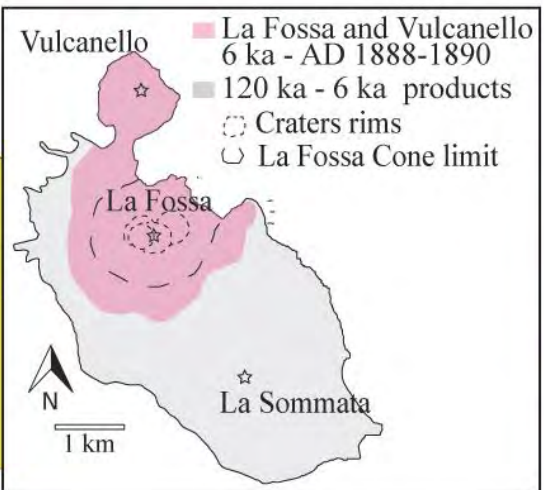
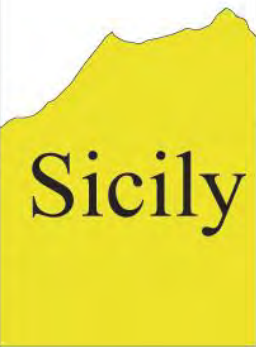
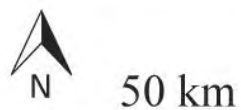


The magmatic-hydrothermal system of Vulcano island and possible relationships with phreatic eruptions.

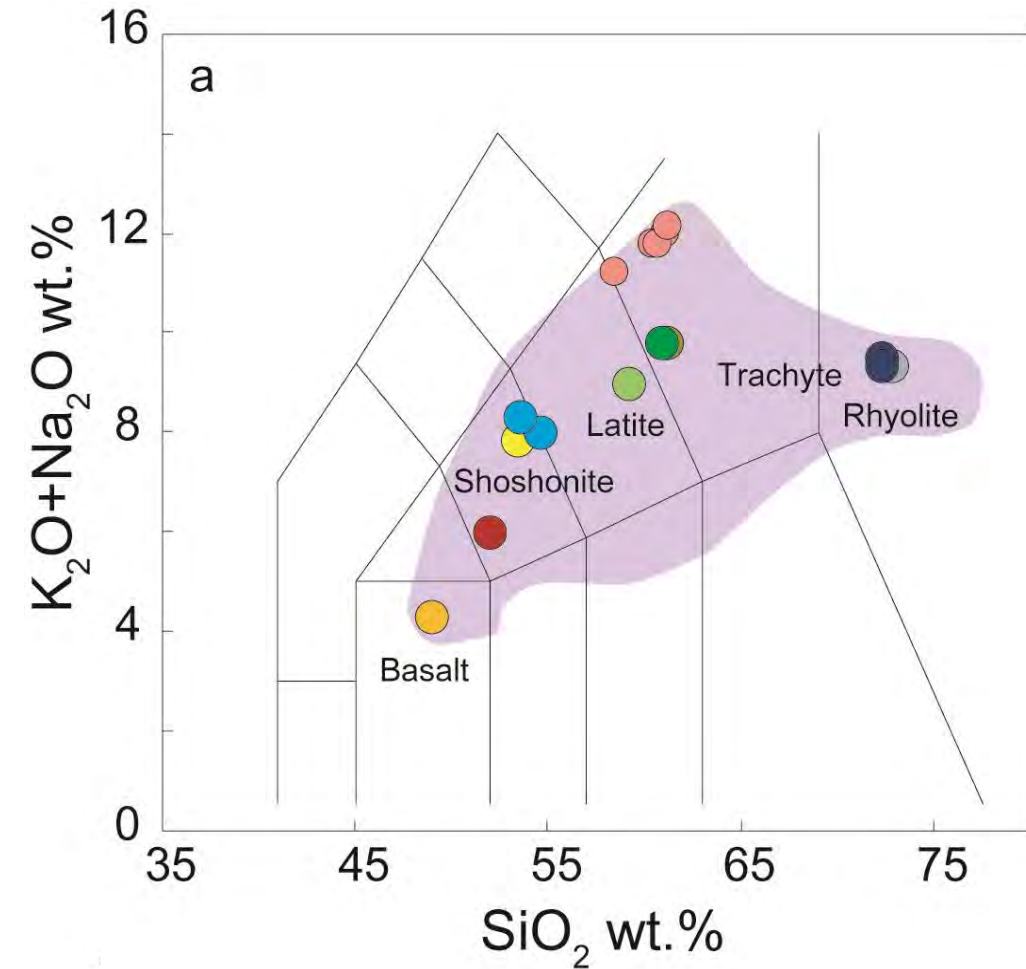
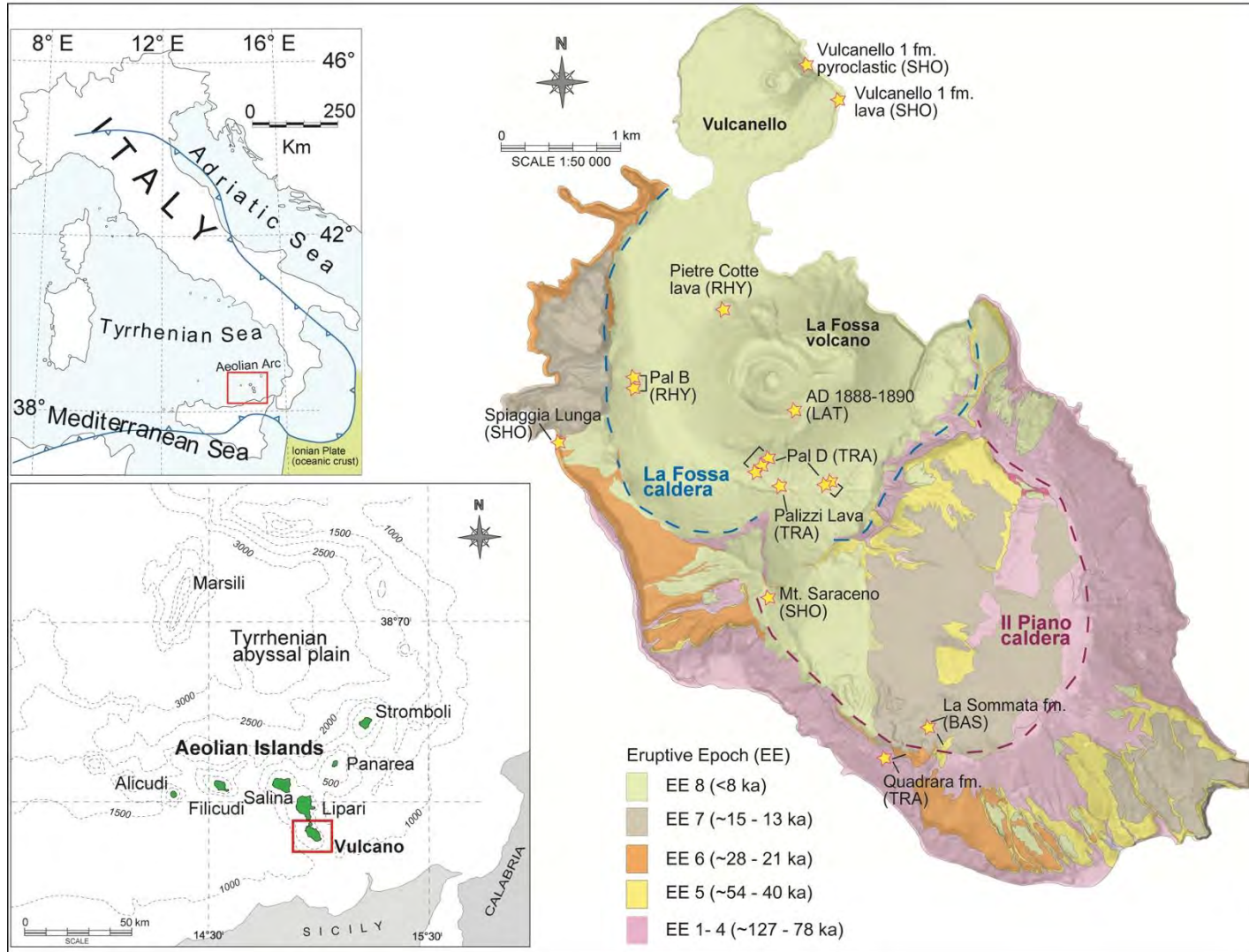
Fulignati Paolo¹,

¹ Dipartimento di Scienze della Terra, Università di Pisa, via S. Maria, 53 56126 Pisa, Italy

