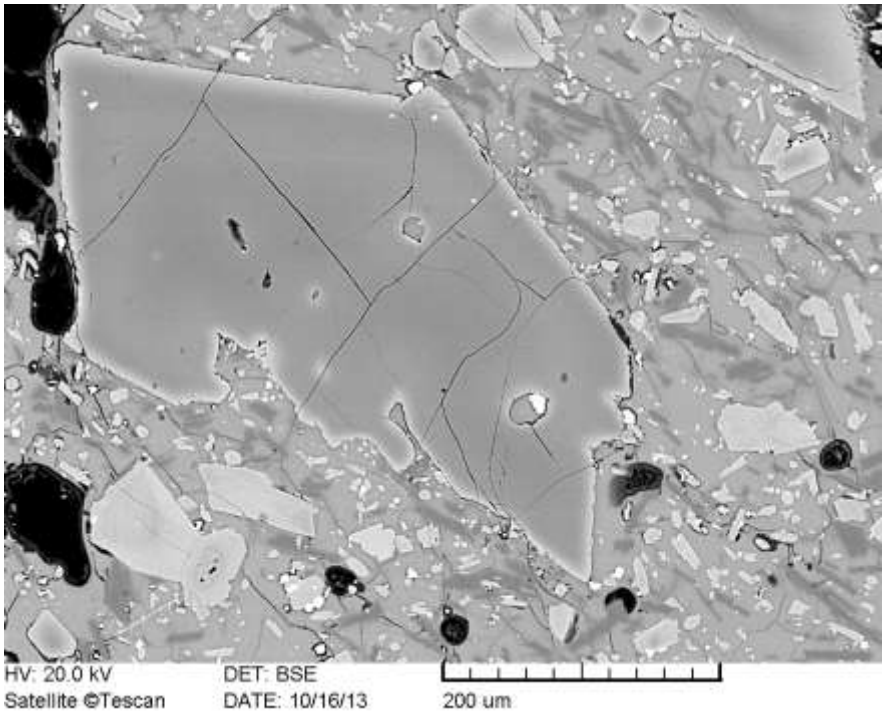
Petrographic and geochemical investigation of the pyroclastics from Bondoró volcanic centre (western Pannonian Basin, Hungary)

Taracsák Zoltán

Department of Petrology and Geochemisty, Eötvös Loránd University;
MTA-ELTE Volcanology Research Group, Budapest



Monogenetic volcanic fields: Volcanic hazard

Monogenetic volcanic fields: small-volume eruptive centres scattered in a large area

Long lifespan (several Ma) → even fields declared inactive can become active again

Fast ascending magmas
→ can reach the surface within a few days
→ highly unpredictable nature

A great threat, especially in overpopulated areas (i.e. Auckland, New Zealand)

Parícutin, Michoacán-Guanajuato Volcanic Field, Mexico

Mt. Eden, Auckland Volcanic Field, New Zealand

Introduction

Basaltic Magmas

Produced by partial melting of the upper mantle

Fast ascent, especially at monogenetic volcanic fields → Small degree of magma differentiation

→ The composition of magma that reached the surface represents the composition of the parental magma

→ Whole-rock geochemistry

→ Implication for the source region characteristics

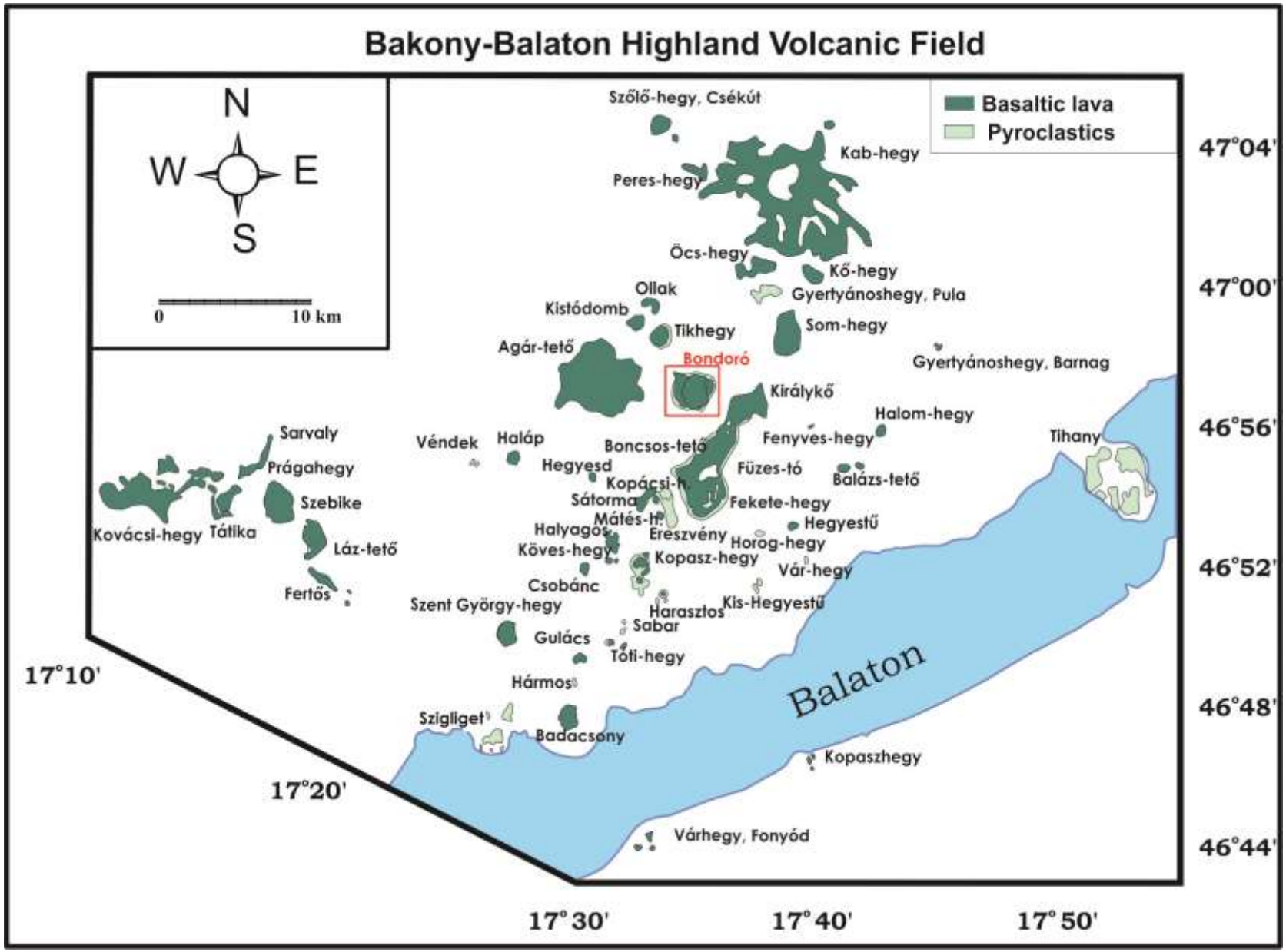
- But sometimes: presence of abundant xenoliths and xenocrysts in the basalt
  → significant modification in the whole rock geochemical data

- Pyroclastic rocks
  → juvenile basalt fragments

Another method has to be applied

→ Detalied investigation of fresh sideromelane glass shards

Location


Bakony-Balaton Highland Volcanic Field
N
W
E
S
0
10 km
Basaltic lava
Pyroclastics
Szőlő-hegy, Csékút
Kab-hegy
Peres-hegy
Öcs-hegy
Kő-hegy
Ollak
Gyertyánoshegy, Pula
Kistódomb
Tikhegy
Som-hegy
Agár-tető
Bondoró
Gyertyánoshegy, Barnag
Királykő
Halom-hegy
Sarvaly
Véndek
Haláp
Boncsos-tető
Fenyves-hegy
Tihany
Prágahegy
Hegyesd
Füzes-tó
Balázs-tető
Szebike
Sátorma
Fekete-hegy
Kovácsi-hegy
Tátika
Mátés-h.
Hegyestű
Láz-tető
Halyagos
Ereszvény
Horog-hegy
Köves-hegy
Kopasz-hegy
Vár-hegy
Fertős
Csobánc
Szent György-hegy
Kis-Hegyestű
Harasztos
Sabar
Gulács
Tóti-hegy
Hármas
Balaton
Szigliget
Badacsony
Kopaszhegy
Várhegy, Fonyód
47°04'
47°00'
46°56'
46°52'
46°48'
46°44'
17°10'
17°20'
17°30'
17°40'
17°50'

