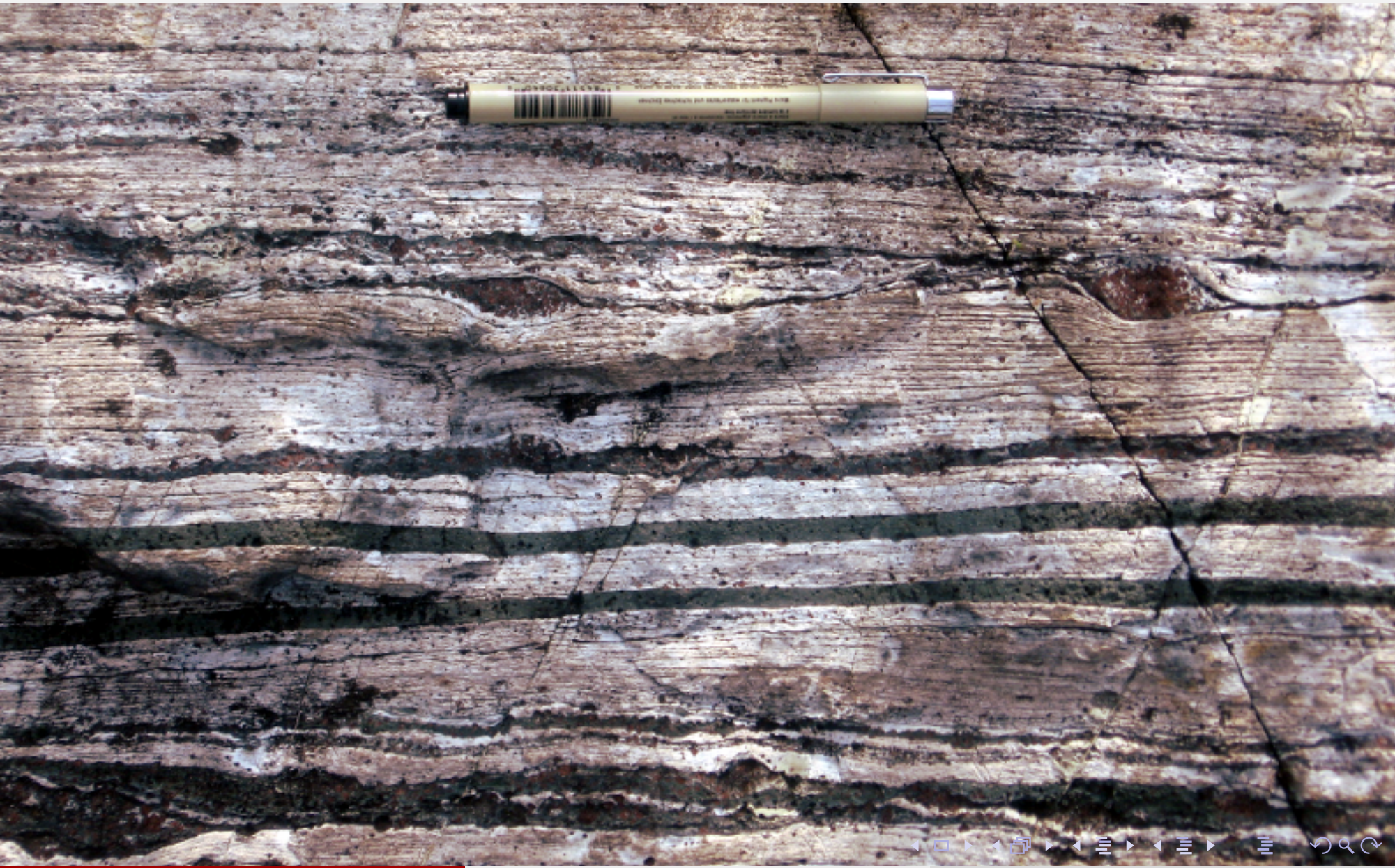


Magnetic expression of the Chipman domain



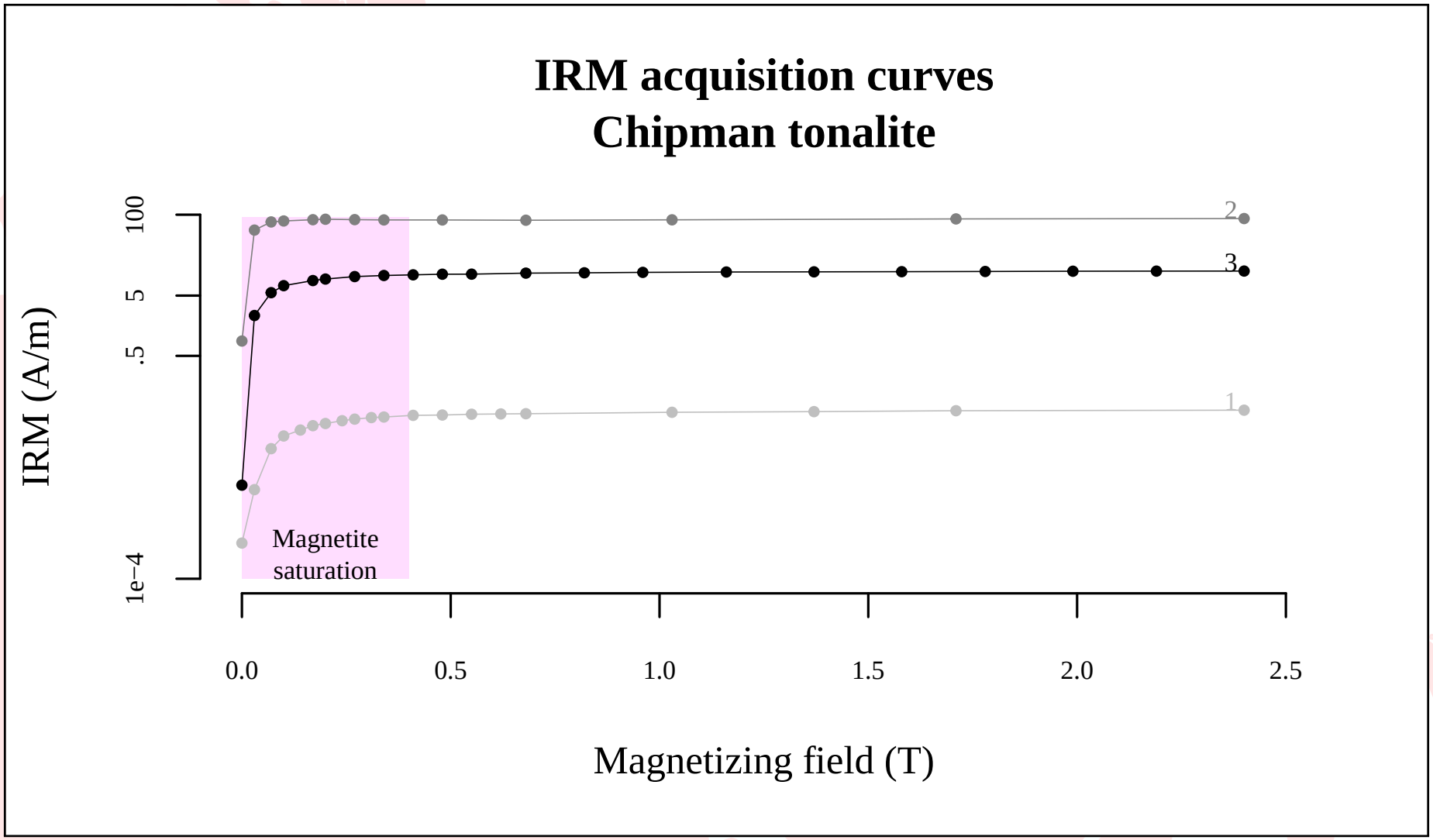
Chipman tonalite samples: 1, 2, &3

Photo by: Sean P. Regan