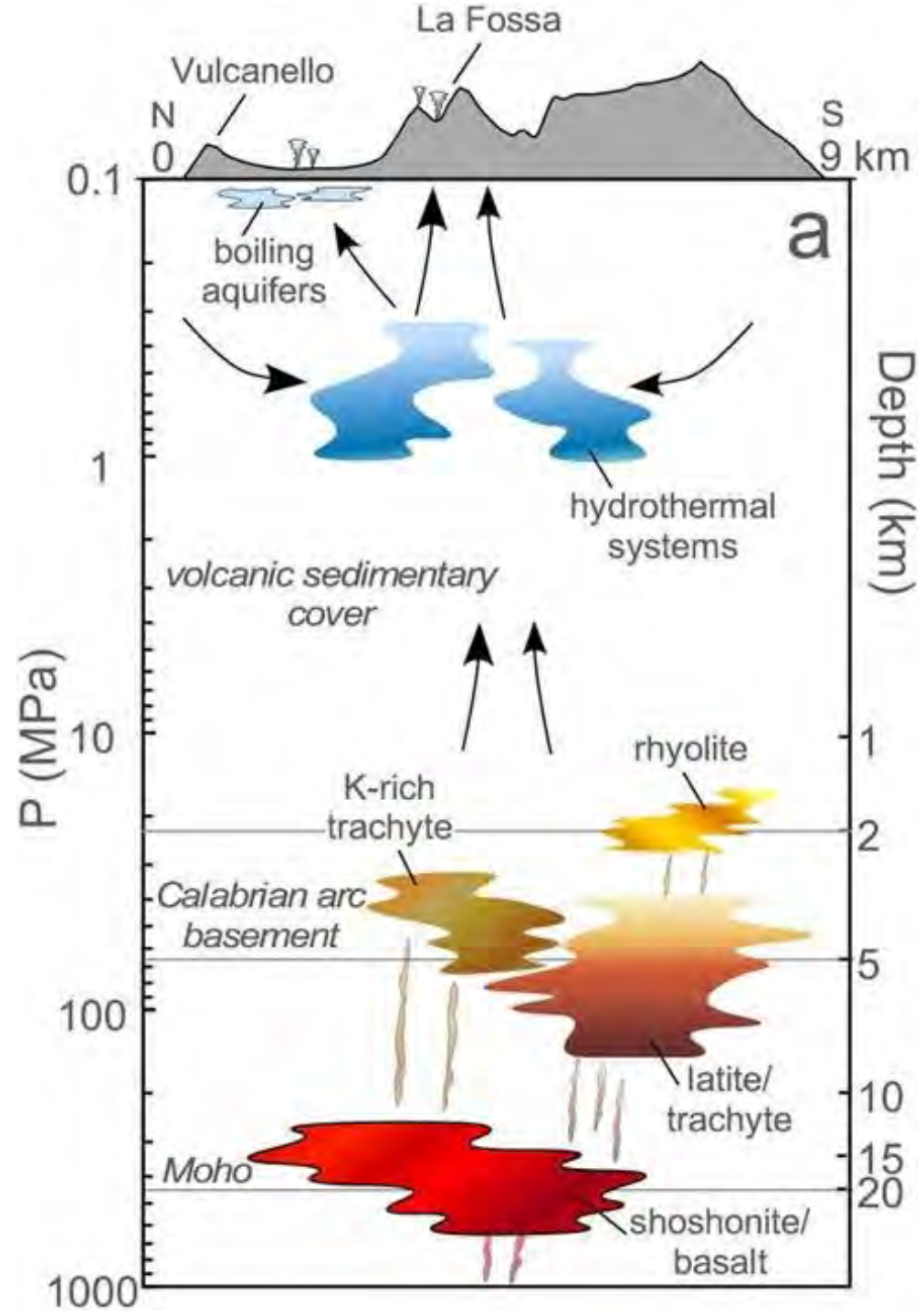
Email: paolo.fulignati@unipi.it

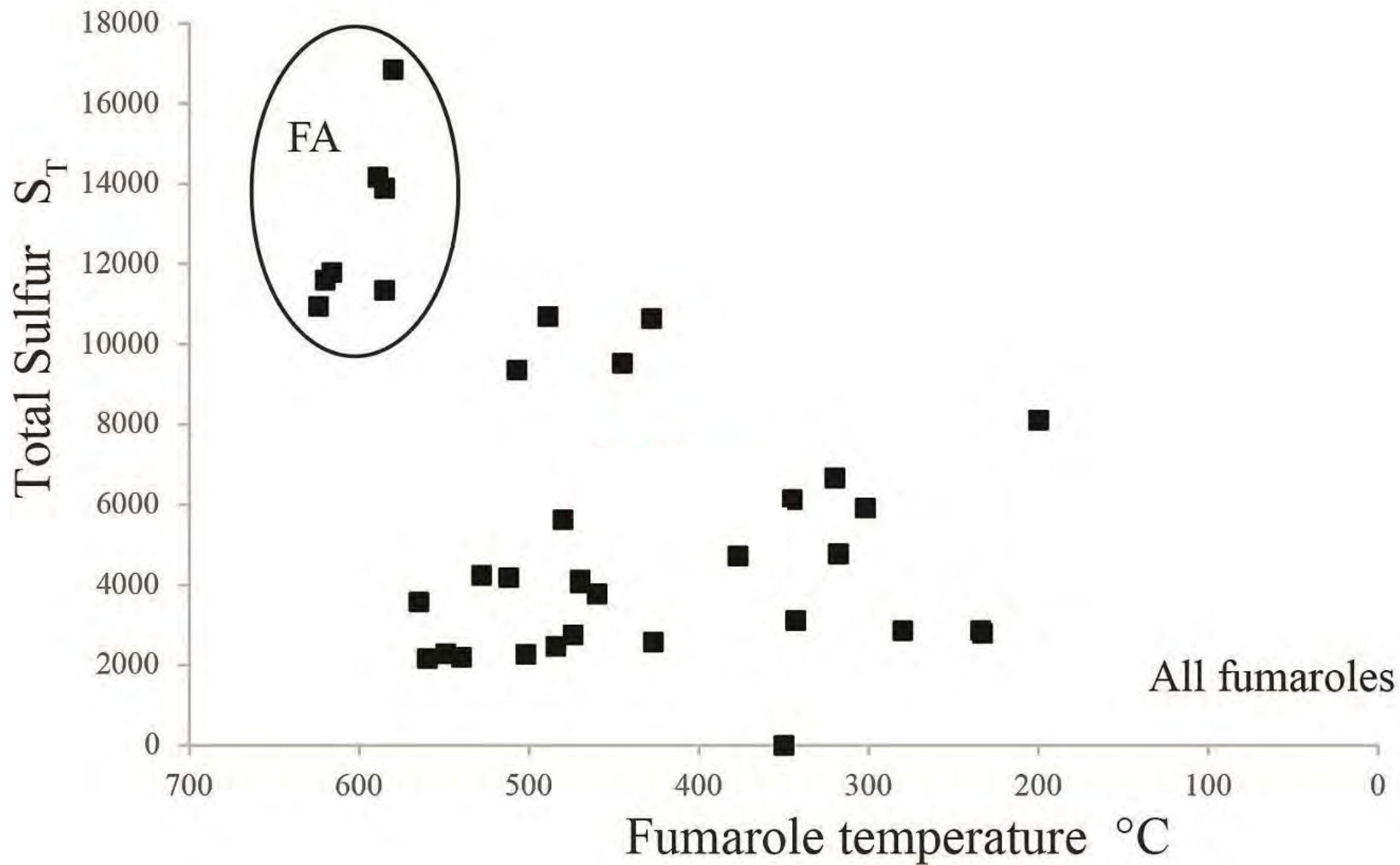


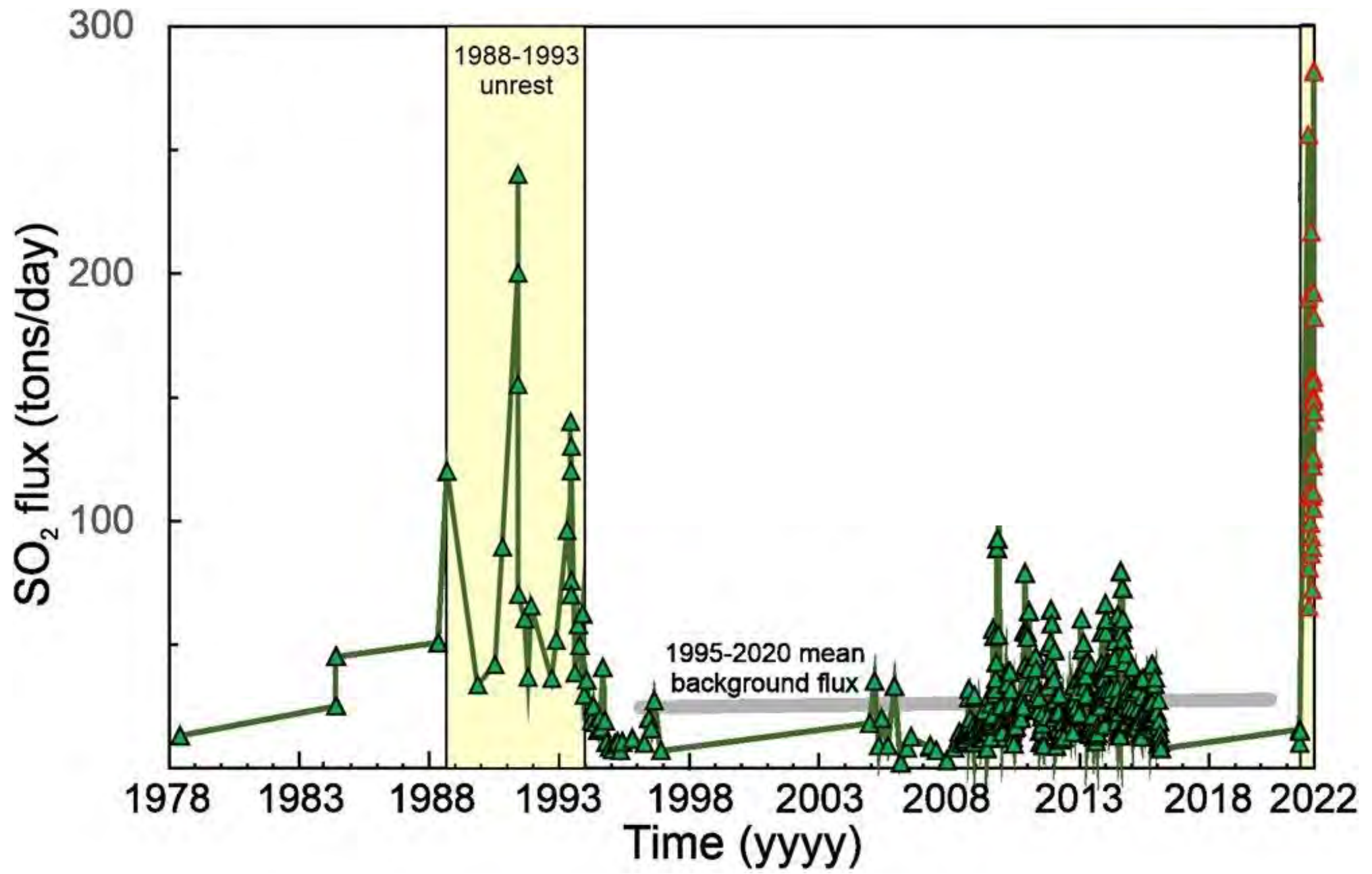
Vulcano Island (Italy)

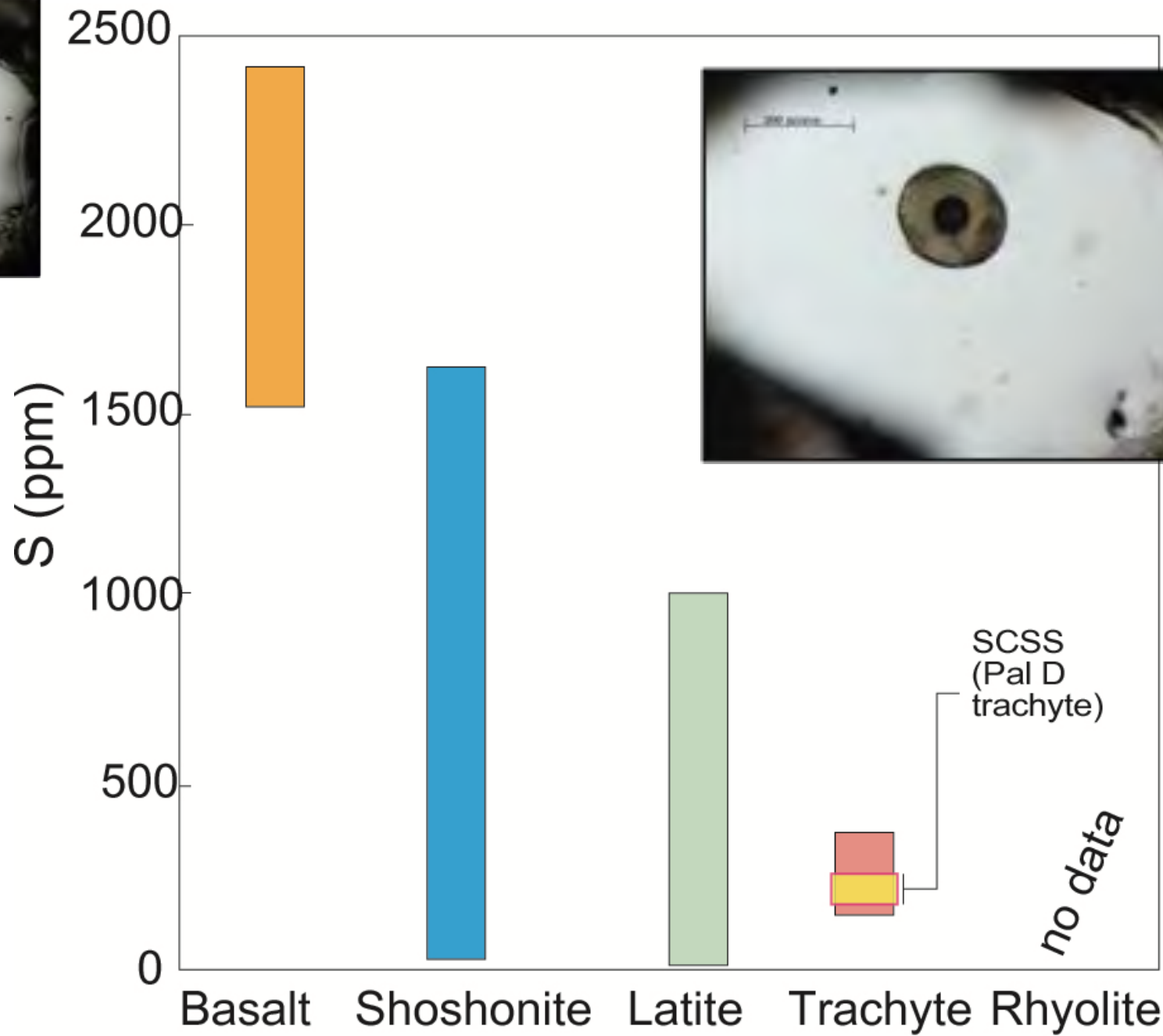


The compositions of volcanic products of Vulcano island span from basalts to rhyolites

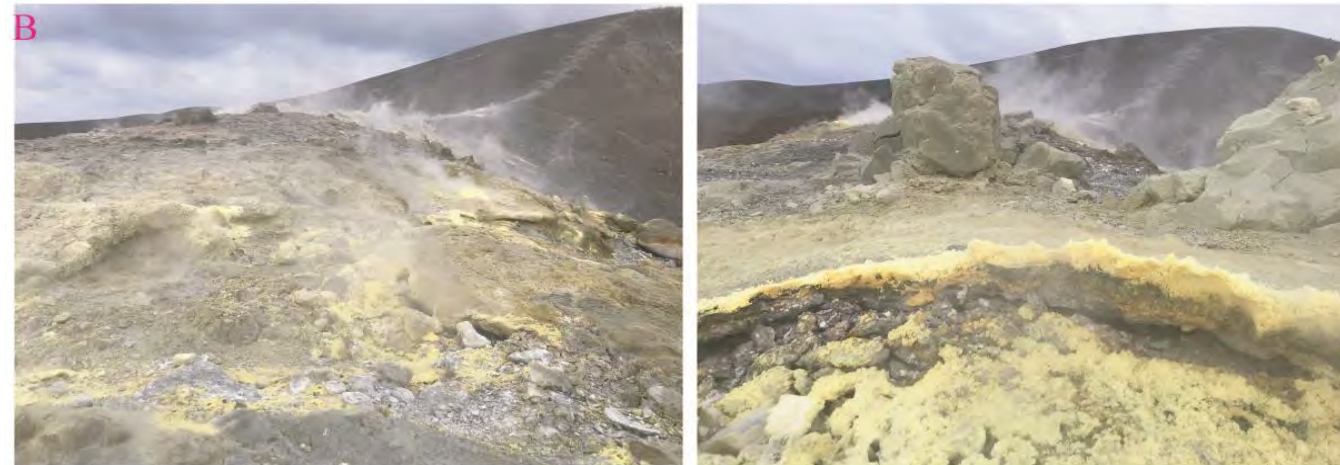
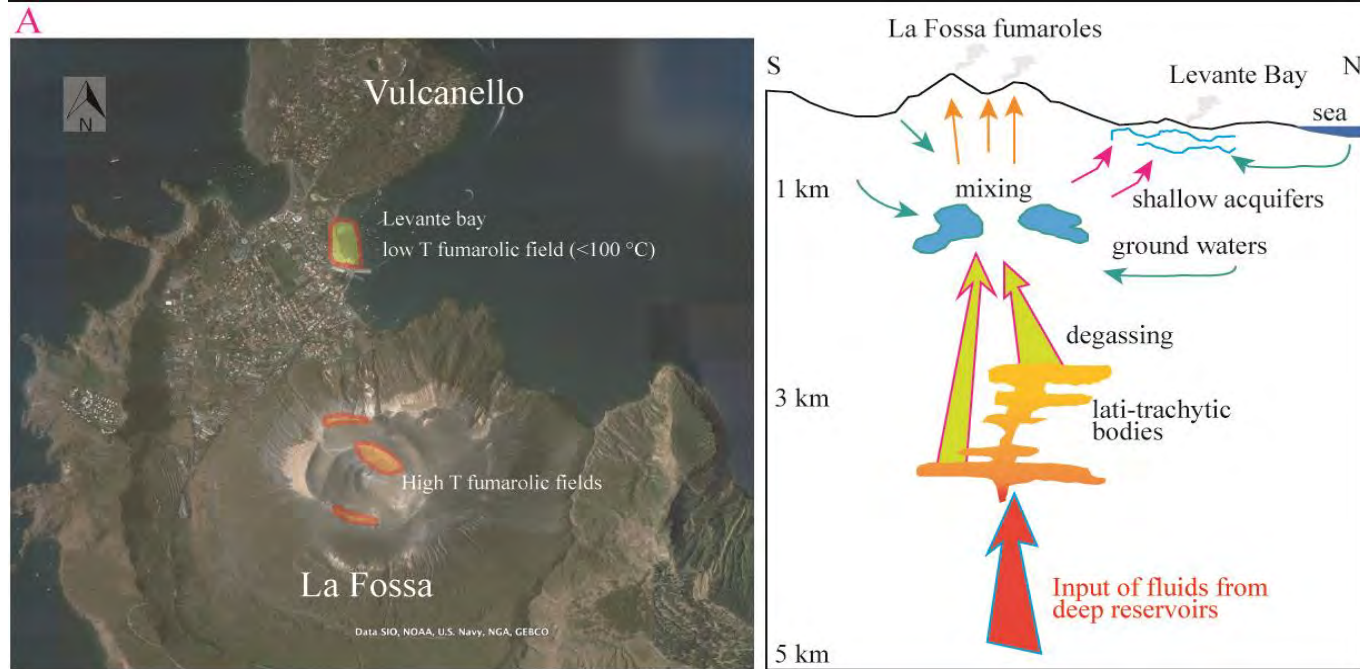