Previous knowledge about the Bondoró

Compex volcanic structure

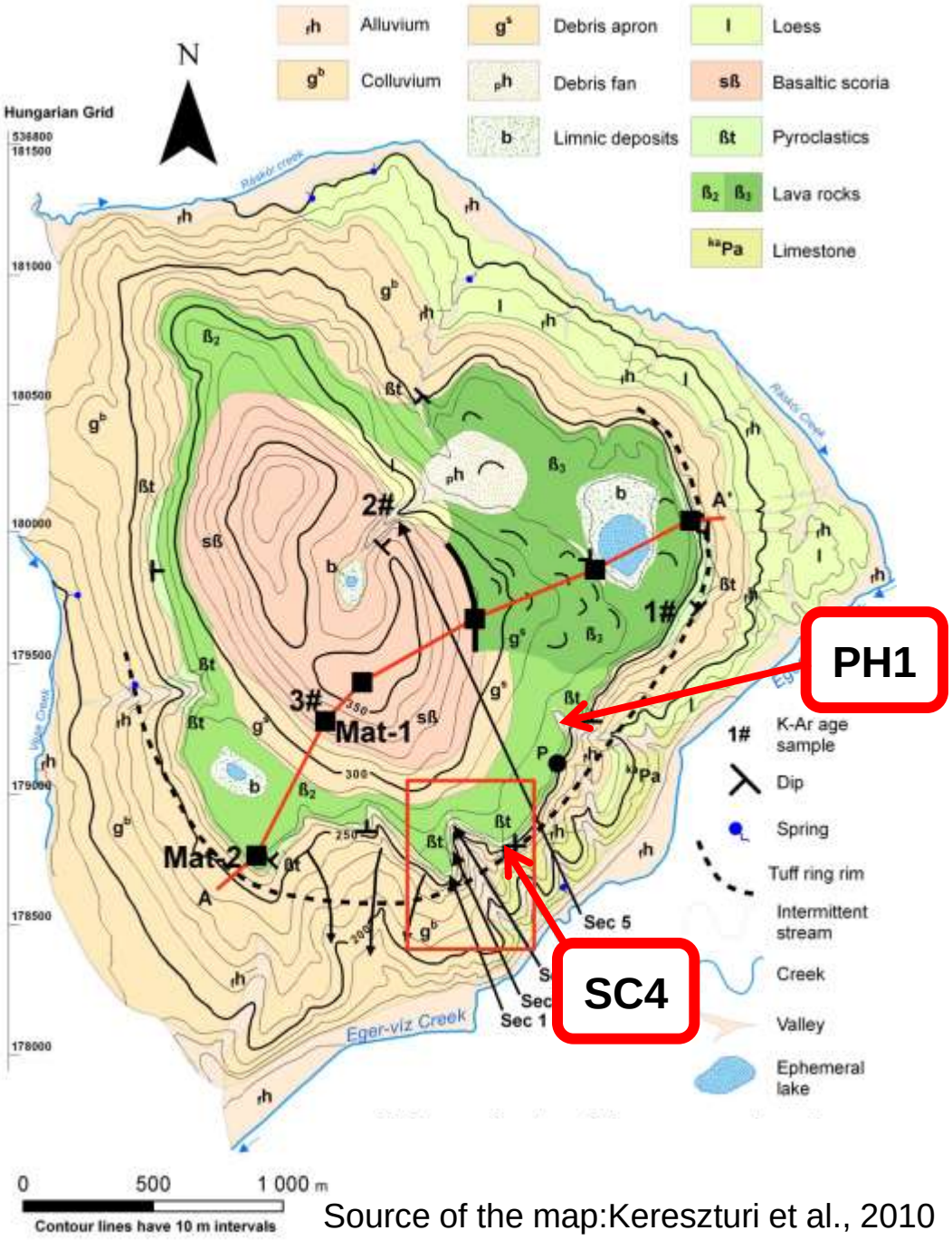
→ multiple different eruptive phases (tuff ring, lavaflows, scoria cone)

→ Complex magmatic system beneath the Bondoró

Previous petrological & geochemical studies of the lava rocks

→ unusually rich in xenocrysts and xenoliths

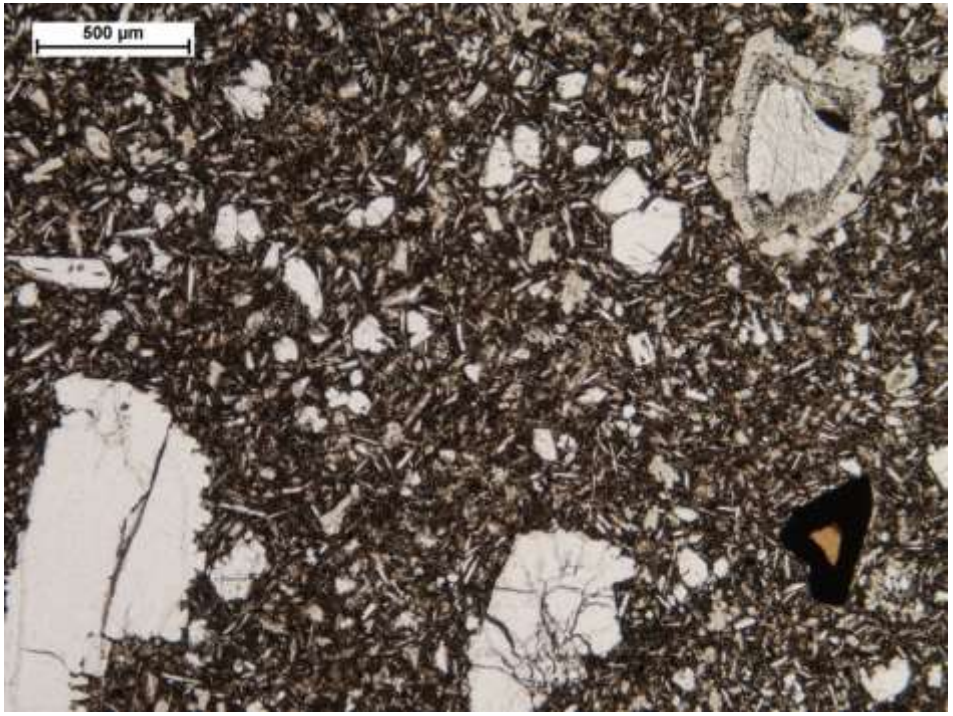
What about the pyroclastics?



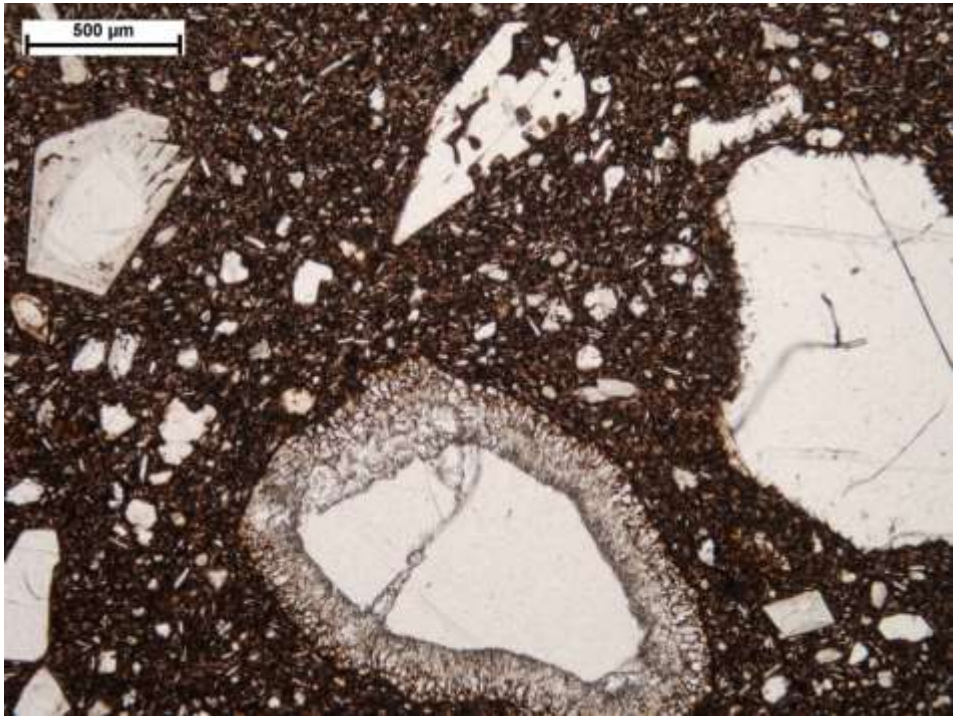
Source of the map:Kereszturi et al., 2010