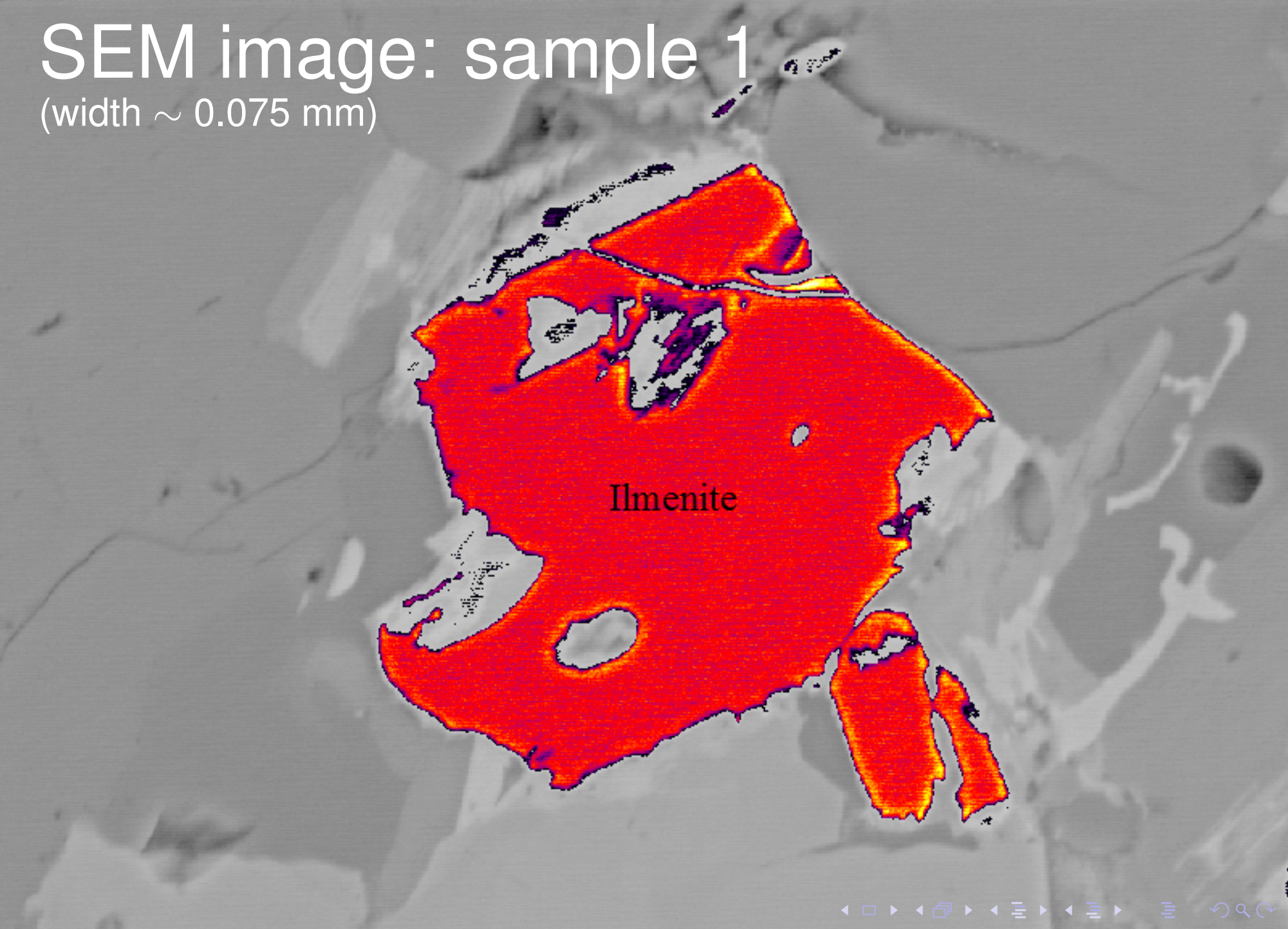
Chipman tonalite samples: 1, 2, &3

Isothermal remanent magnetization



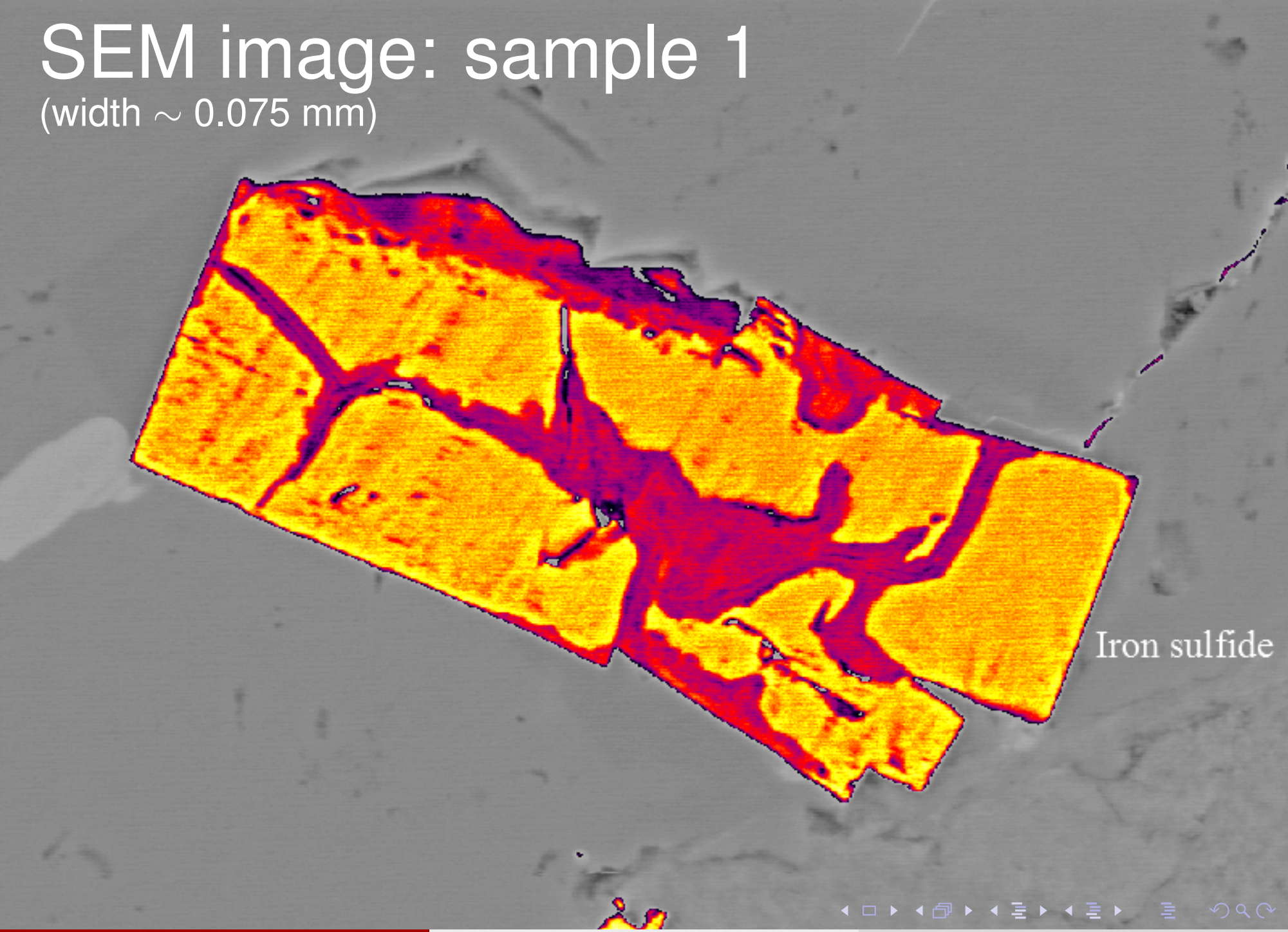
SEM image: sample 1

(width $\sim$ 0.075 mm)