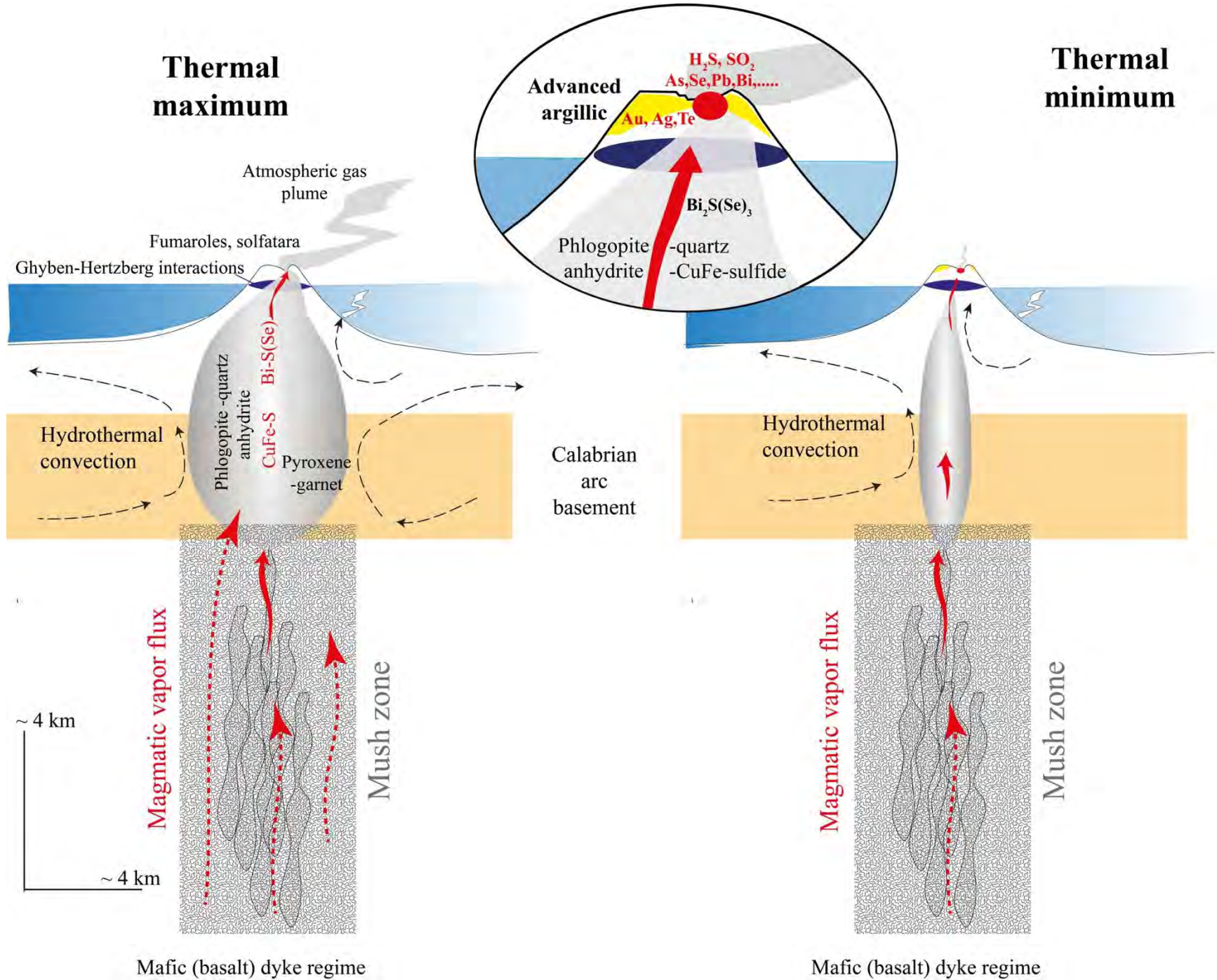






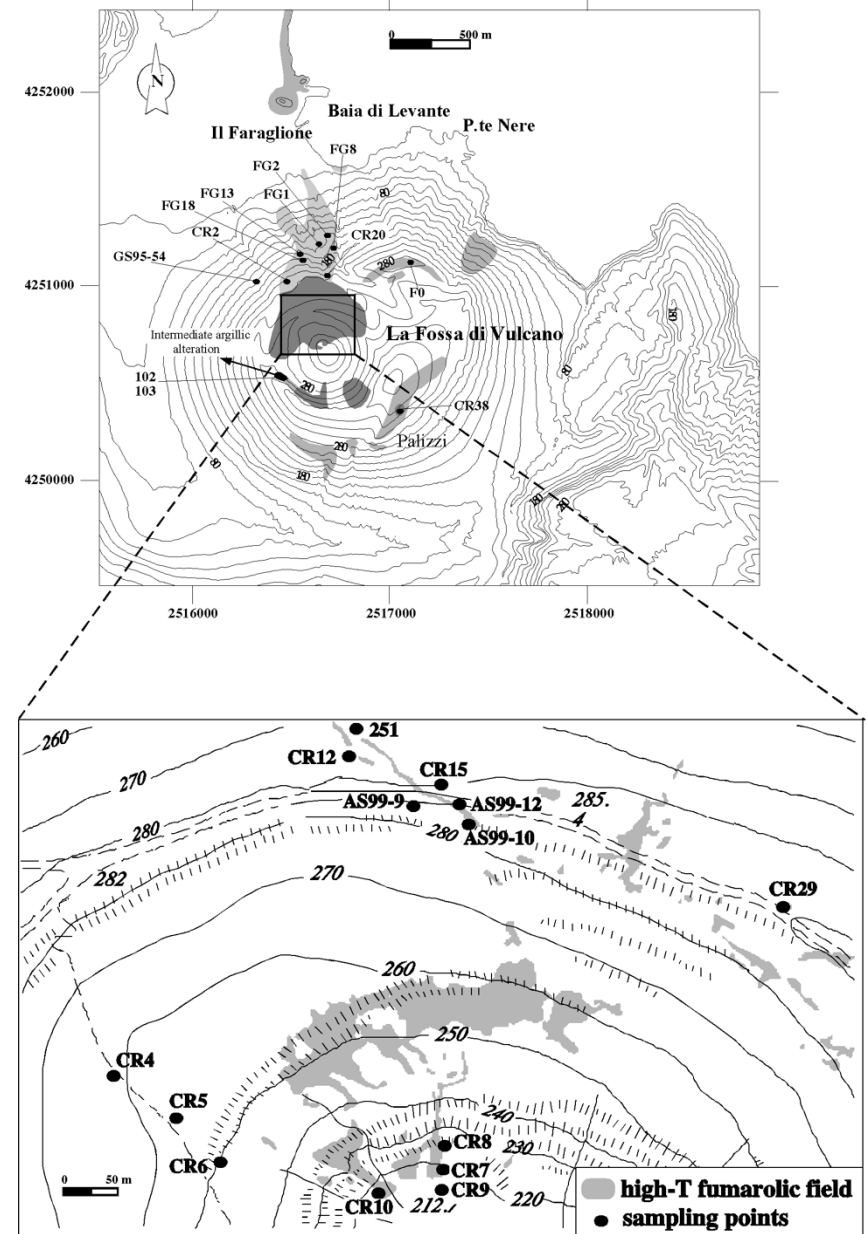
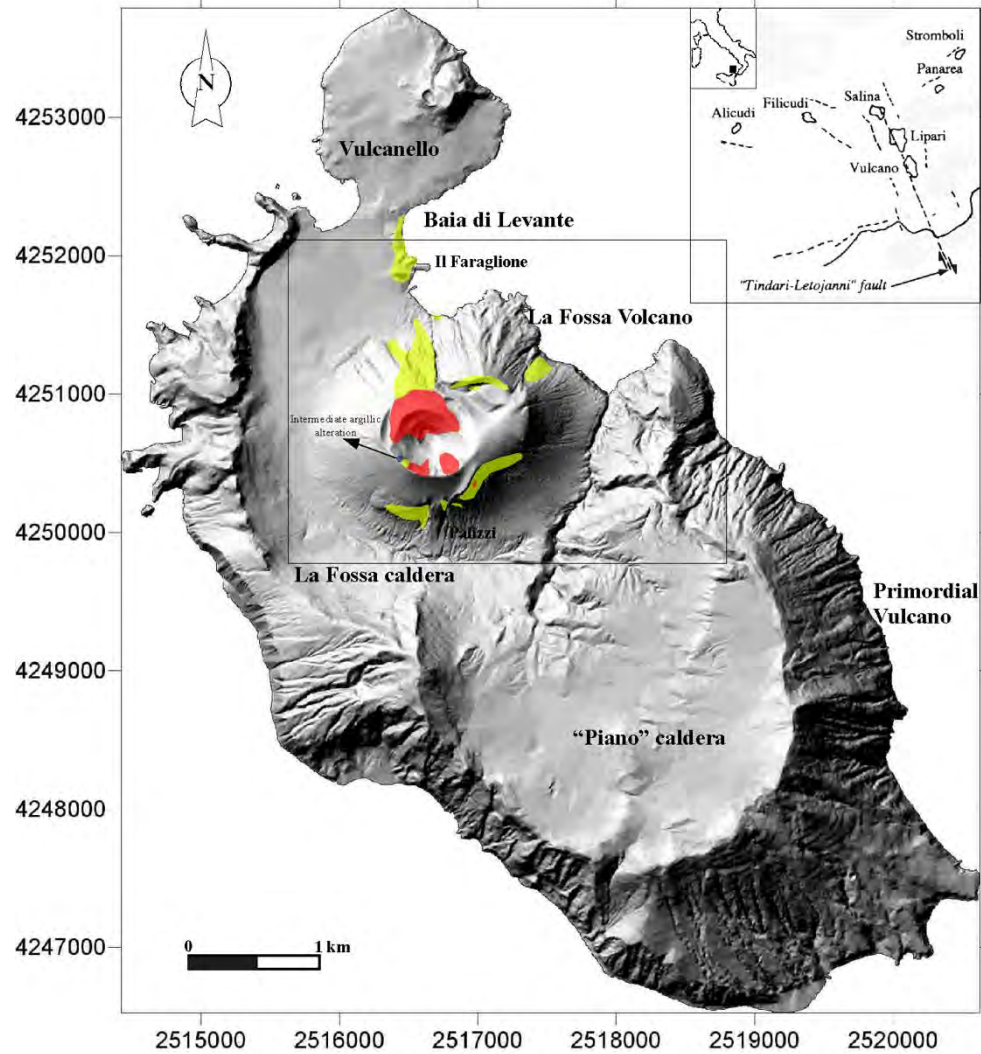
Active magmatic-hydrothermal system