Petrography

Textural features

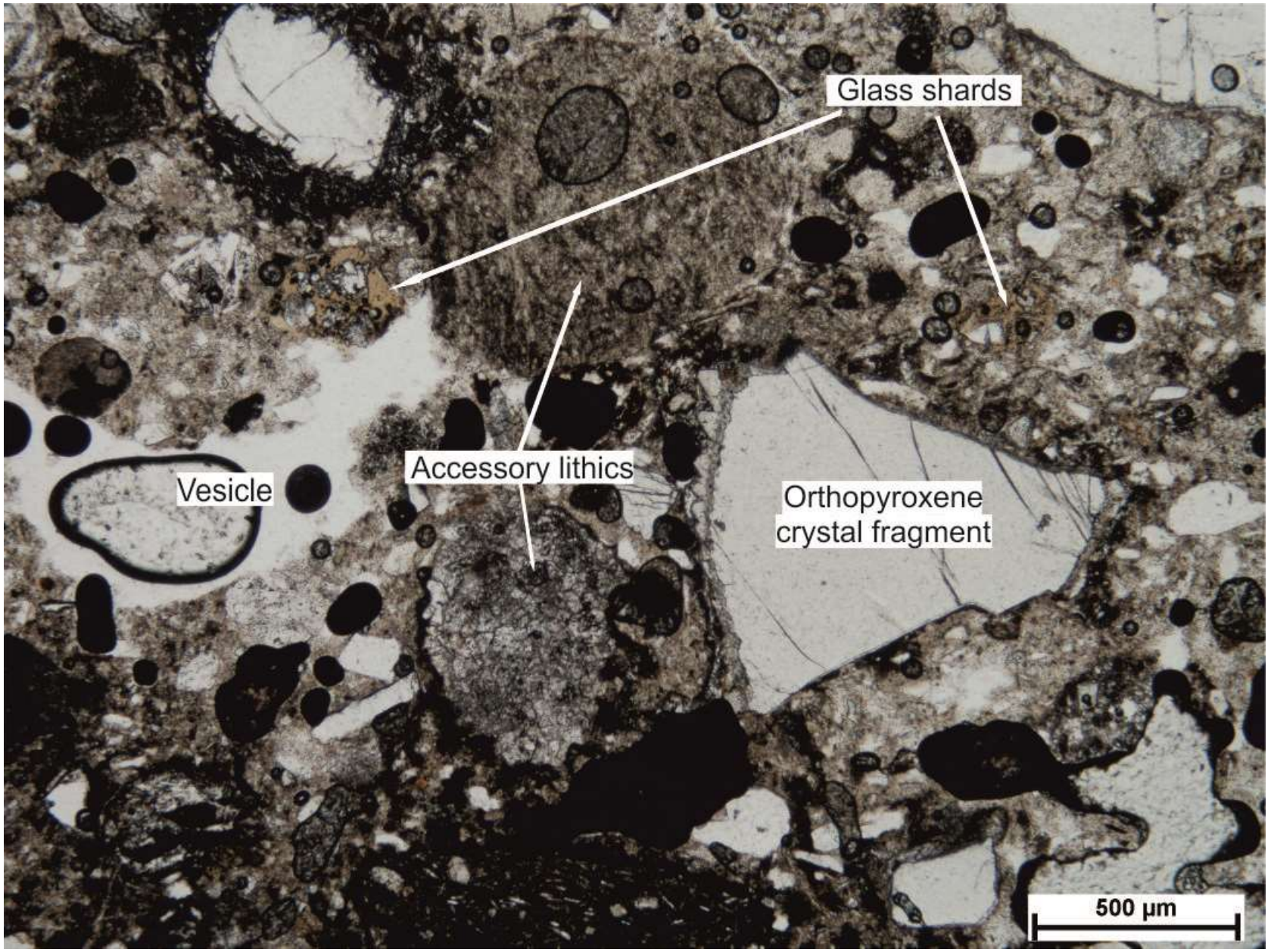


Lava rocks

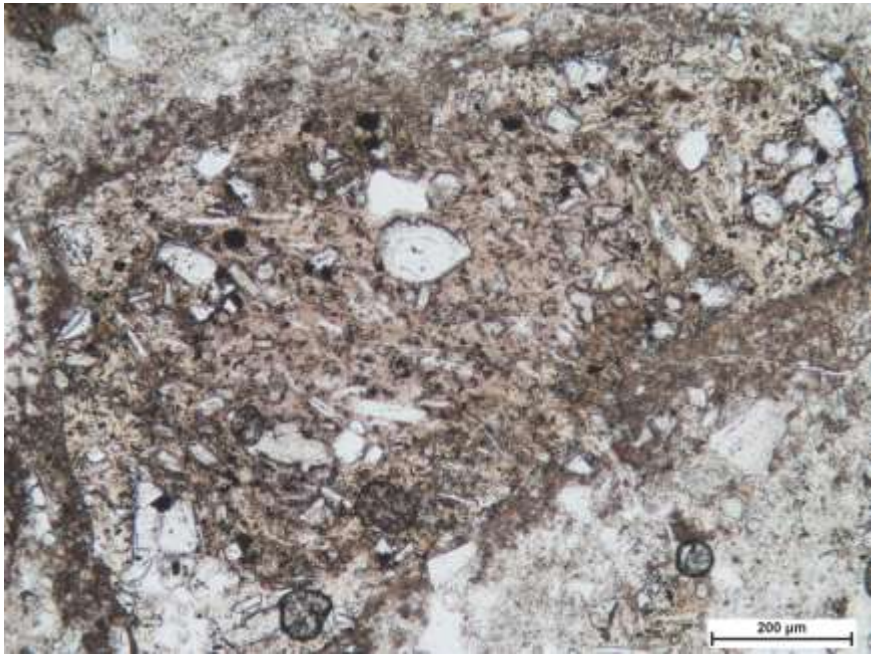


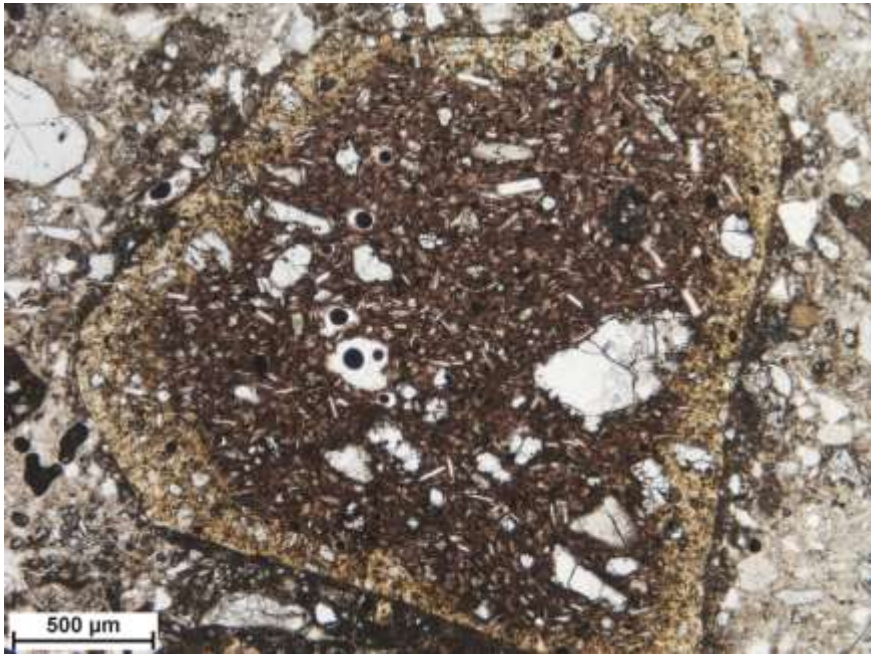
Basalt fragments in the pyroclastics

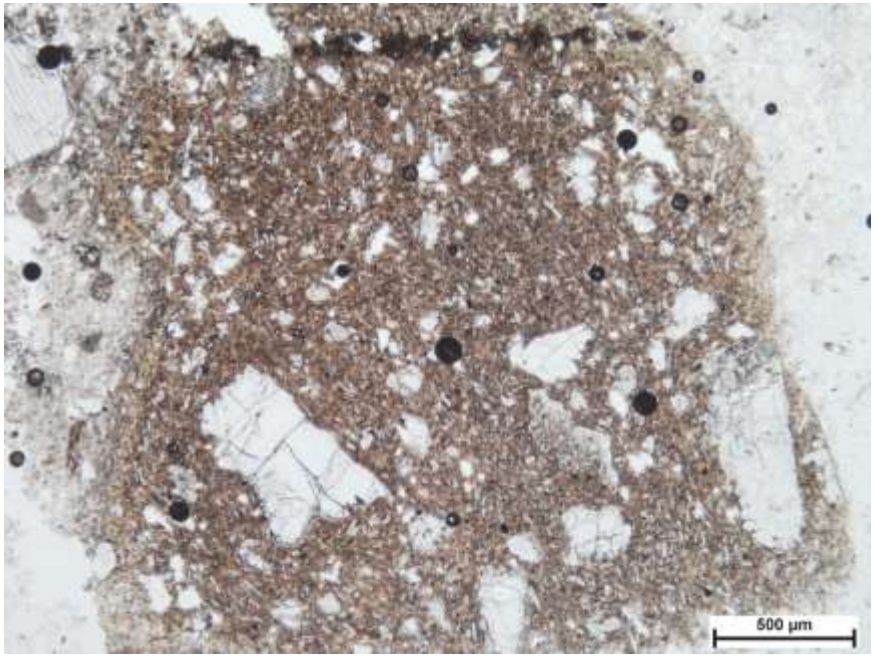