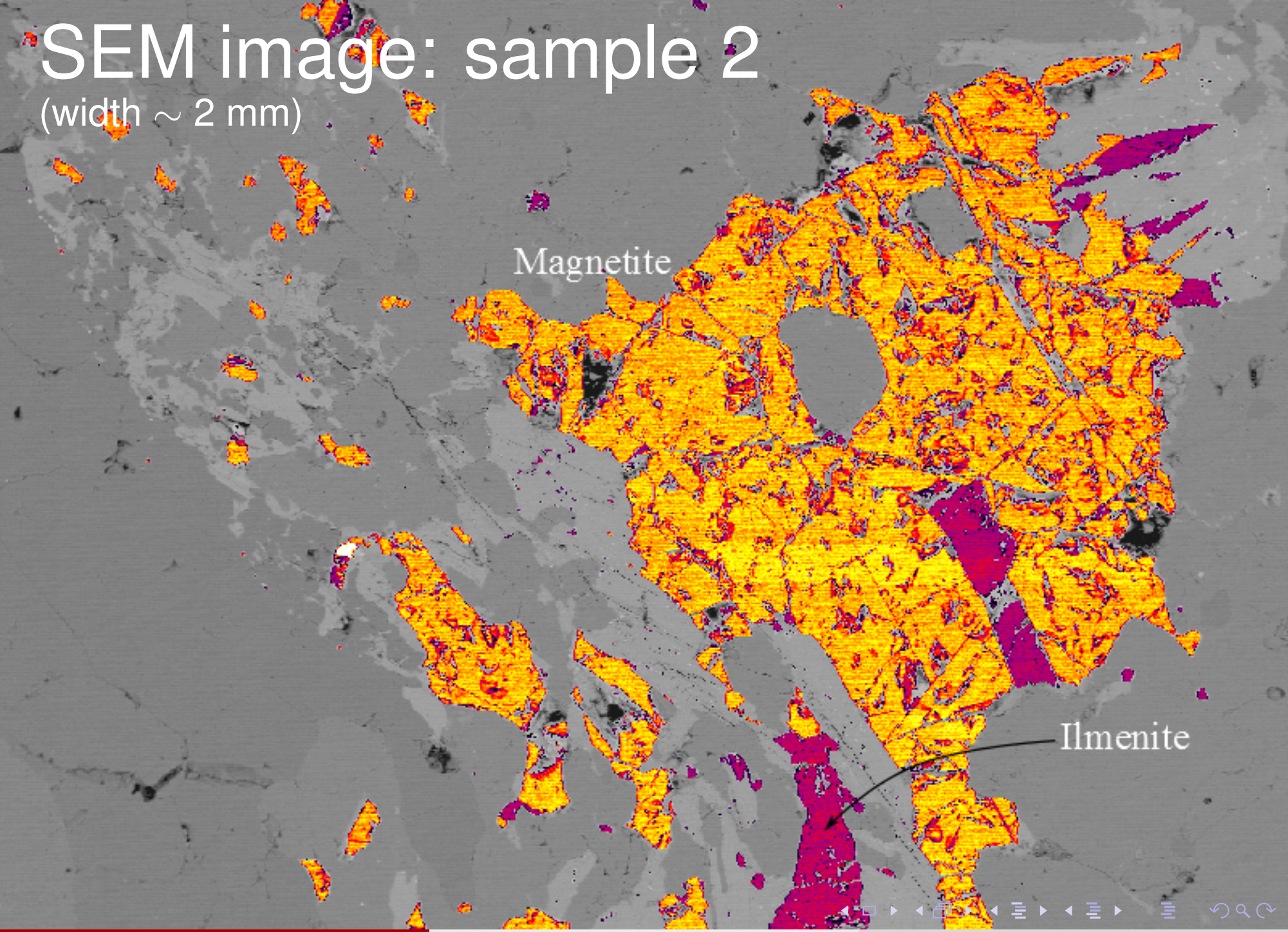
SEM image: sample 1

(width $\sim$ 0.075 mm)

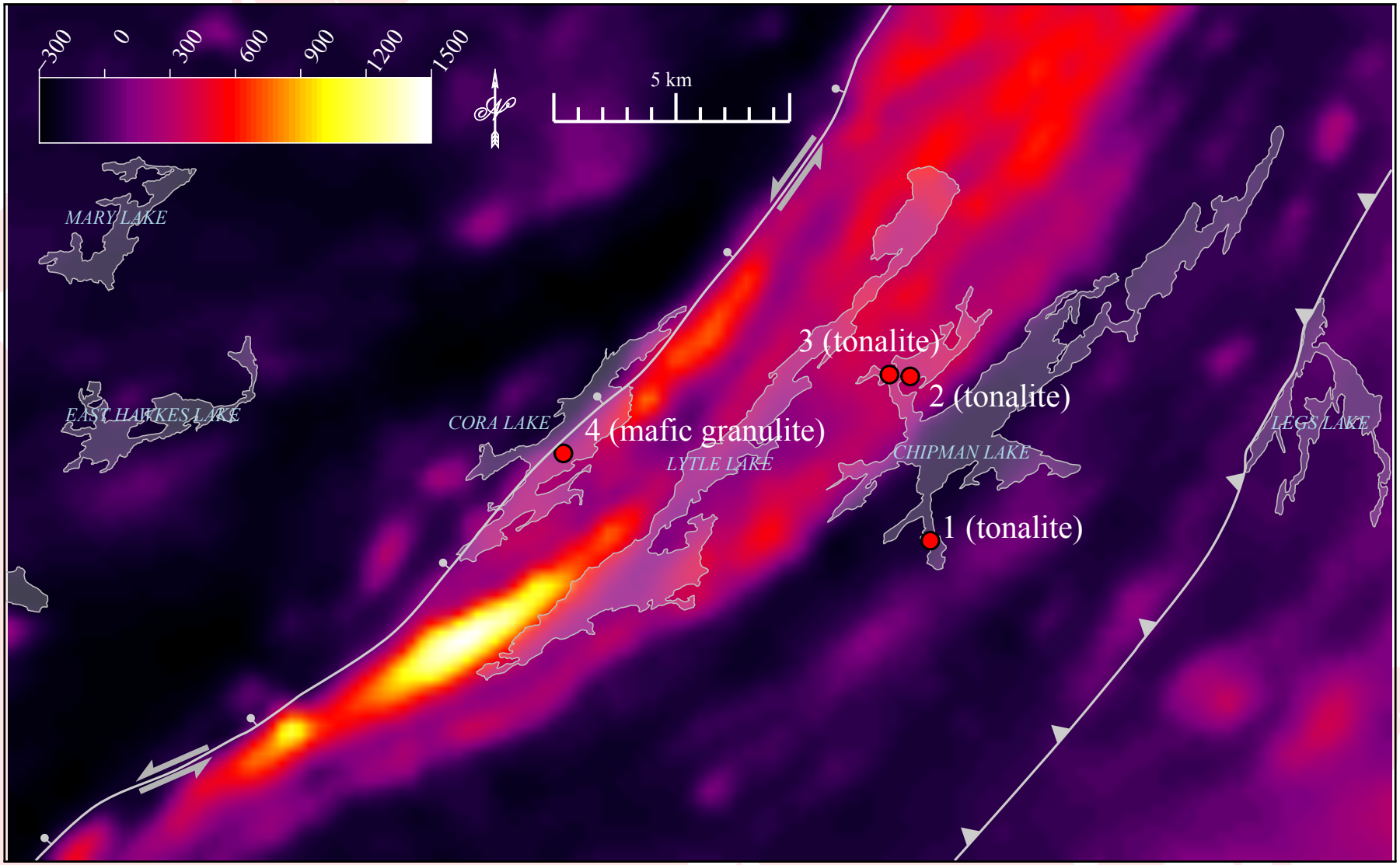


SEM image: sample 2

(width $\sim$ 2 mm)