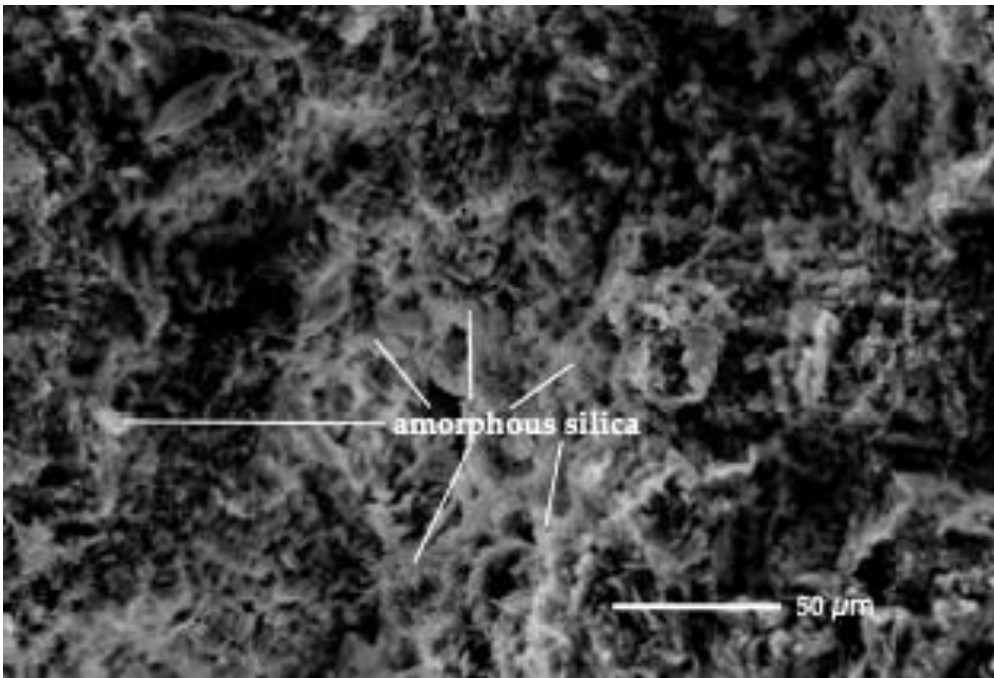




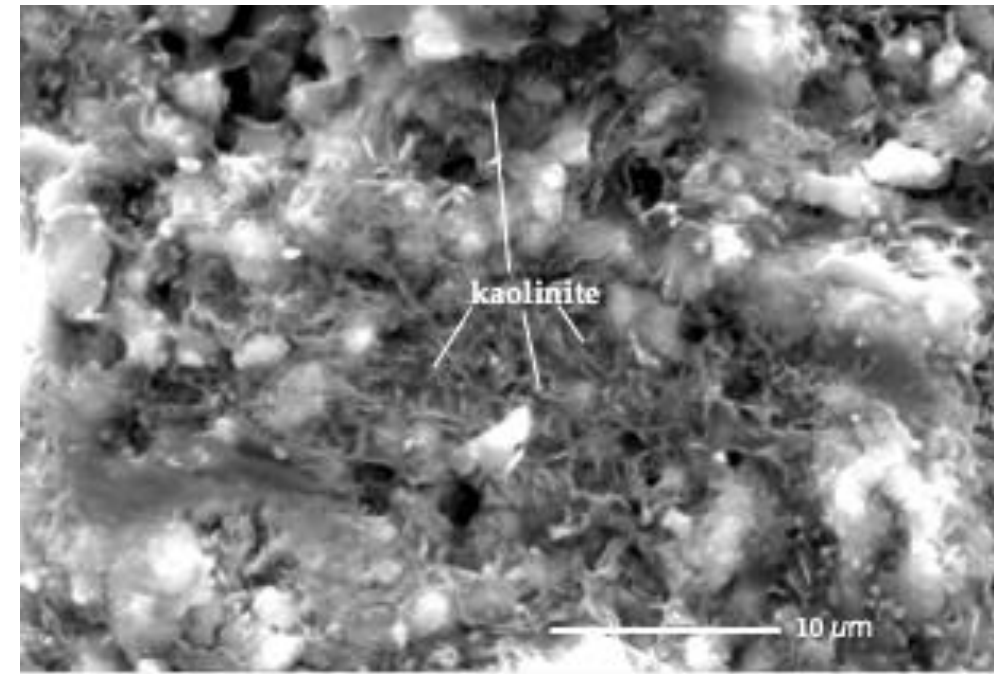
Mafic (basalt) dyke regime

Mafic (basalt) dyke regime

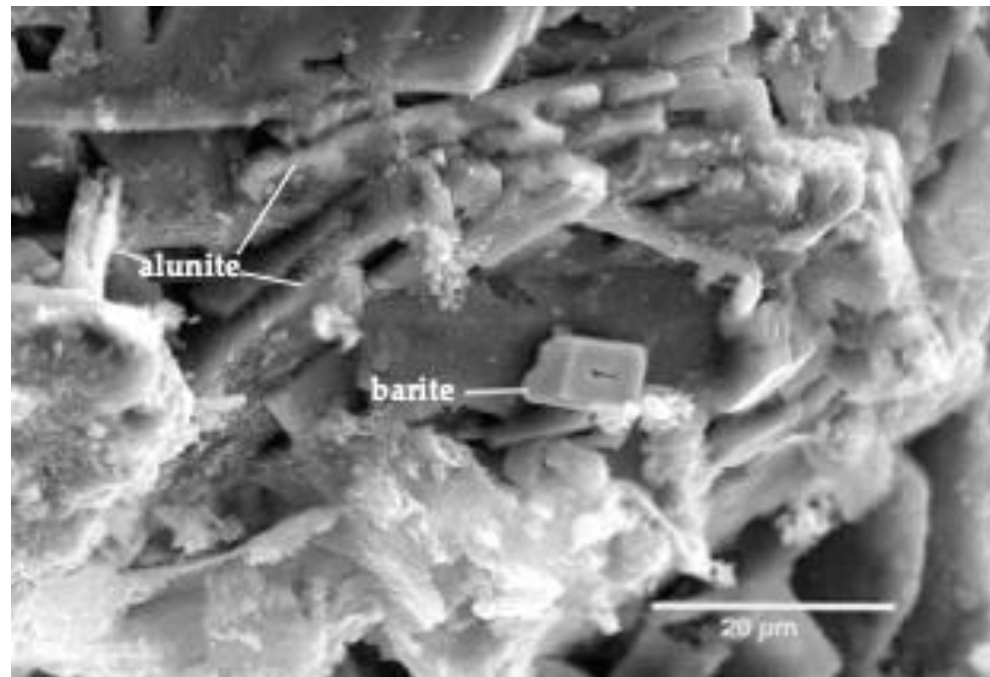




Silicic (pH < 2)



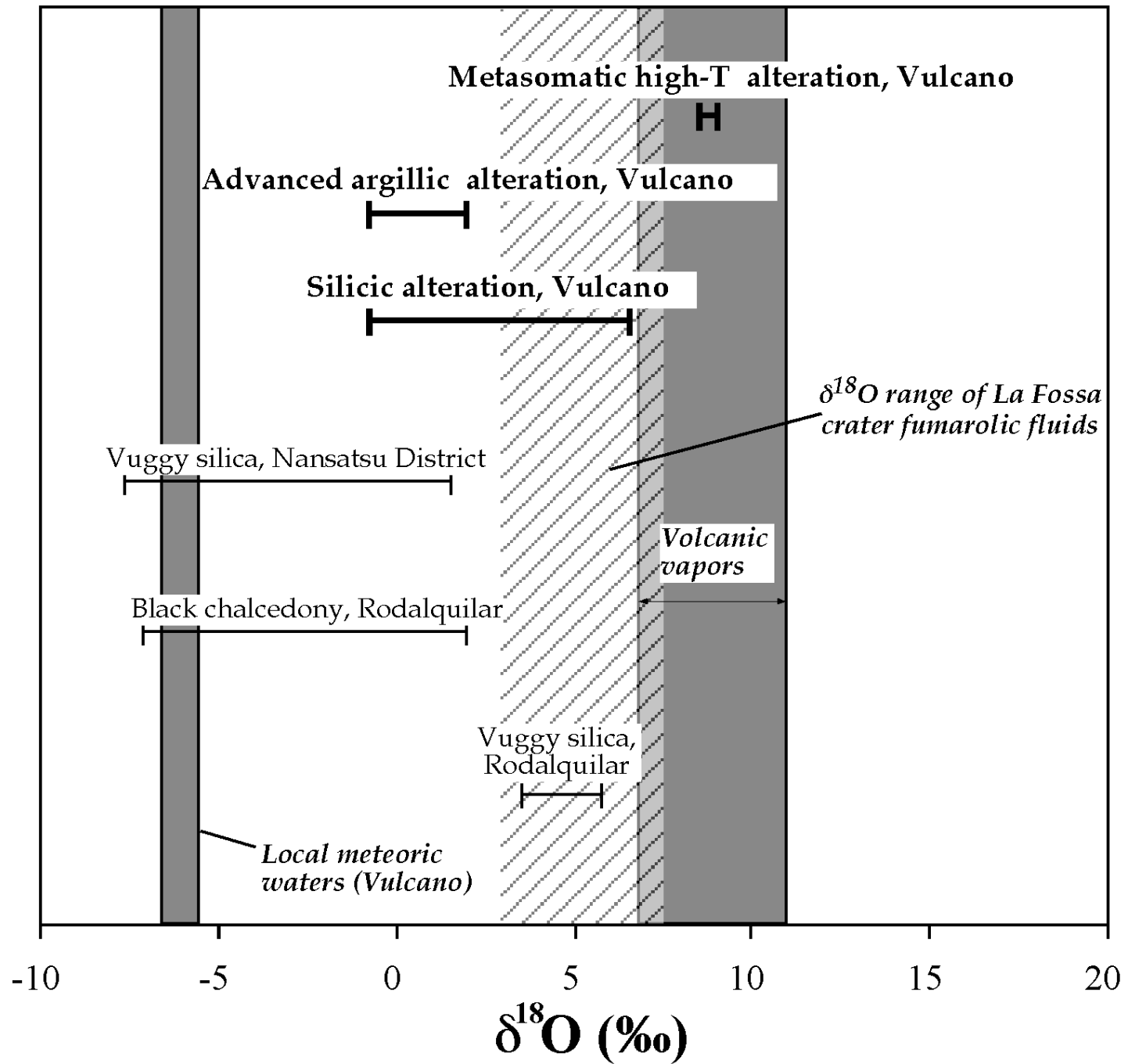
**Intermediate argillic
(4 < pH < 5.5)**

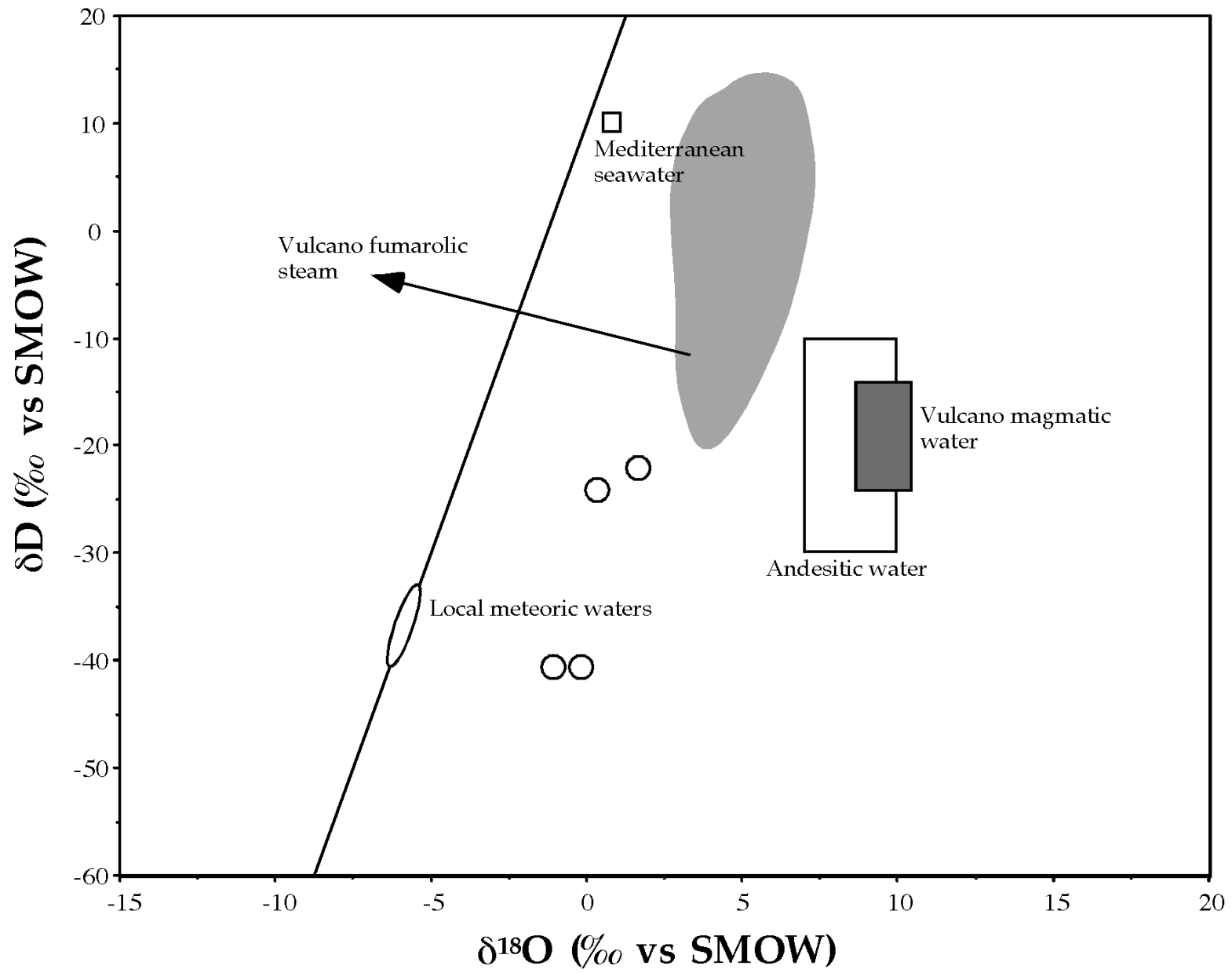


**Advanced argillic
(2 < pH < 4)**

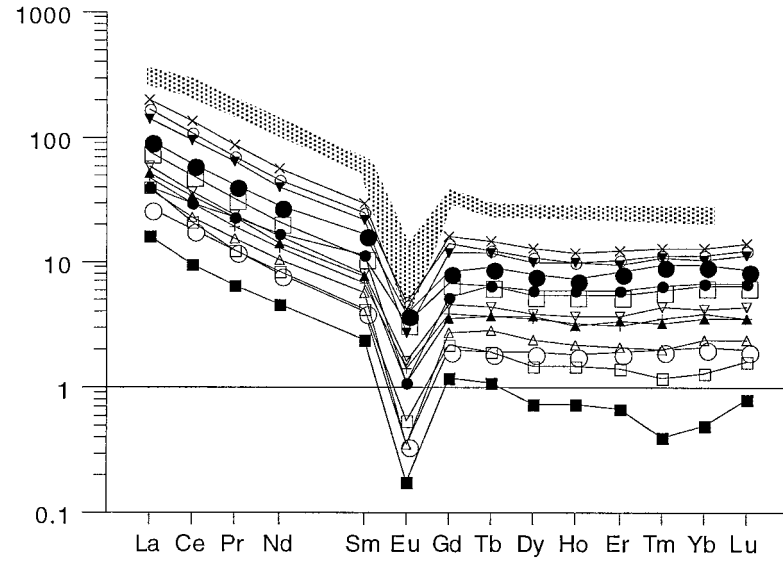
2. Secondary minerals identified in the superficial alteration facies of Vulcano through XRD and SEM-EDS investigations