Petrography



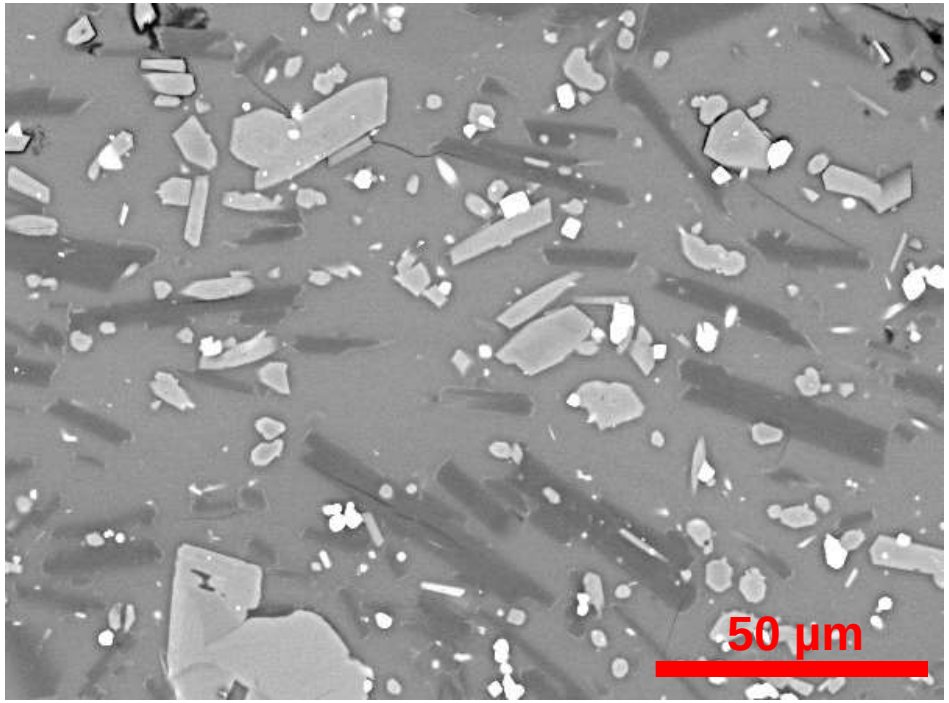
Glass shards: colour



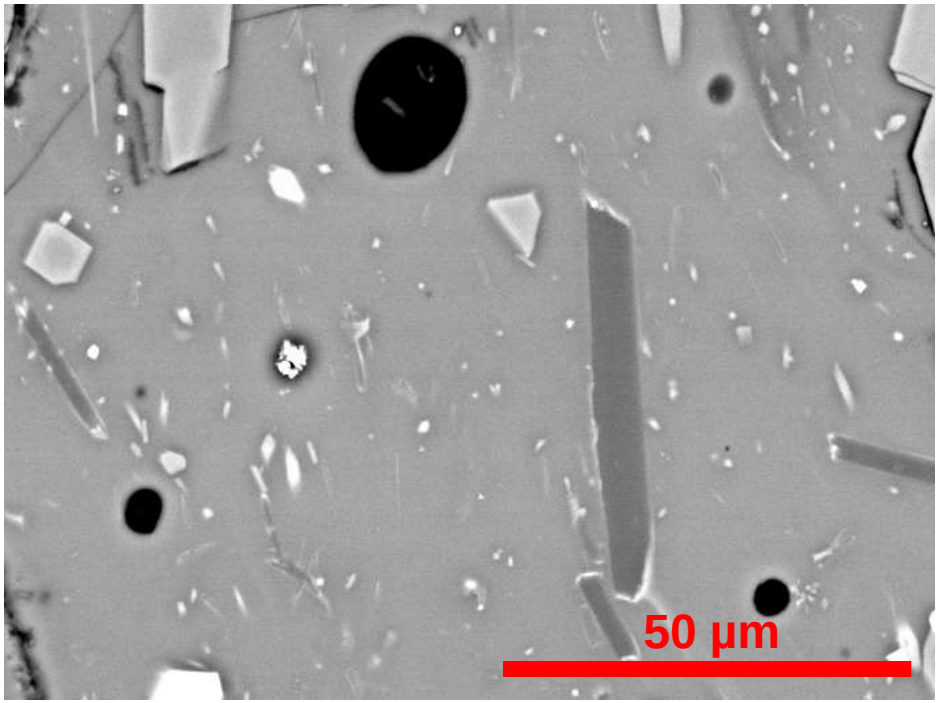




Glass shards: Crystal content

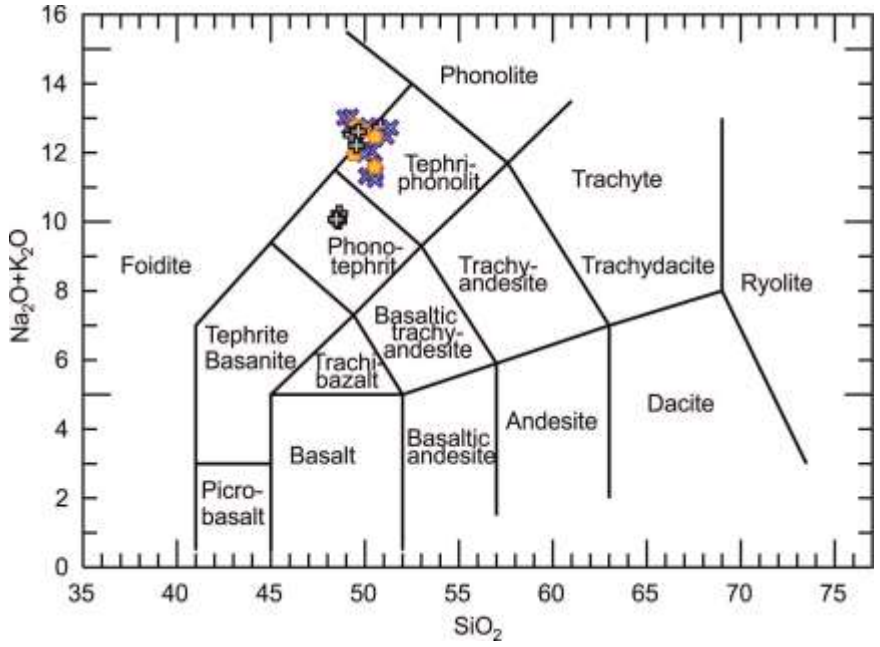


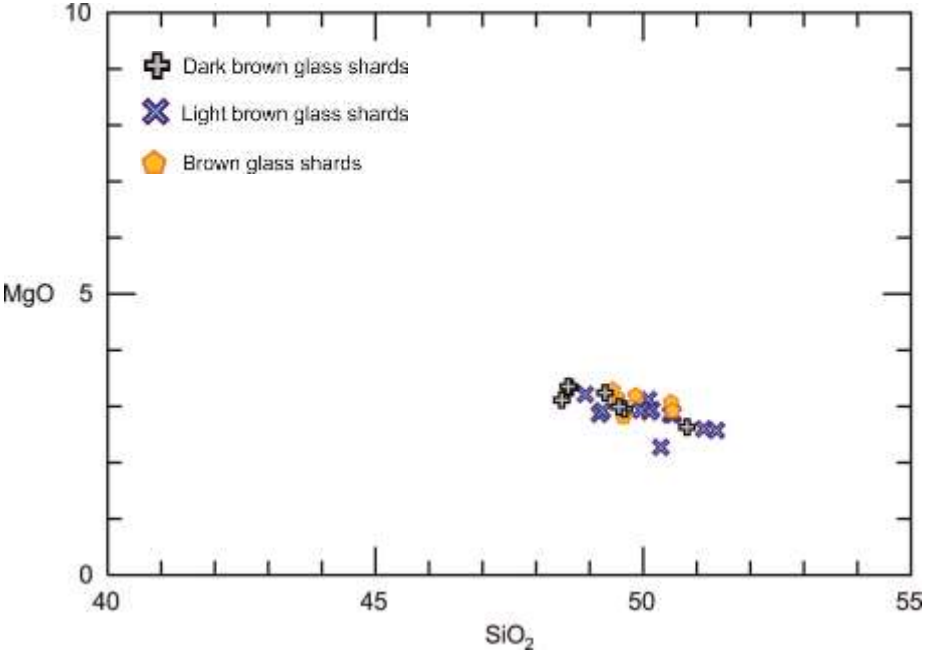
Crystal-rich glass shard