Mafic granulite sample: 4

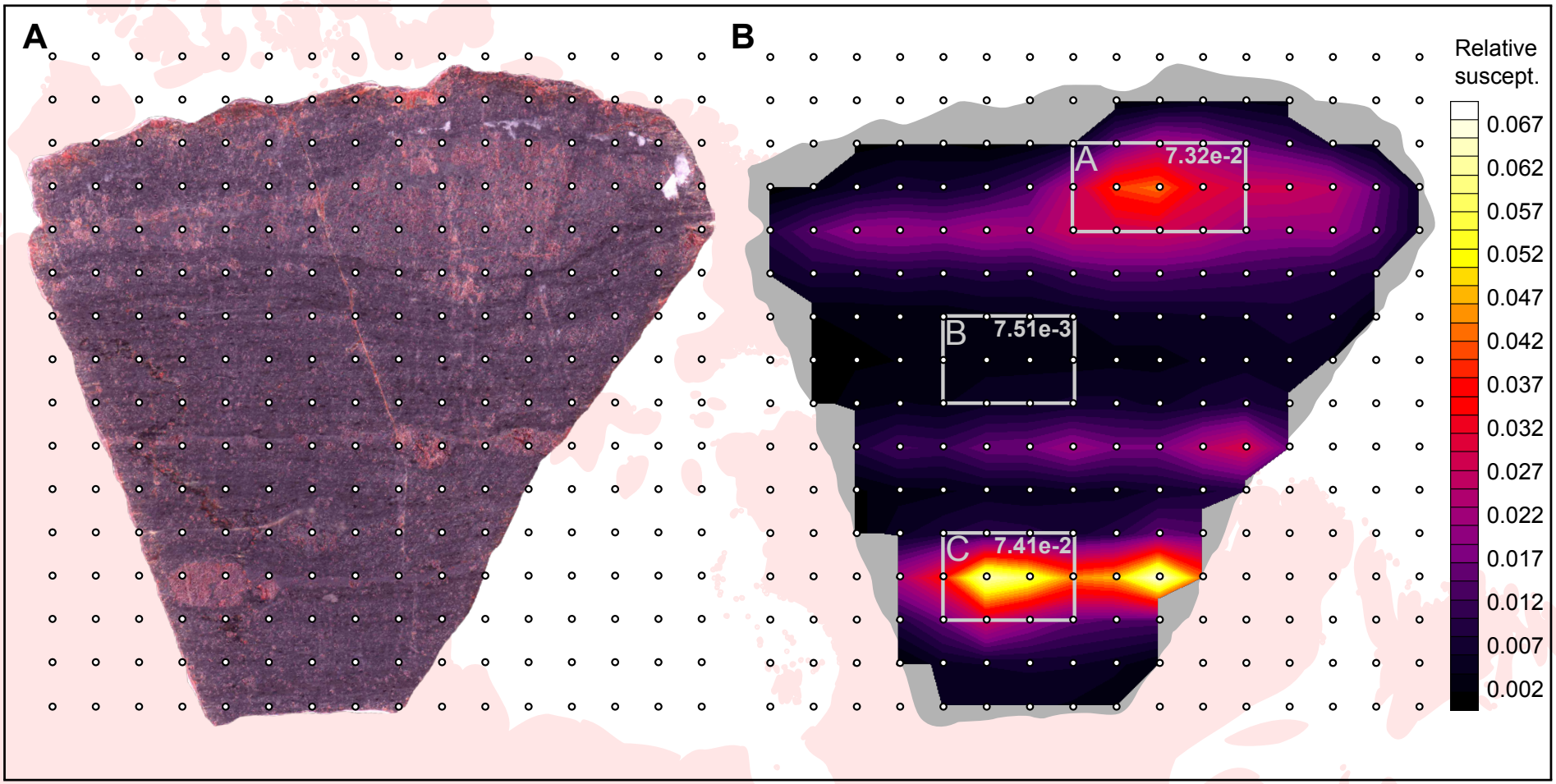


Mafic granulite sample: 4

Photo by: Sean P. Regan

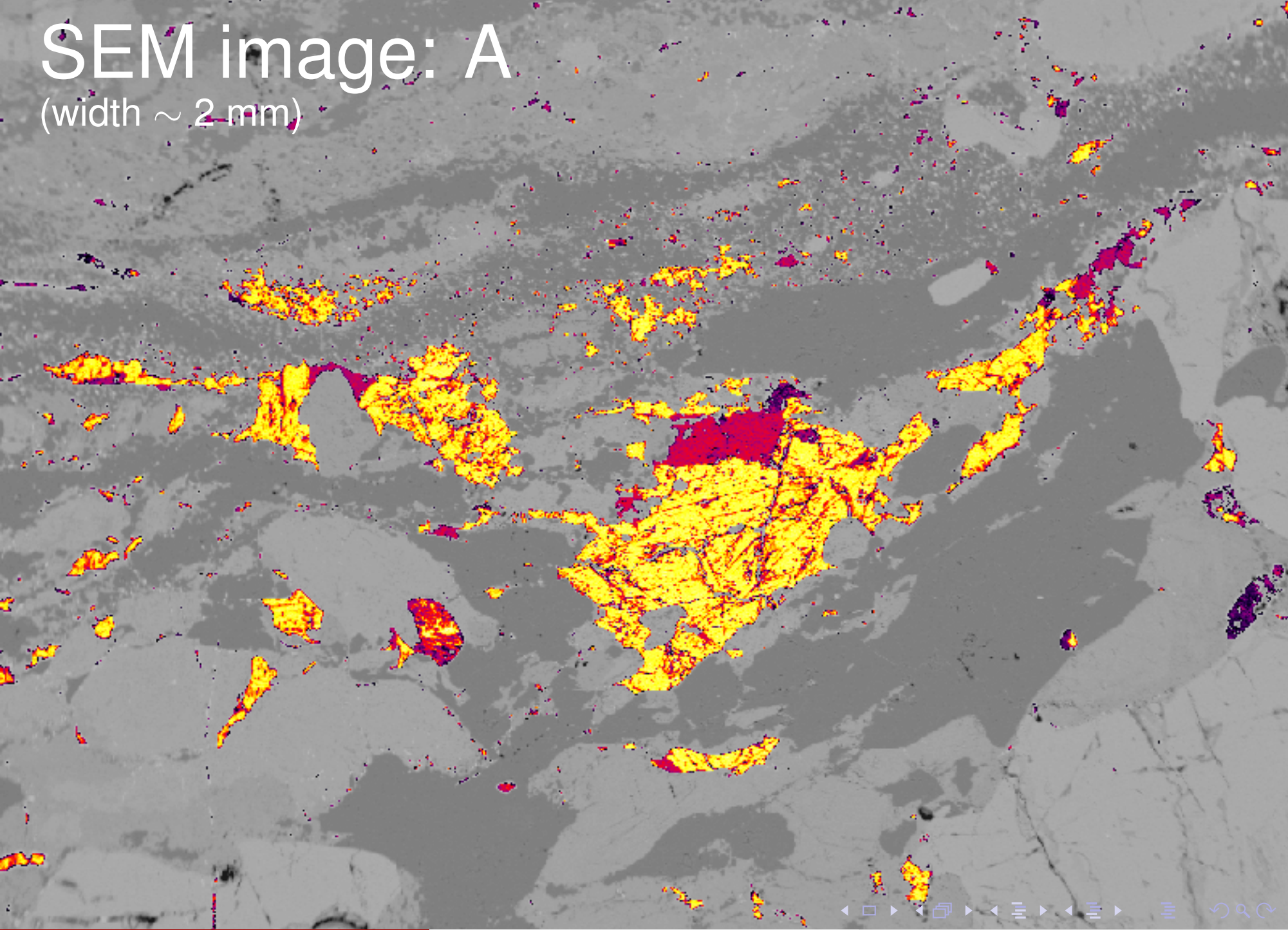
Mafic granulite sample: 4