Alteration facies	Secondary minerals identified		
	XRD		SEM-EDS
Intermediate argillic	<i>halloysite</i>	[Al ₂ Si ₂ O ₅ (OH) ₄]	<i>goethite</i>
	<i>smectite</i>		
	<i>hematite</i>		
Advanced argillic	<i>alunite</i>	[KAl ₃ (SO ₄) ₂ (OH) ₆]	<i>alunite goethite</i>
	<i>natroalunite</i>	[NaKAl ₃ (SO ₄) ₂ (OH) ₆]	<i>natroalunite</i>
	<i>jarosite</i>	[KFe ₃ (SO ₄) ₂ (OH) ₆]	<i>jarosite</i>
	<i>gypsum</i>		<i>gypsum</i>
	<i>amorphous silica</i>		<i>amorphous silica</i>
	<i>mizzonite</i>	[(Na,K)Ca(Si,Al) ₆ O ₁₂ Cl]	<i>native sulfur</i>
	<i>native sulfur</i>		<i>halite</i>
	<i>wilcoxite</i>	[MgAl(SO ₄) ₂ F.18H ₂ O]	<i>barite</i>
Silicic	<i>amorphous silica</i>		<i>realgar</i>
	<i>native sulfur</i>		<i>amorphous silica</i>
	<i>salammoniac</i>	[(NH) ₄ Cl]	<i>native sulfur</i>
	<i>crystalite</i>		<i>realgar</i>
			<i>goethite</i>
			<i>barite</i>
		<i>gold</i>	
		<i>tellurium</i>	
		<i>Pb-Bi sulfides</i>	

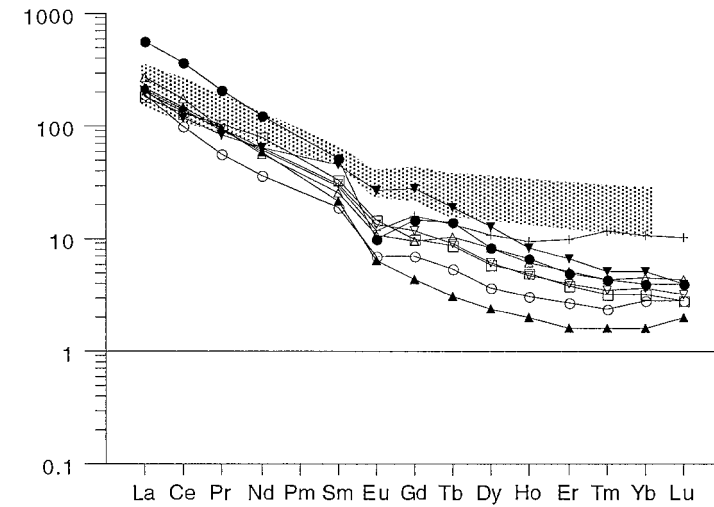
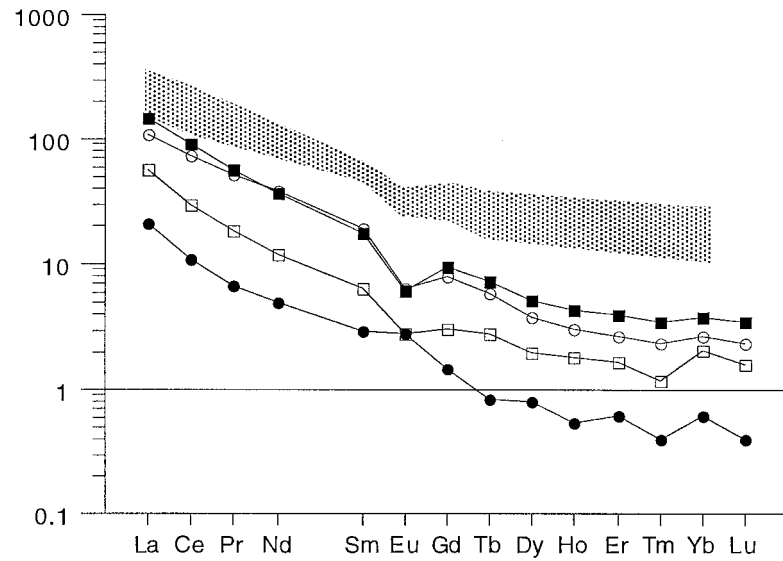
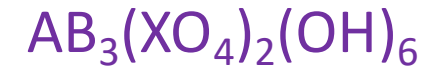
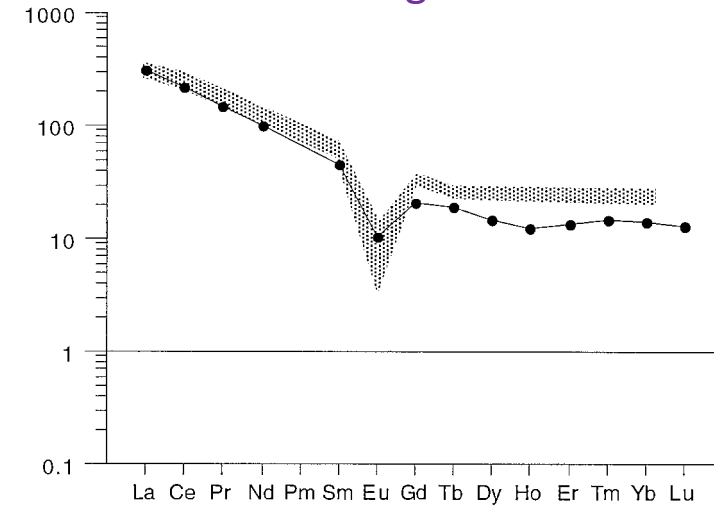