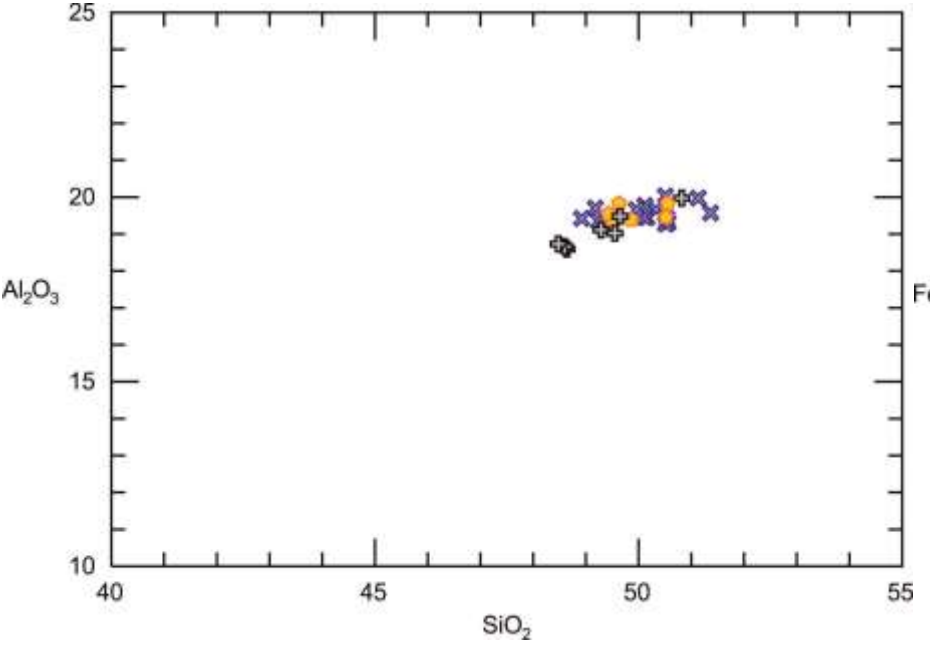


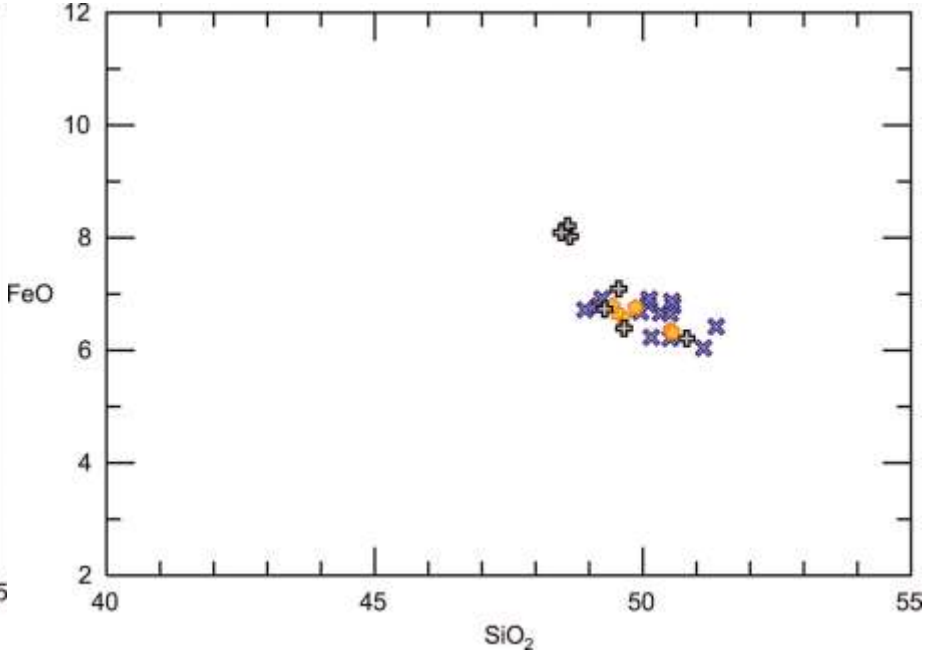
Crystal-poor glass shard

Glass chemistry

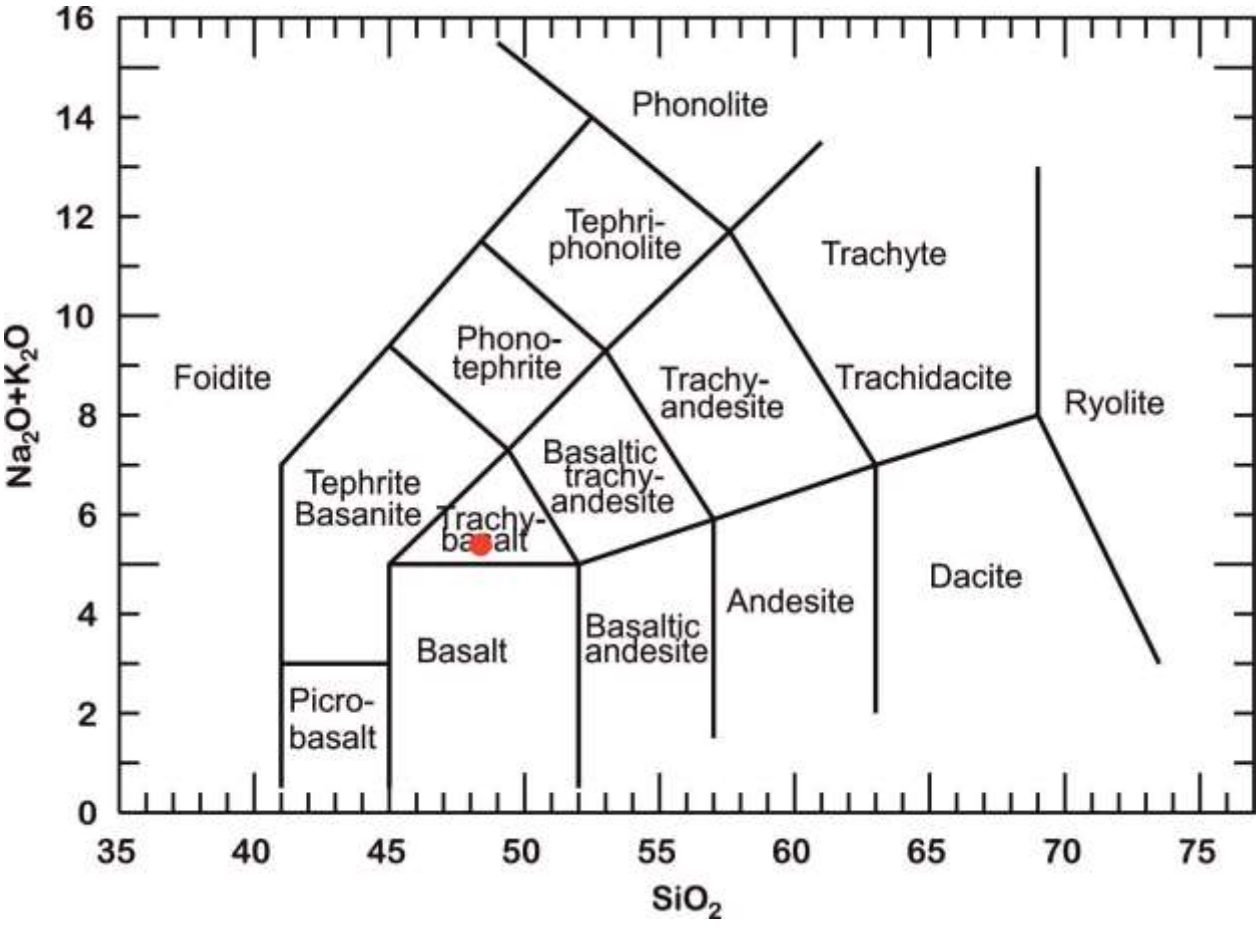


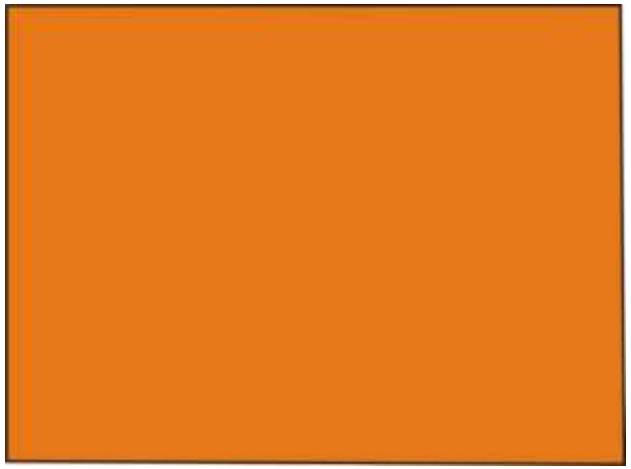




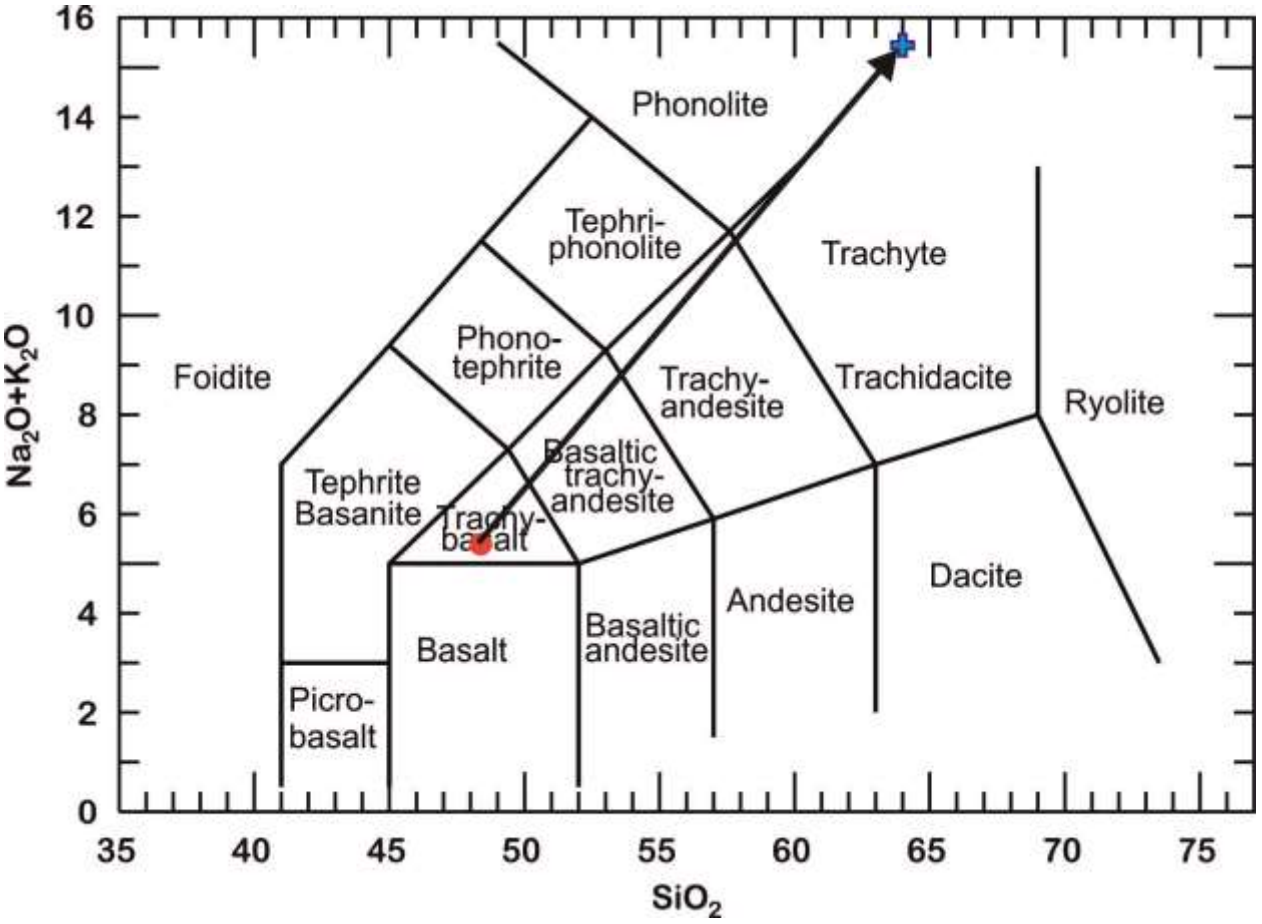