Heterogeneous magnetic susceptibility



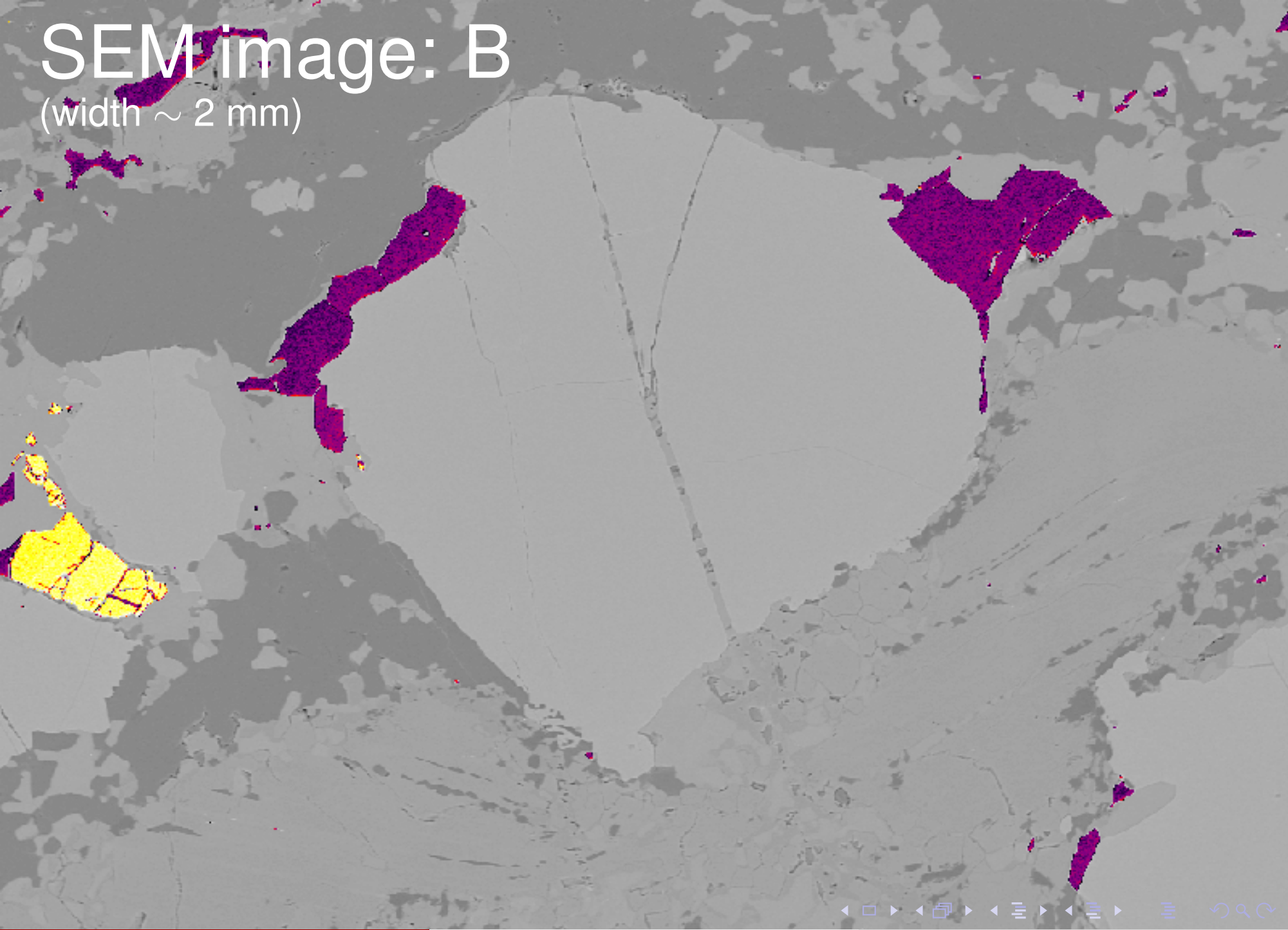
SEM image: A

(width $\sim$ 2 mm)



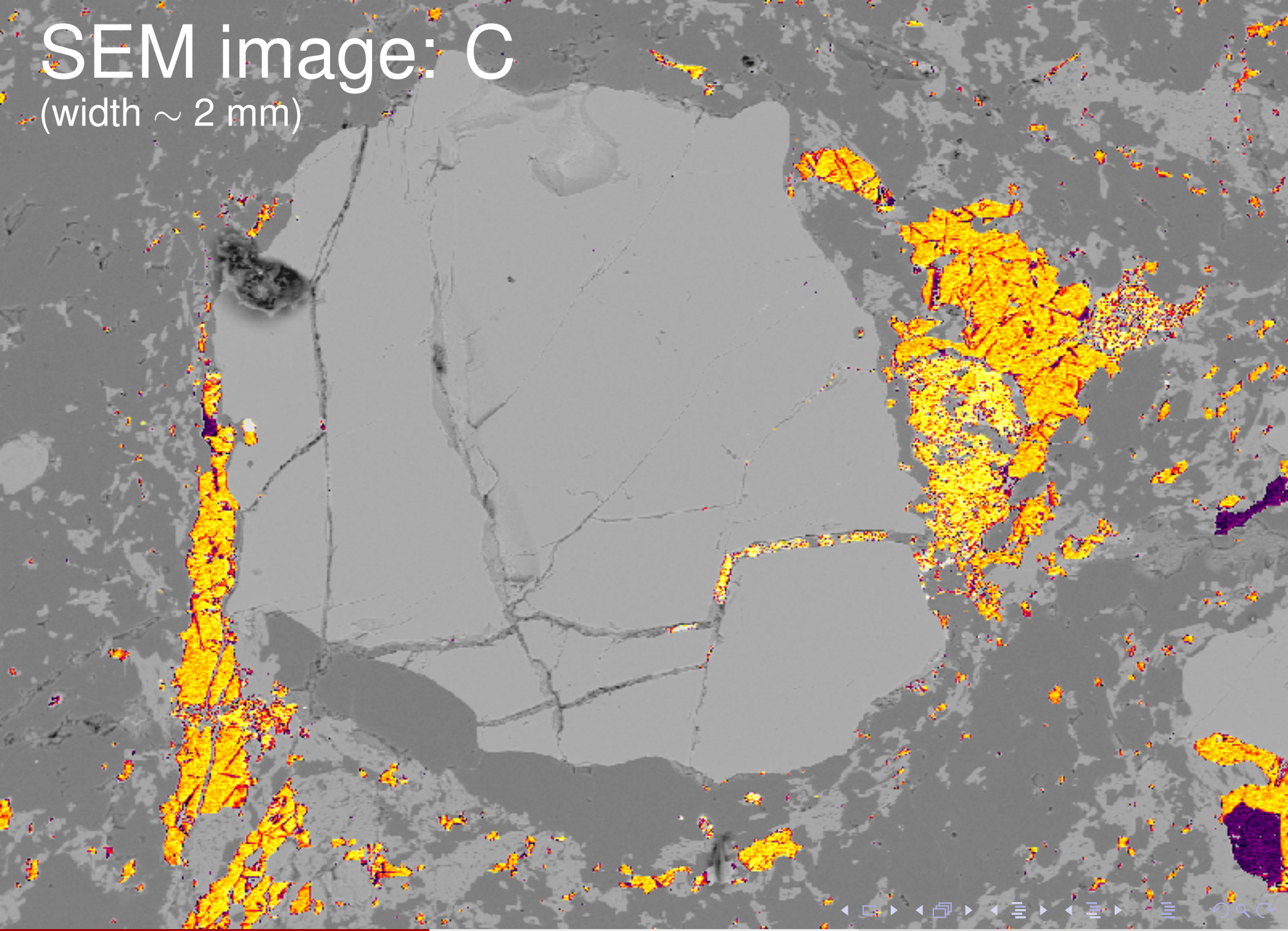
SEM image: B

(width $\sim$ 2 mm)