Silicic alteration



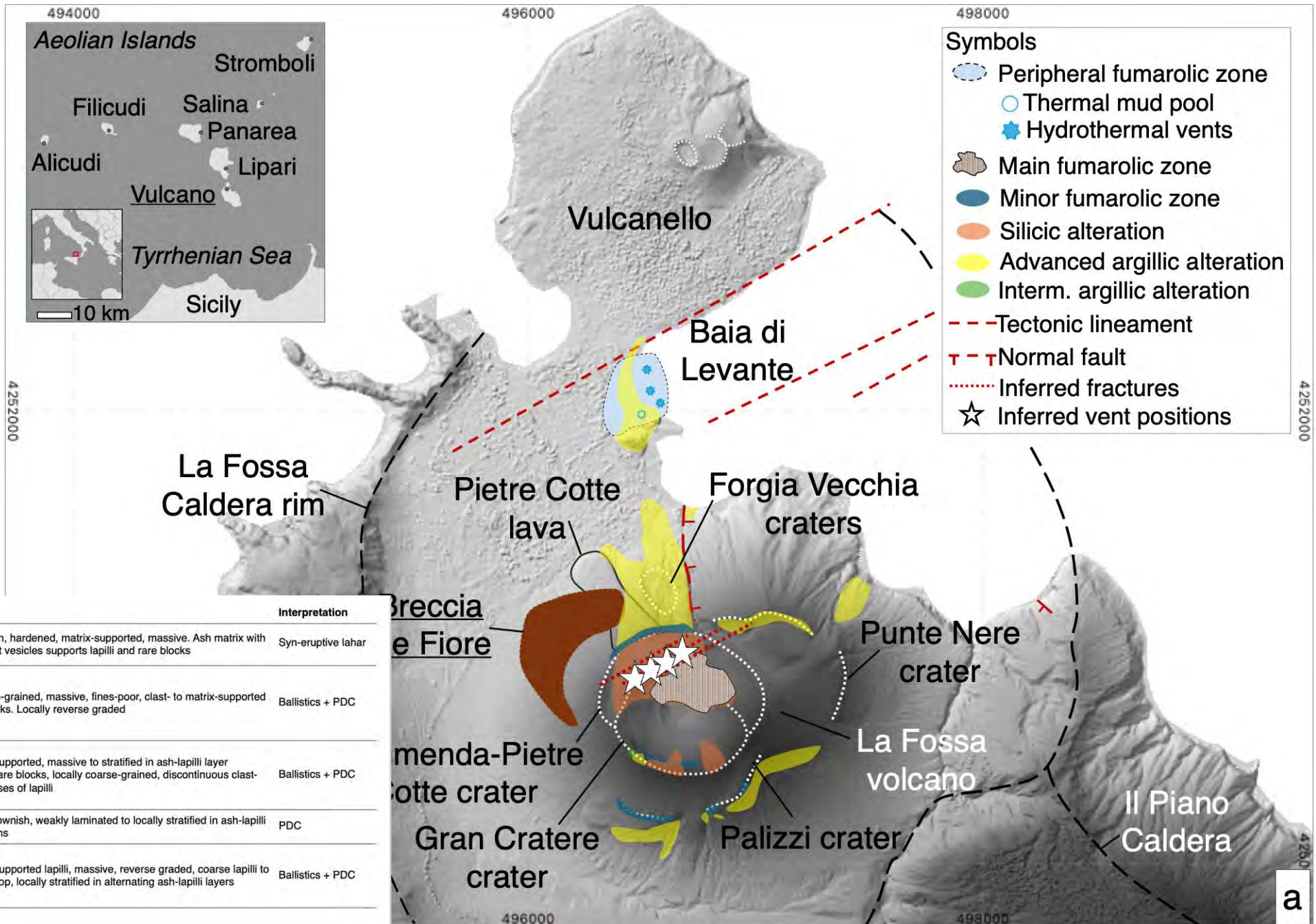
Adv. Argillic alteration

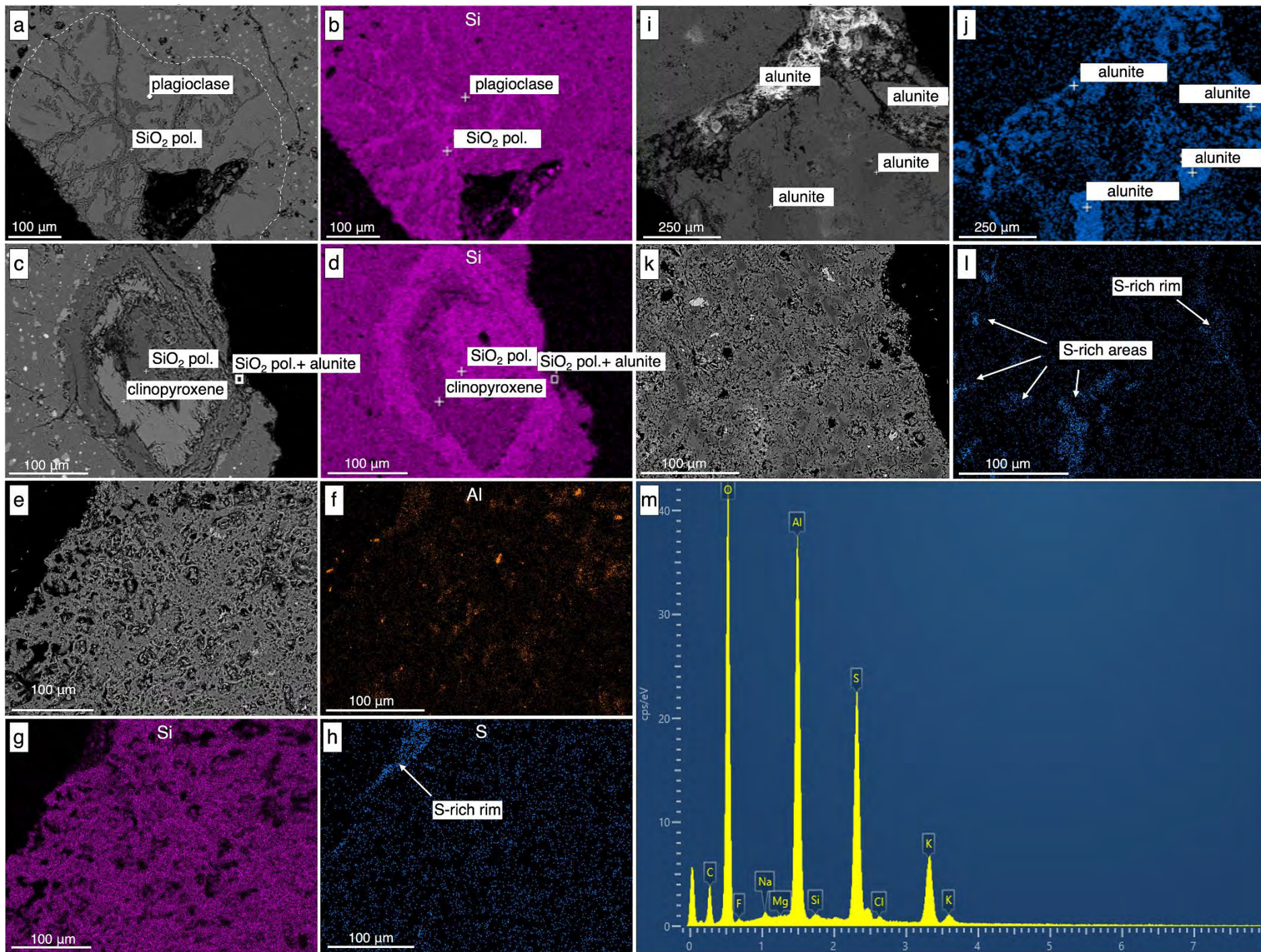


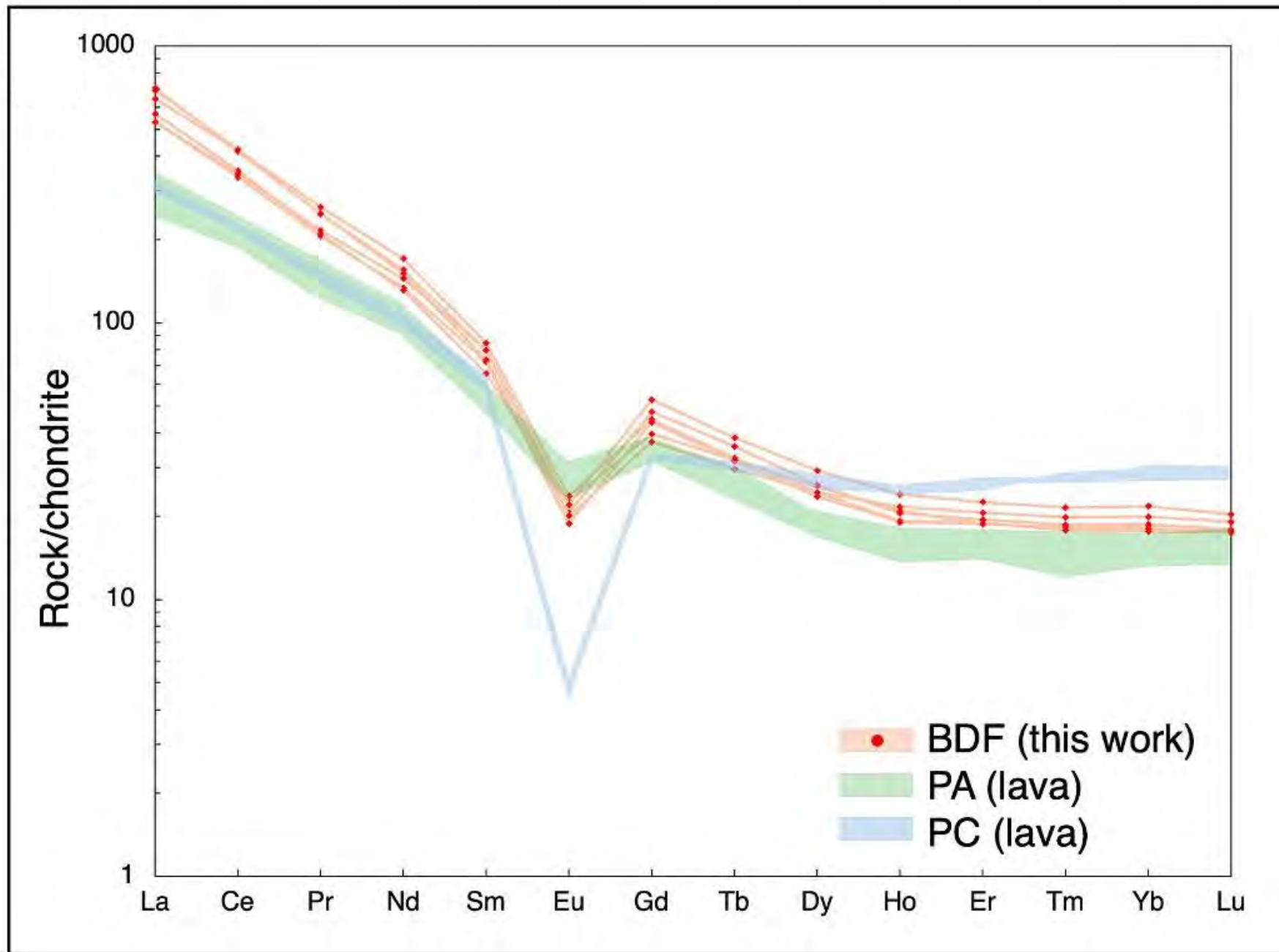
PHREATIC ERUPTIONS

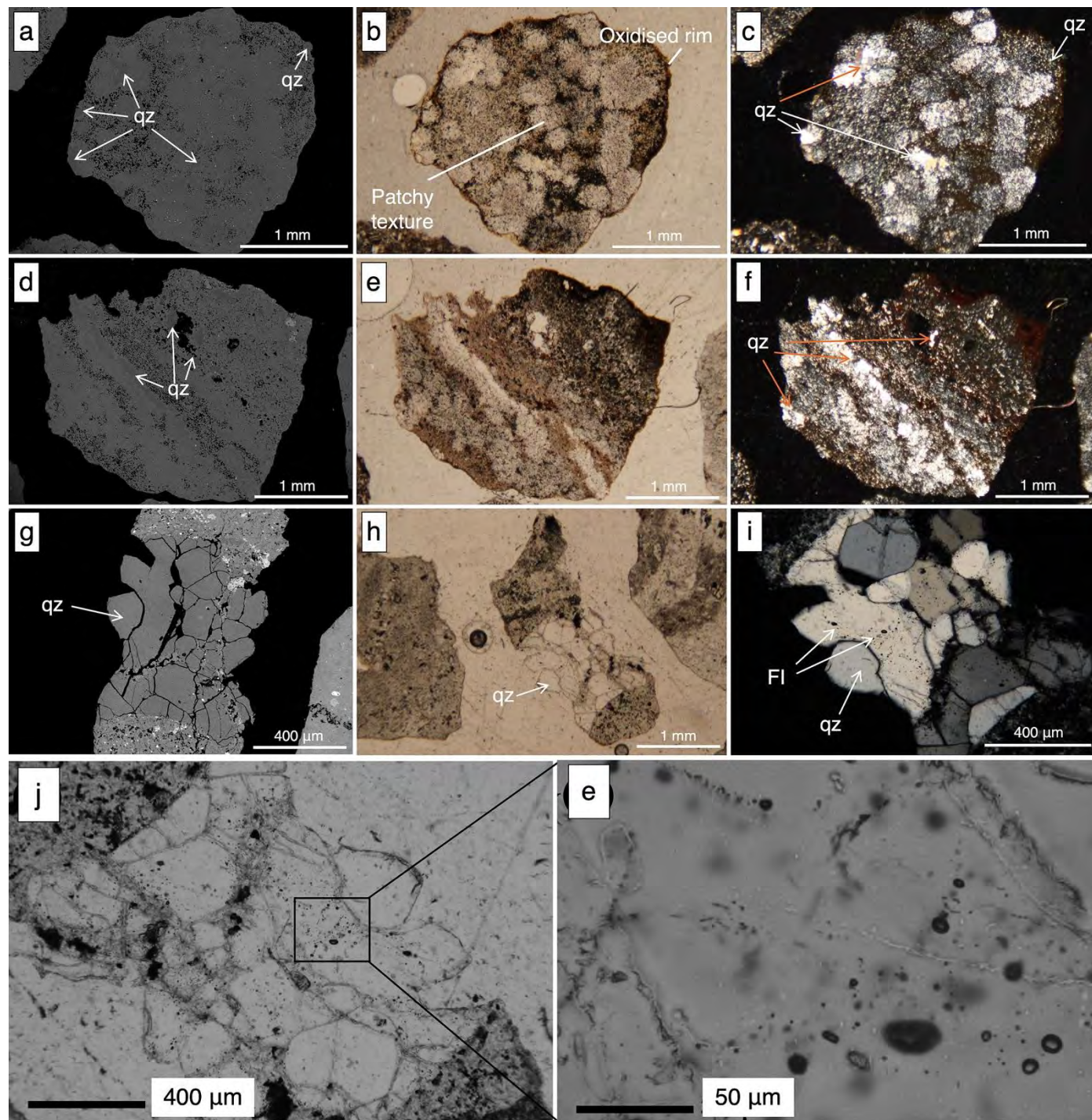
- Phreatic eruptions occur when shallow groundwater or hydrothermal fluids are rapidly converted to steam by an influx of magmatic heat, causing them to erupt explosively
- Although often smaller than magmatic eruptions, phreatic eruptions can be highly destructive and dangerous.
- A key factor influencing the likelihood of phreatic eruptions is the effect of hydrothermal alteration.
- The study of hydrothermally altered lithic clasts provide valuable insights into the lithology of the disrupted hydrothermal aquifer and on the physico-chemical conditions of involved fluids.

Breccia De Fiore (1873)

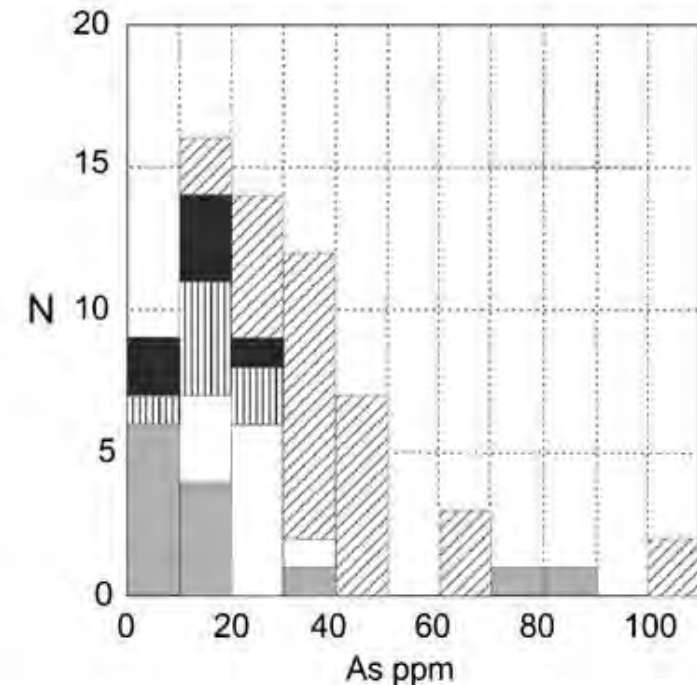
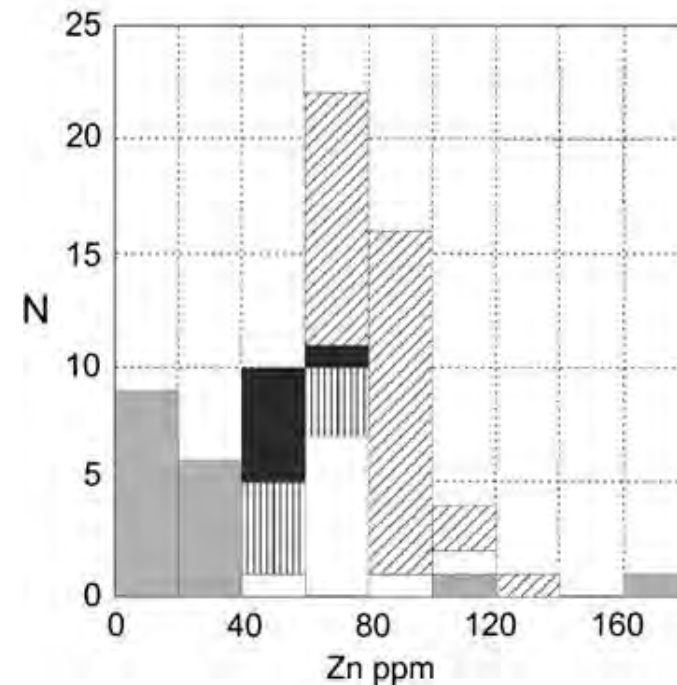
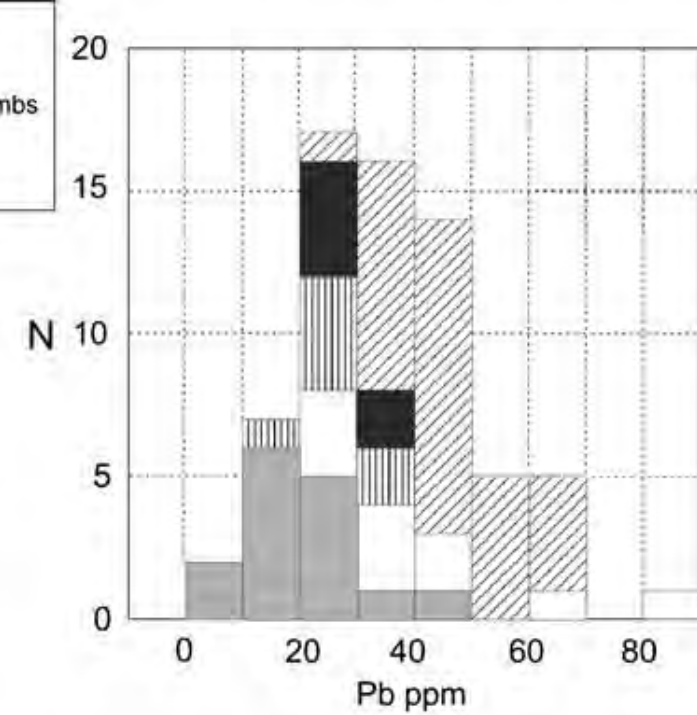
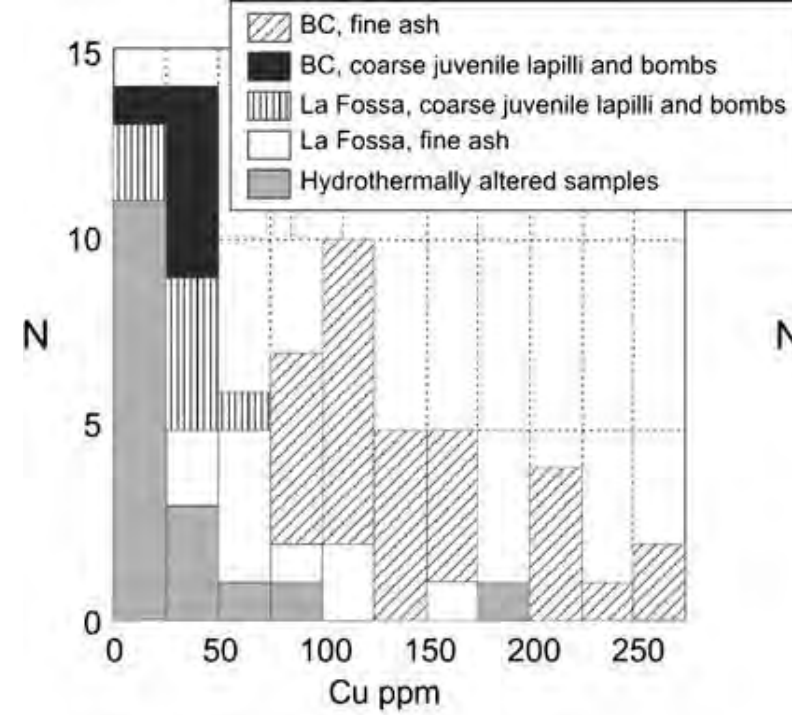