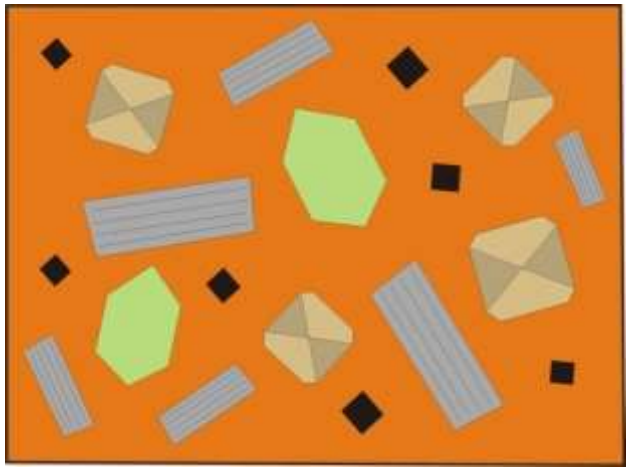
Magma differentiation





Magma differentiation





Modeling

⬇

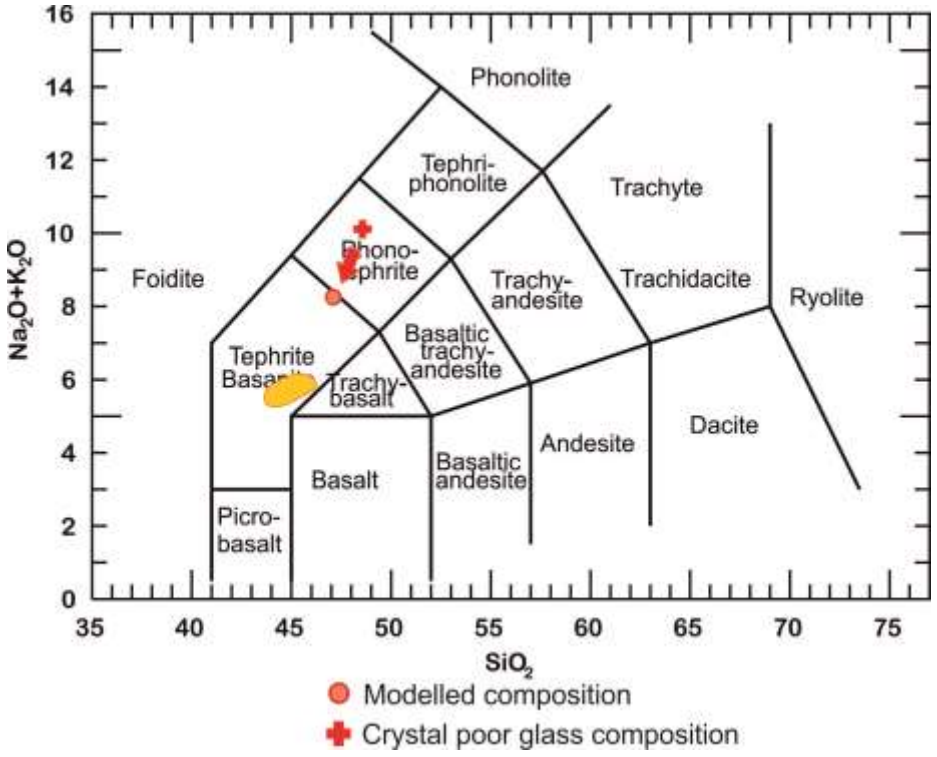
Mass balance calculation

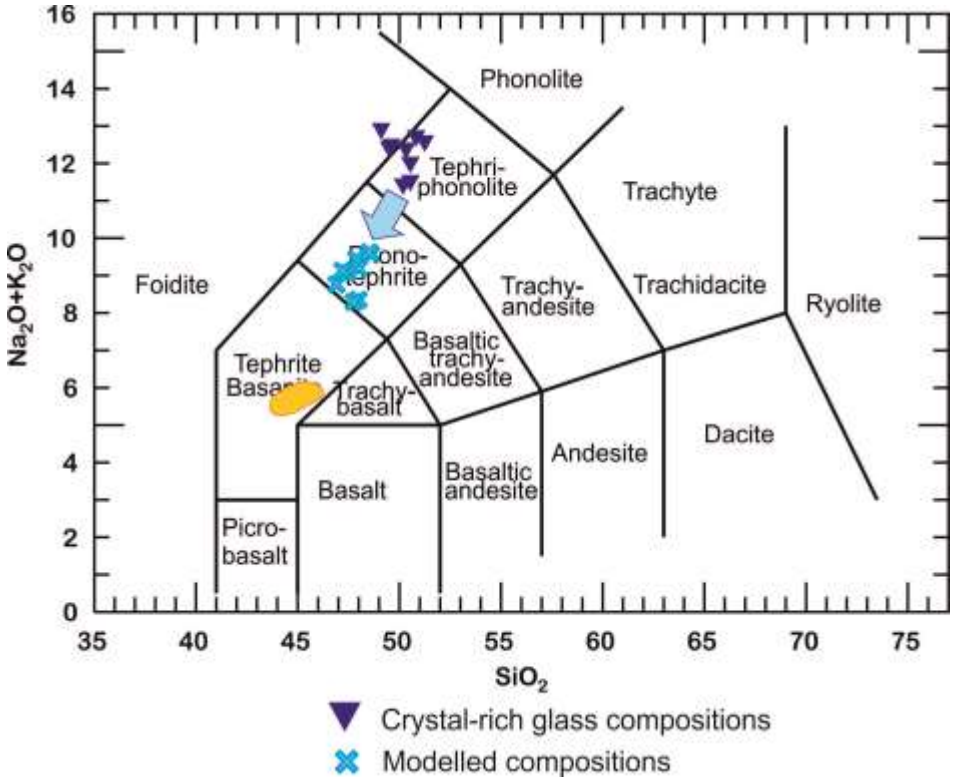
10% olivine fractionation