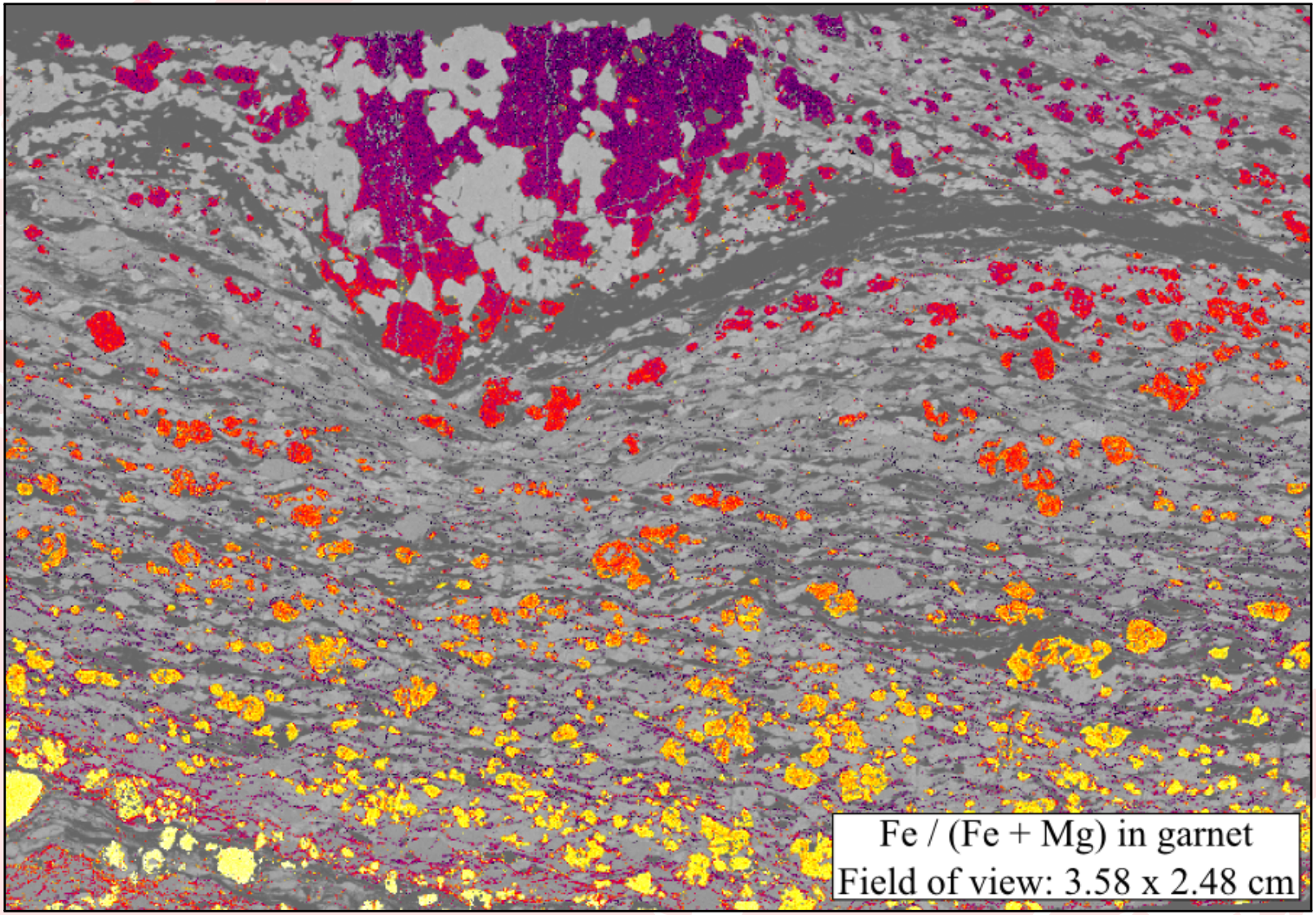
SEM image: C

(width $\sim$ 2 mm)