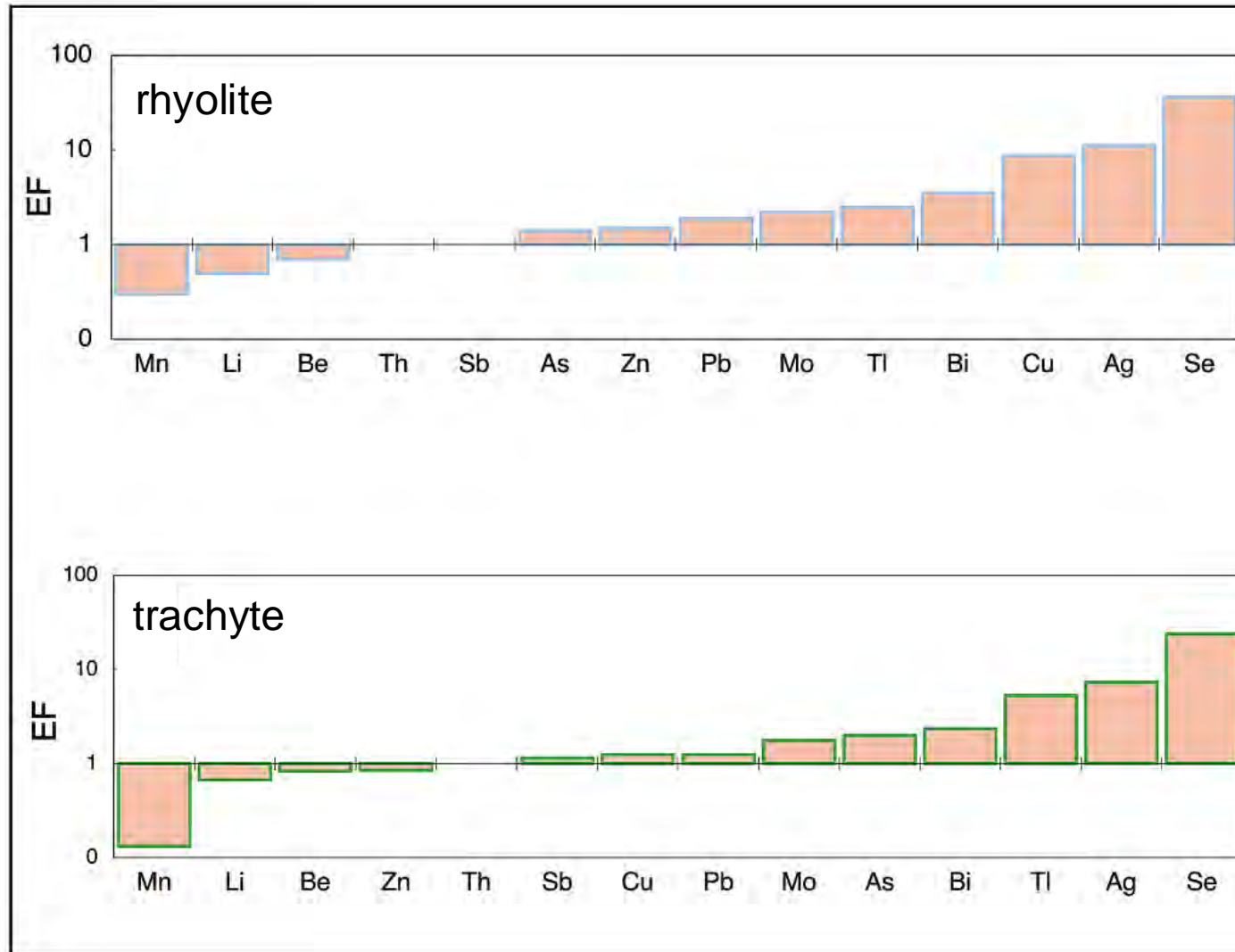






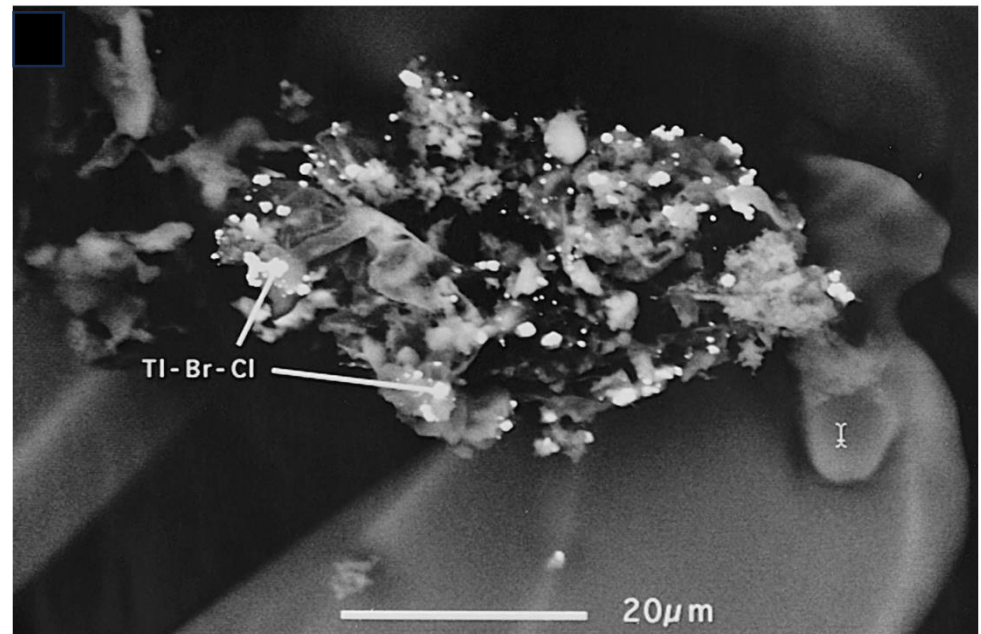
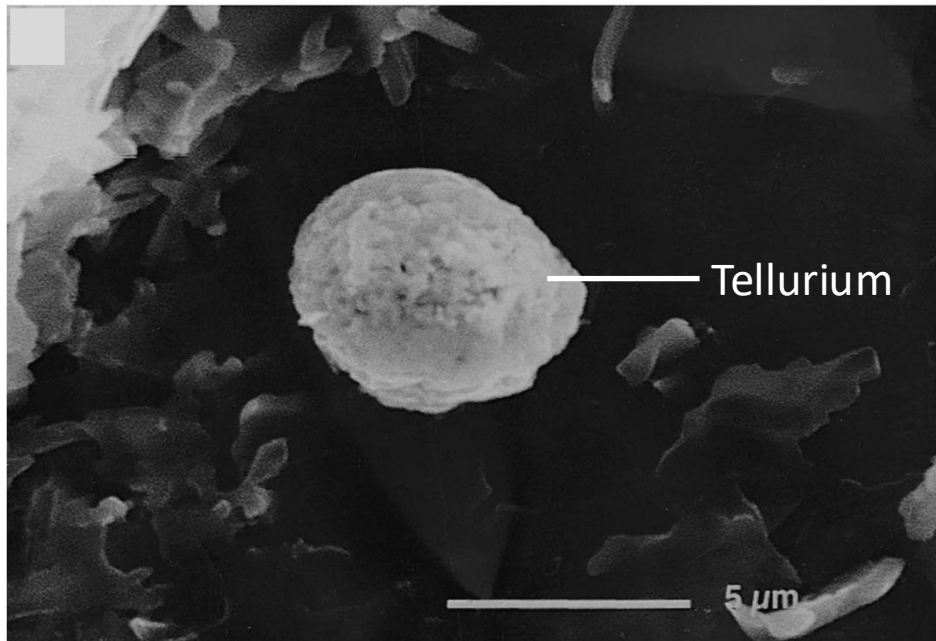
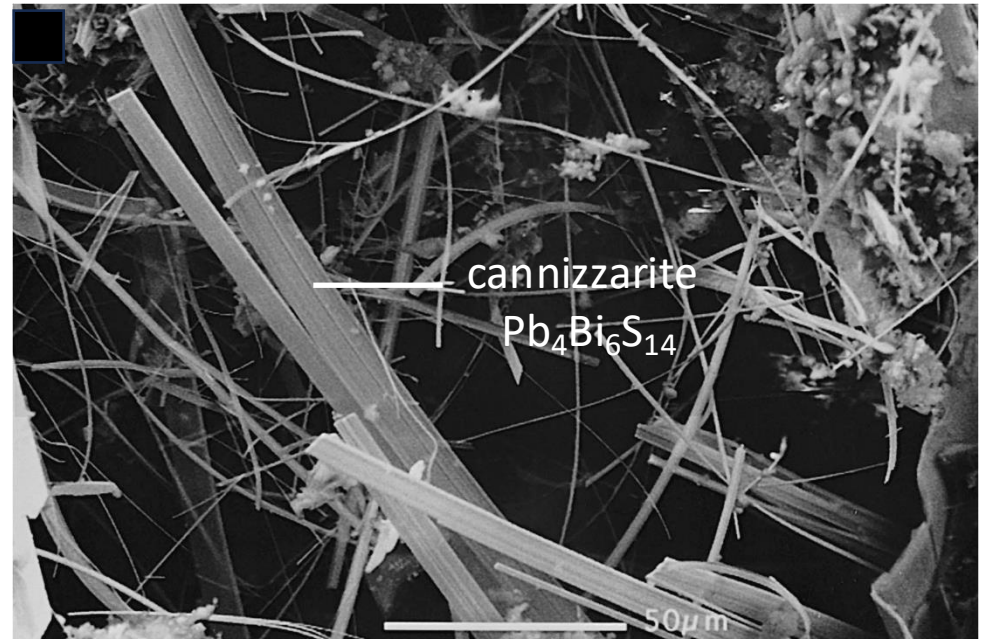
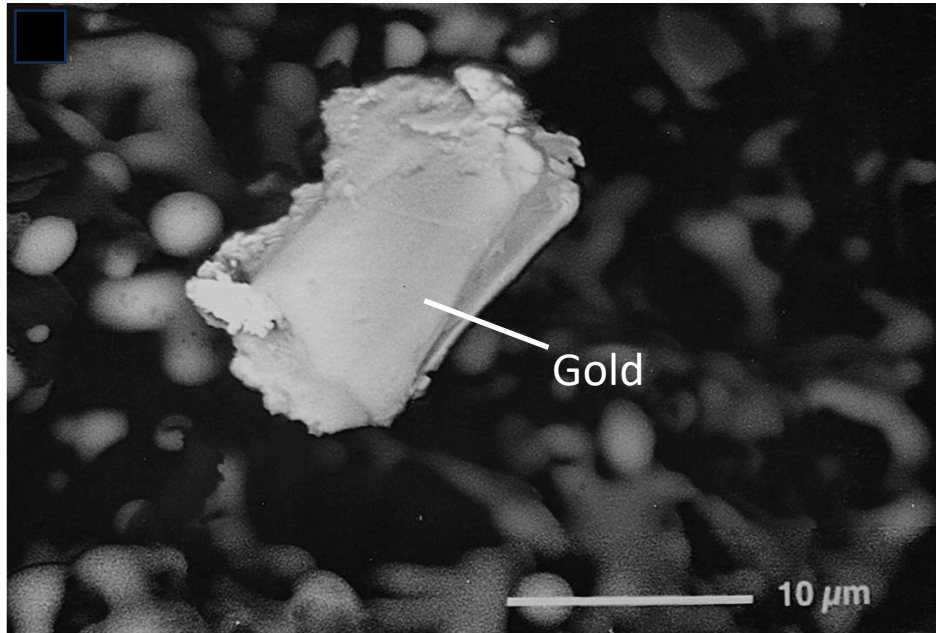
Breccia di Commenda