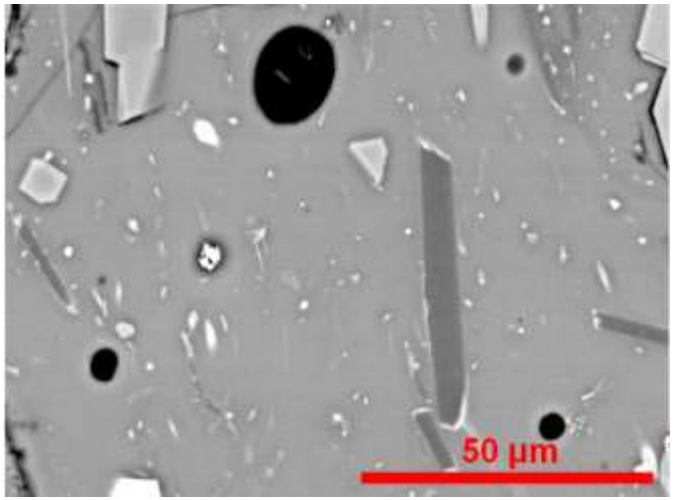
10% olivine & 20% cpx fractionation

10% olivine, 20% cpx, 35% plag és 5% Fe-Ti oxide fractionation

Major element geochemical modelling



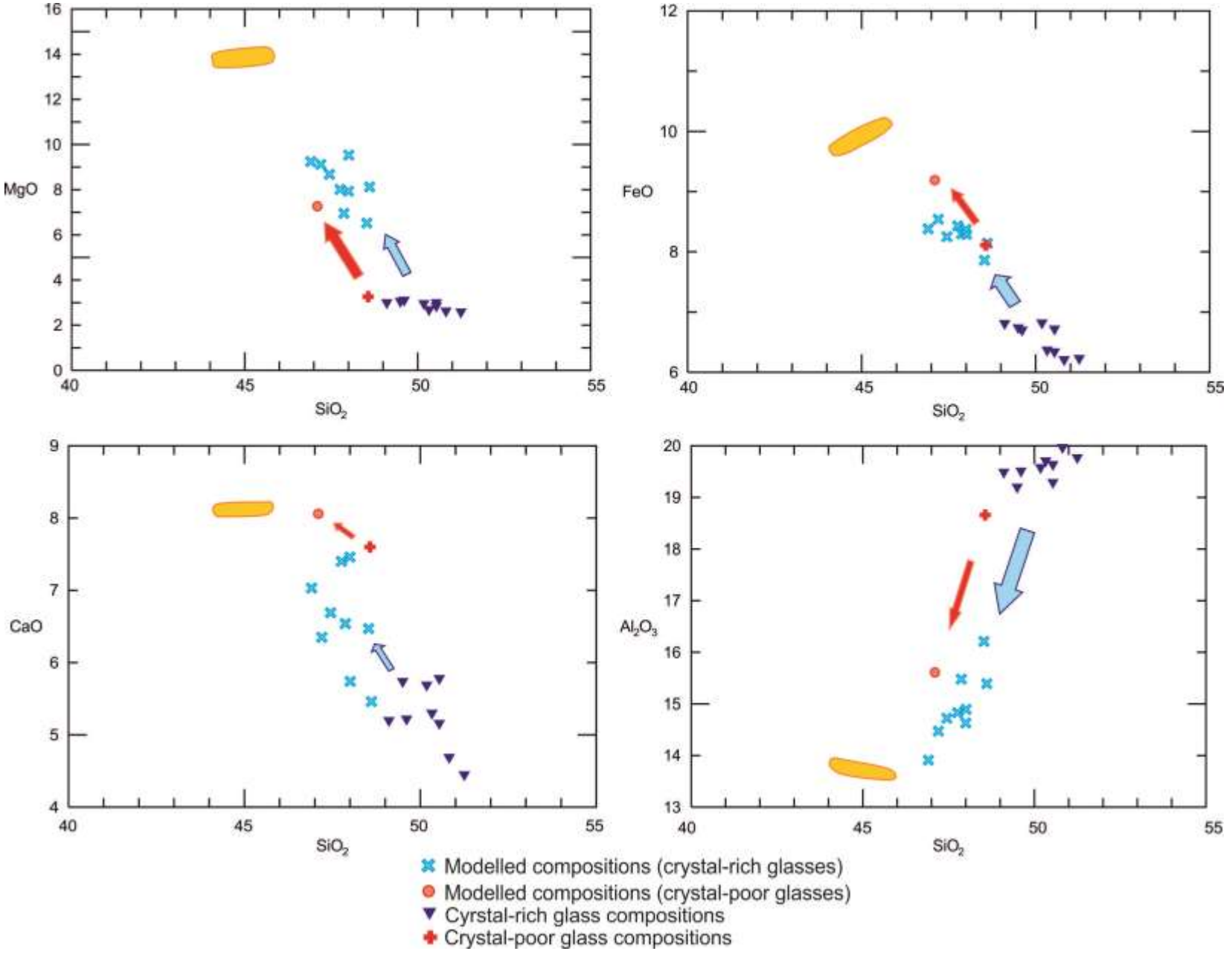




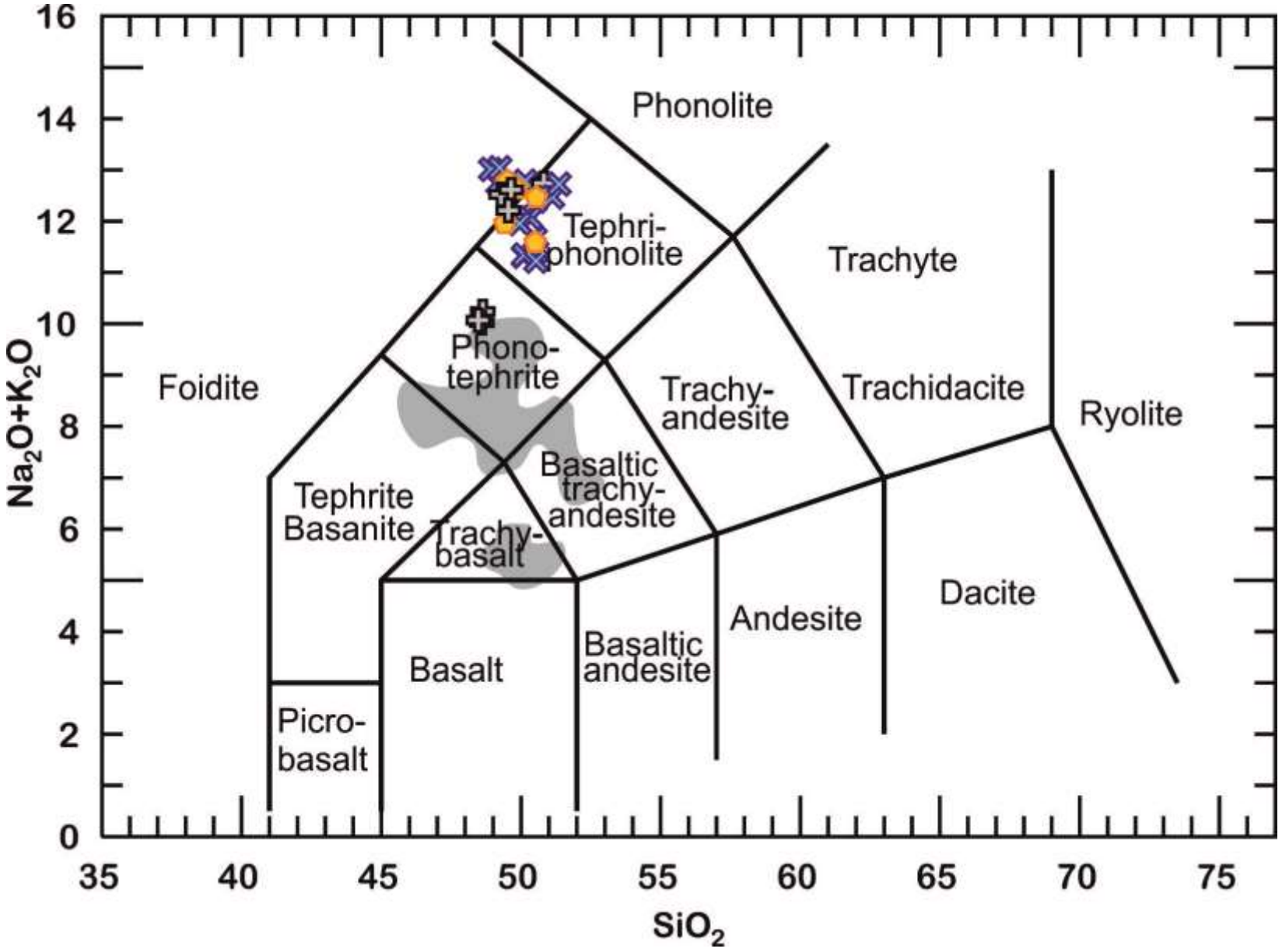