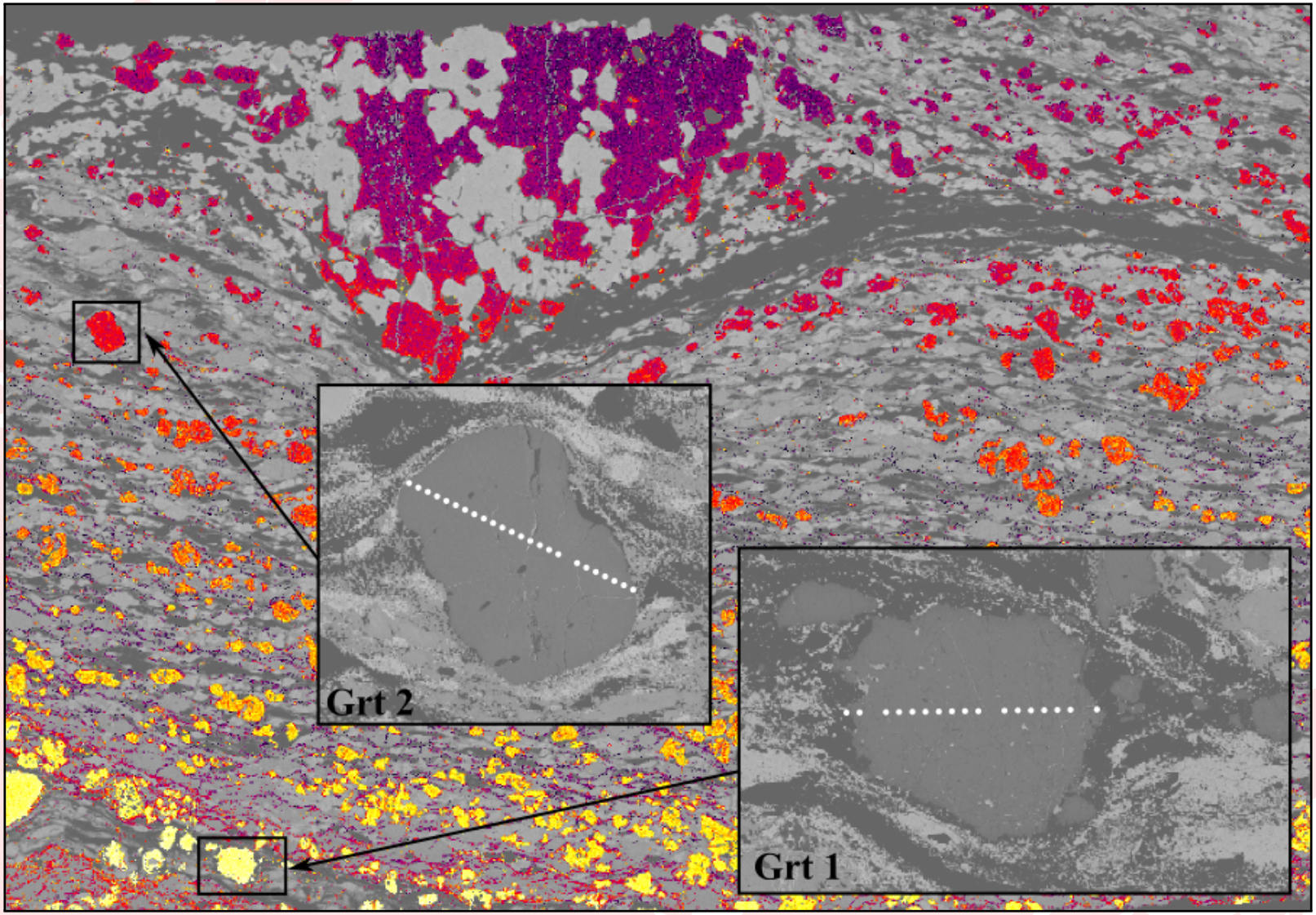
Mafic granulite sample: 4

Whole section compositional gradient in garnet



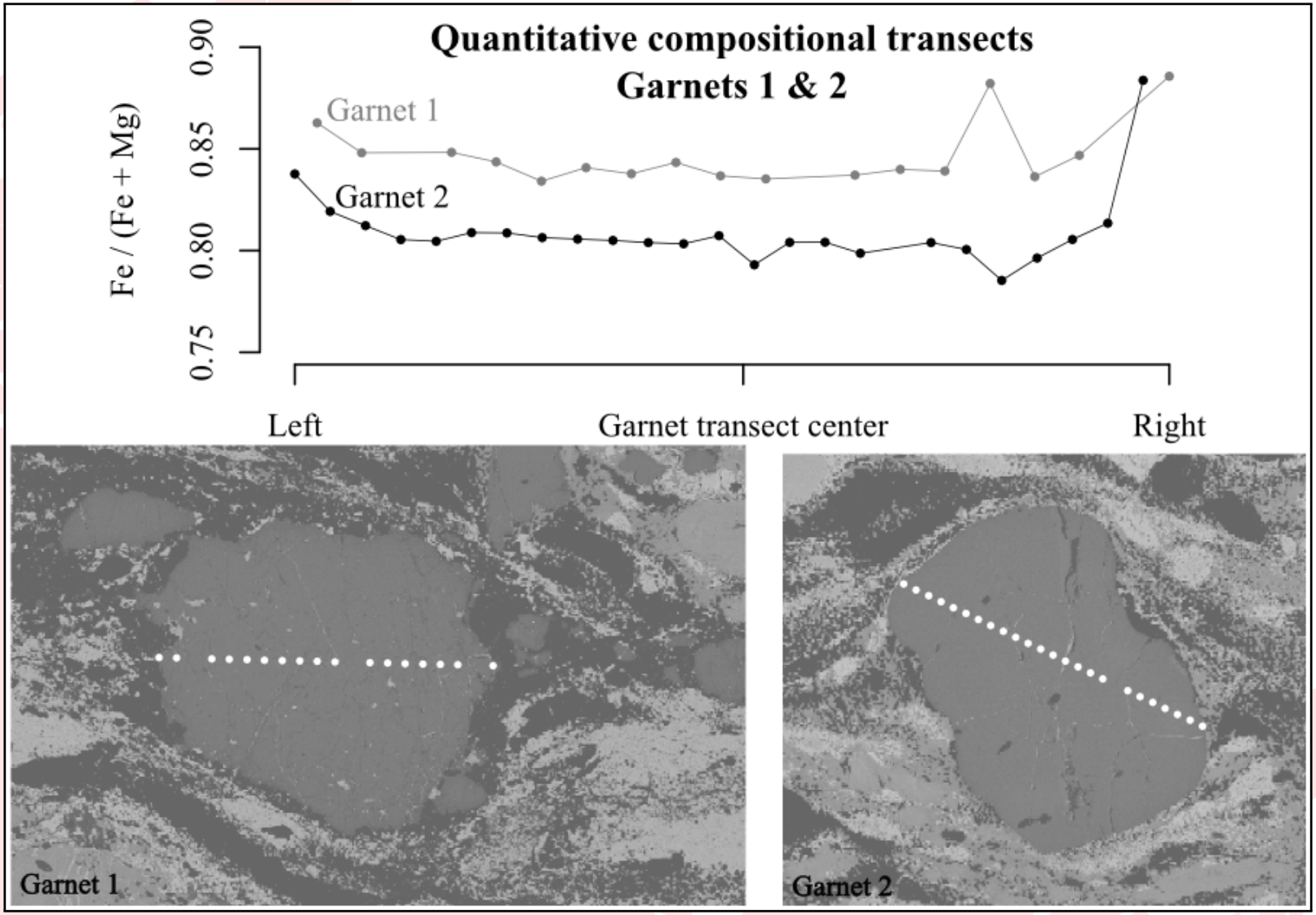
Mafic granulite sample: 4

Garnet compositional mapping



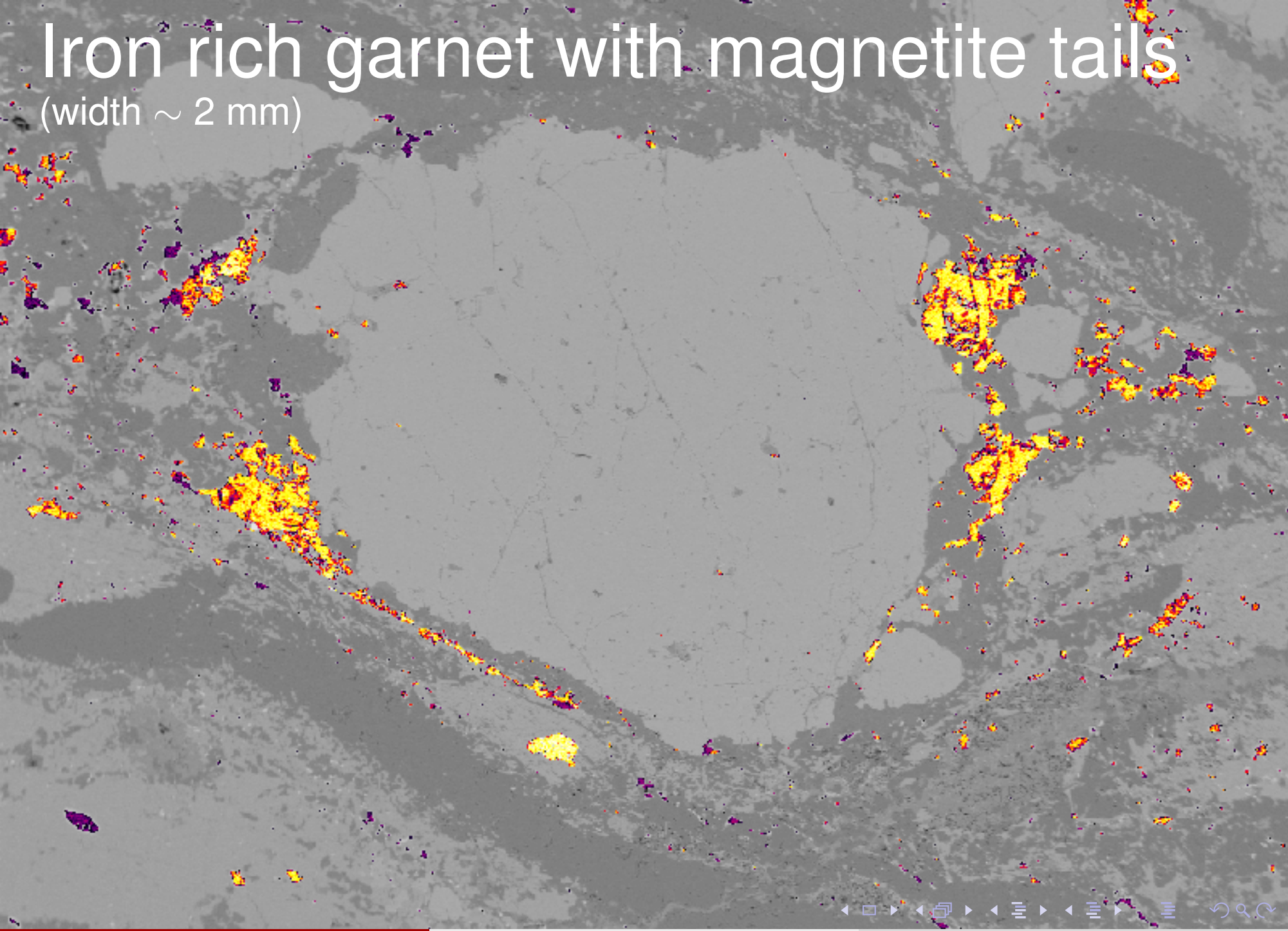
Mafic granulite sample: 4