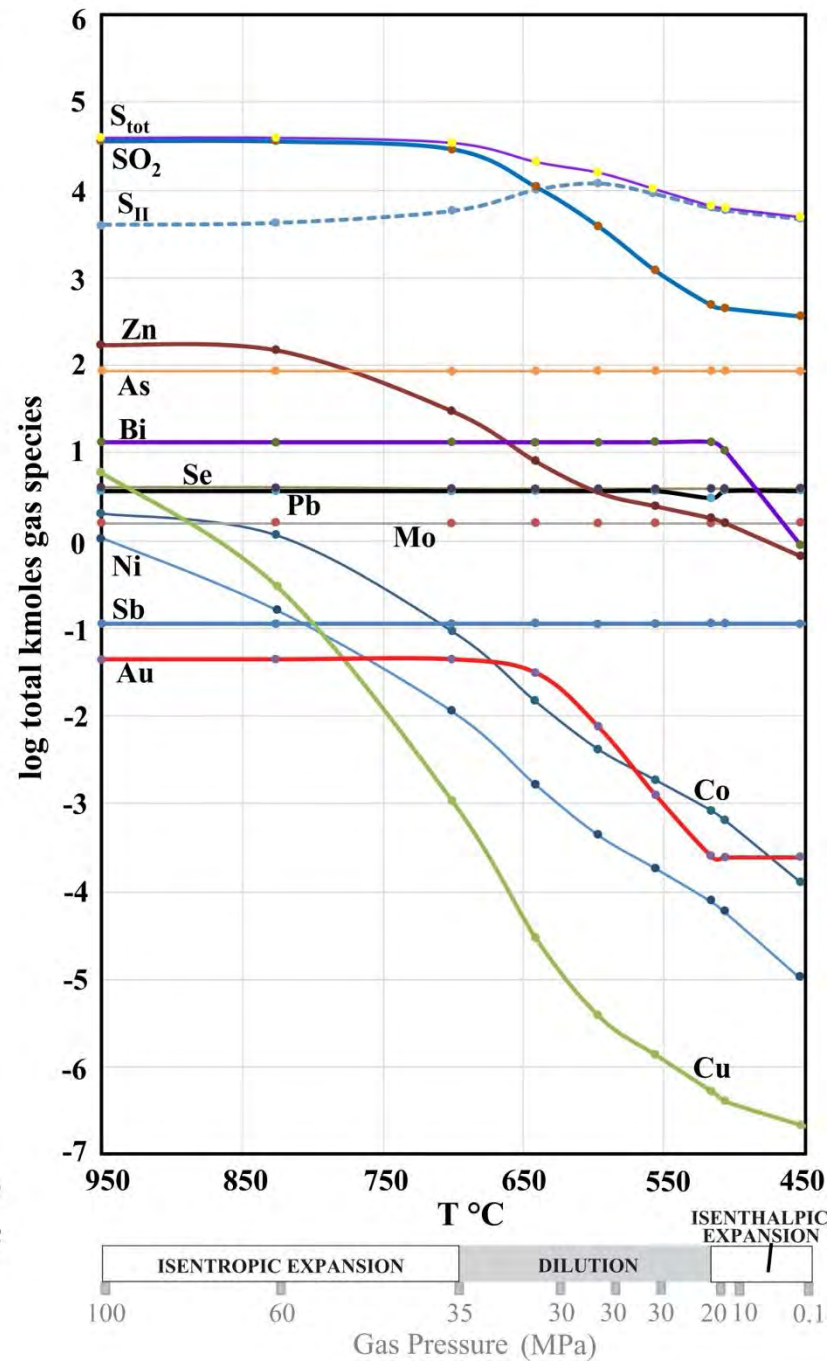
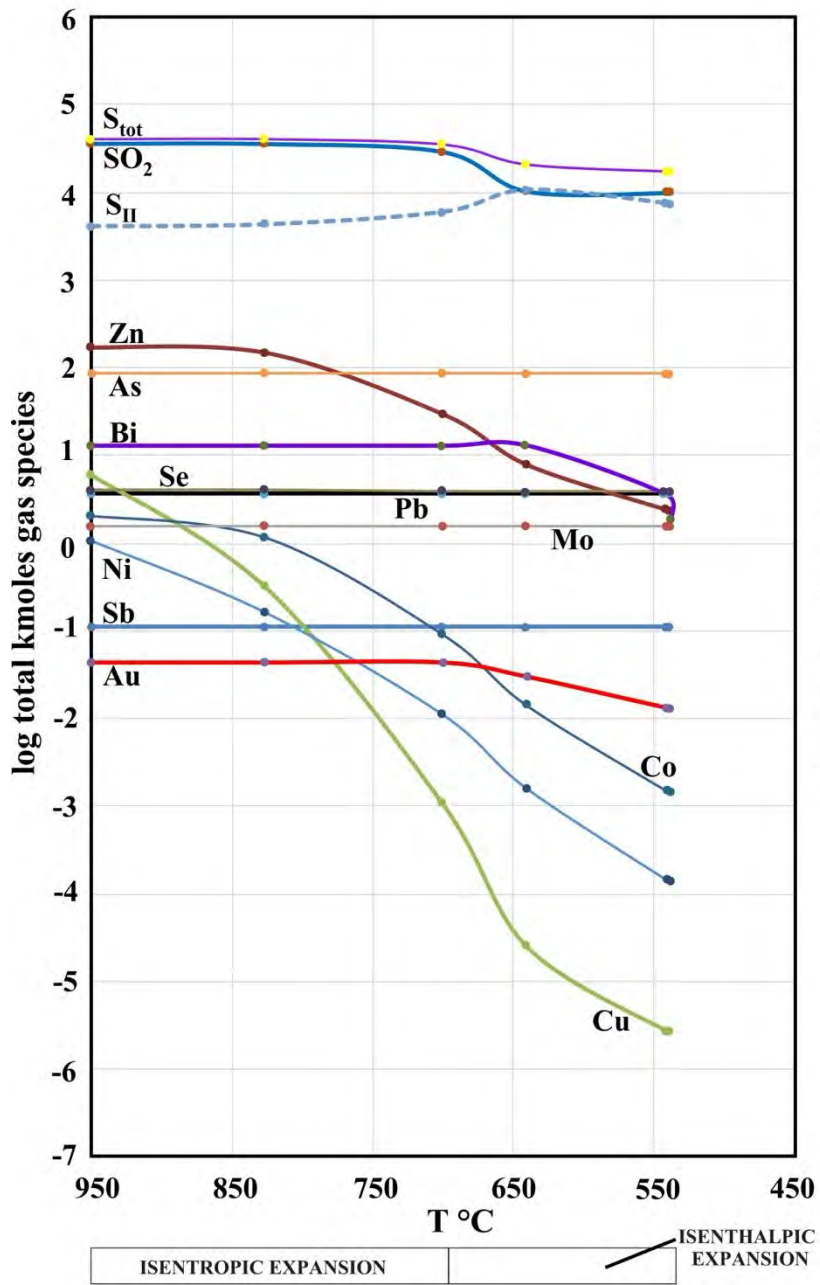


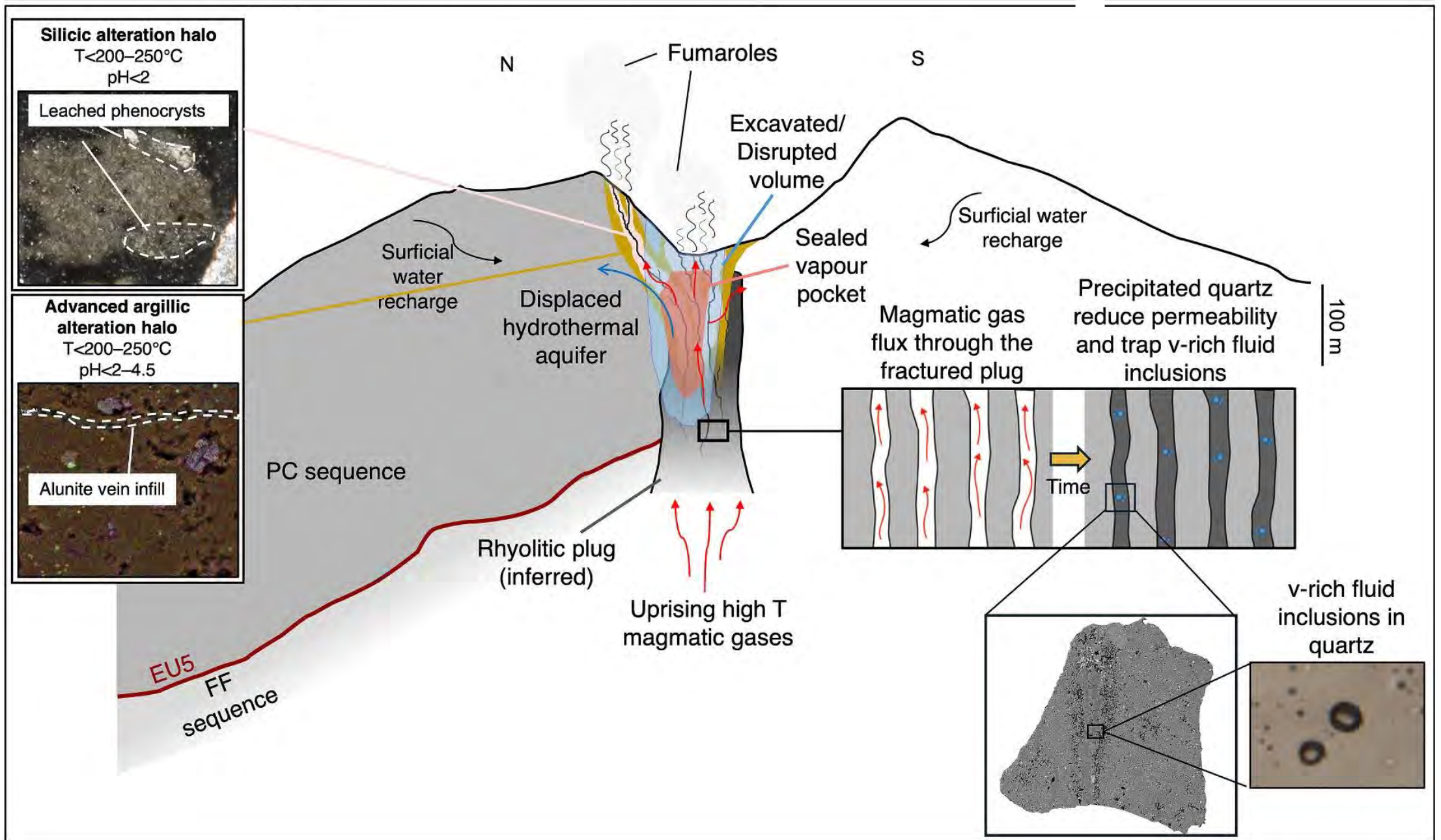


$$EF_{sample} = (X/R)_{sample} / (X/R)_{reference}$$

where X/R represents the ratio of a specific element (X) to a reference immobile element (R , in this case Thorium) in the sample and the reference fresh rock







Take home messages

- La Fossa volcano is characterized by the development of an active high-sulfidation type hydrothermal system
- Hydrothermally altered lithic clasts characterize the deposits of La Fossa phreatic eruptions, and their study allows defining the pre-eruptive conditions
- **1873 eruption:** Pre-eruptive conditions at shallow levels were dominated by hot, acidic fluids ($T < 200\text{ }^{\circ}\text{C}$ – $250\text{ }^{\circ}\text{C}$, pH 2–4.5, locally <2) producing silicic and advanced argillic alteration
- A rhyolitic plug occupied the shallow conduit system of La Fossa and was fluxed by high temperature magmatic gases documented by vapour-rich fluid inclusions
- Metal enrichment in the fine ashes suggests that magmatic gases involved in the eruptive dynamic were capable of transporting metal elements

Thank you!