Garnet quantitative analyses

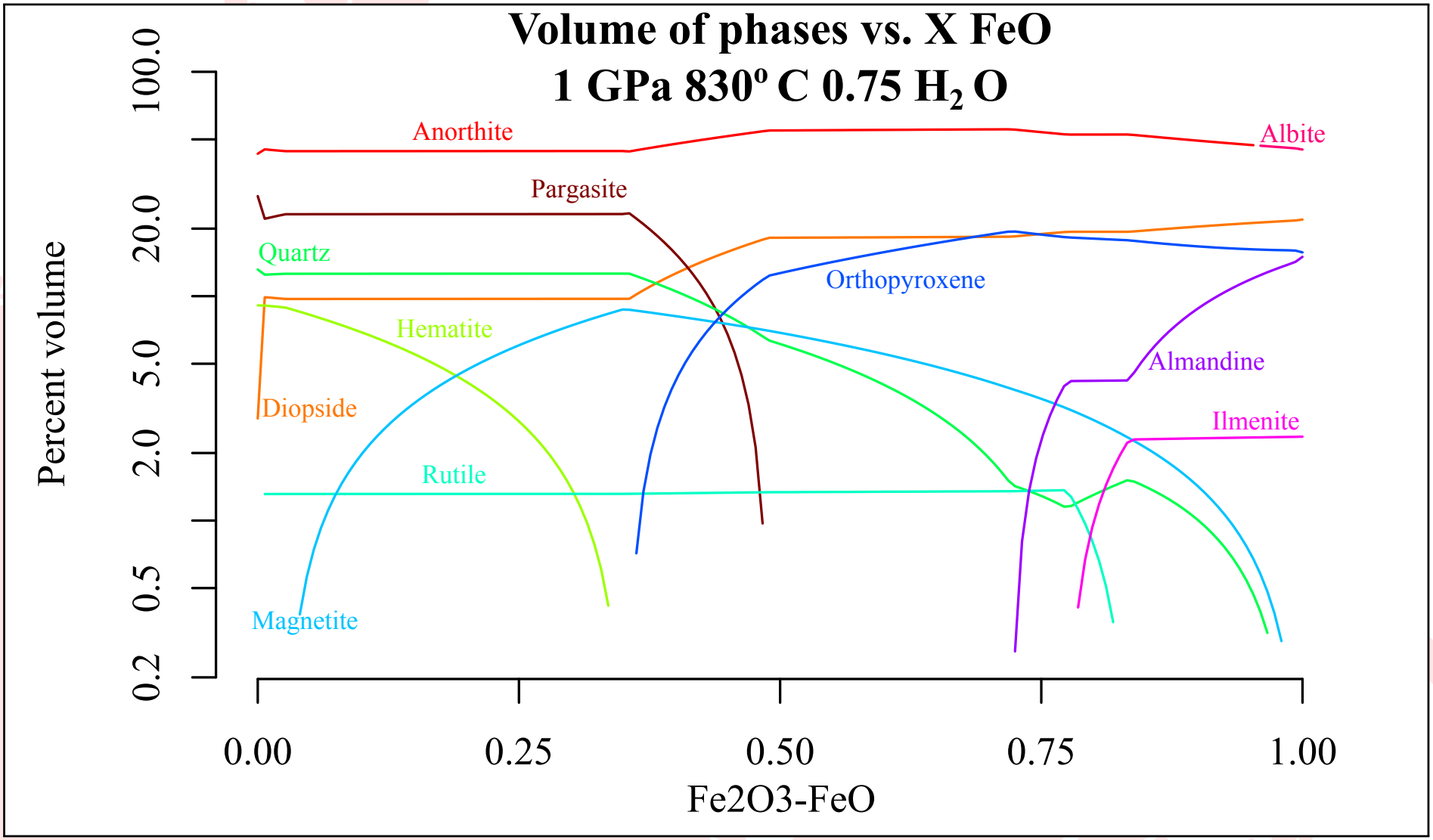


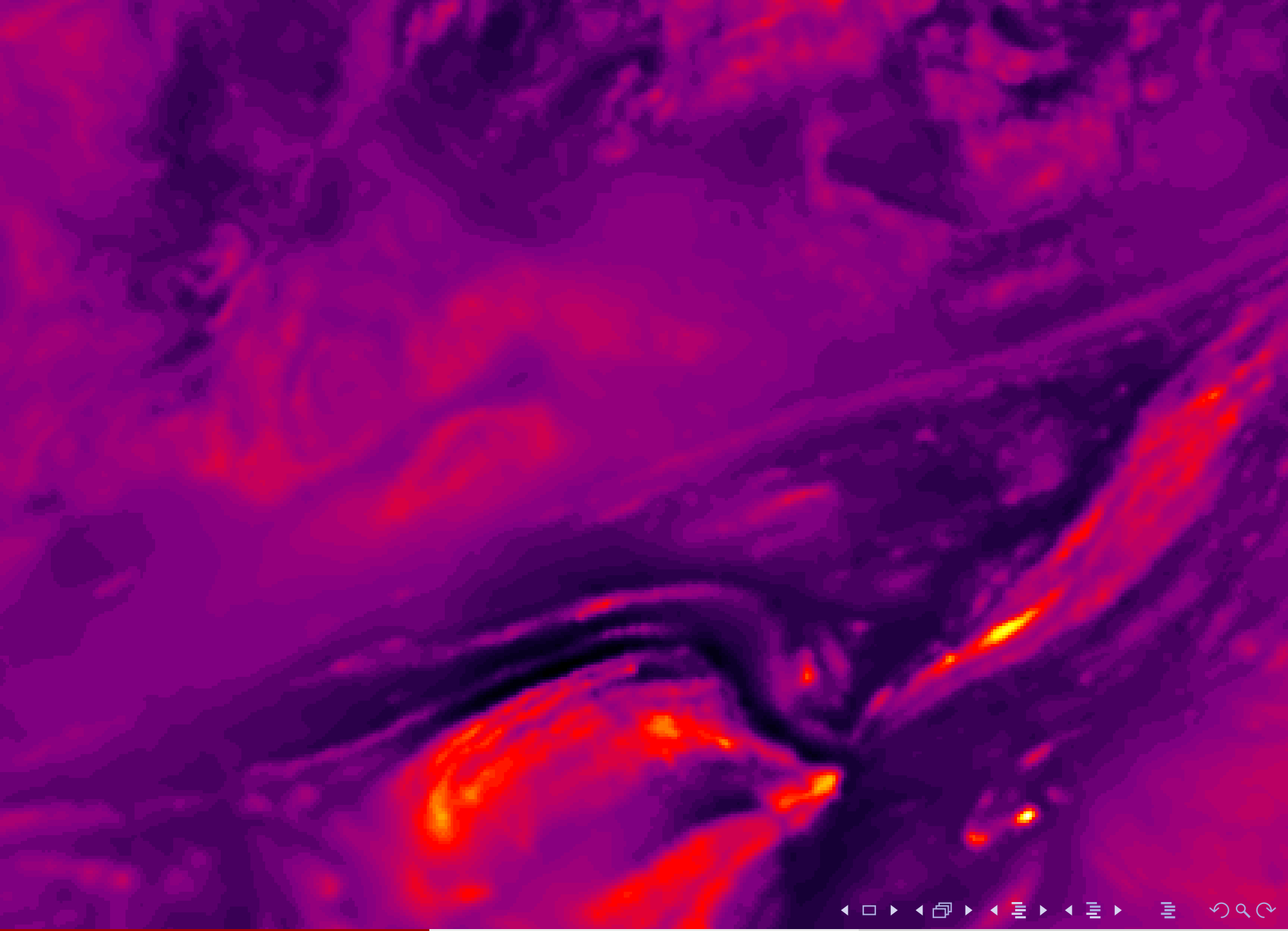
Iron rich garnet with magnetite tails

(width $\sim$ 2 mm)



Implications for iron oxidation state





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