Alkali fractionation trand (basanite → phonolite)

Whole-rock geochemical data (from lava rocks): Embey-Isztin et al., 1993; Unpublished data, Harangi, 2009

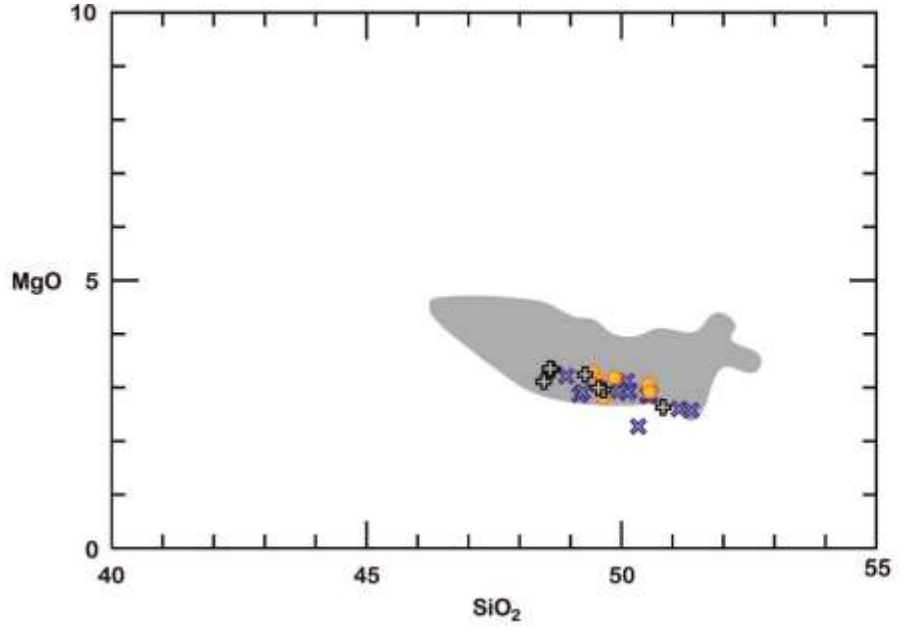
Major element geochemical modelling

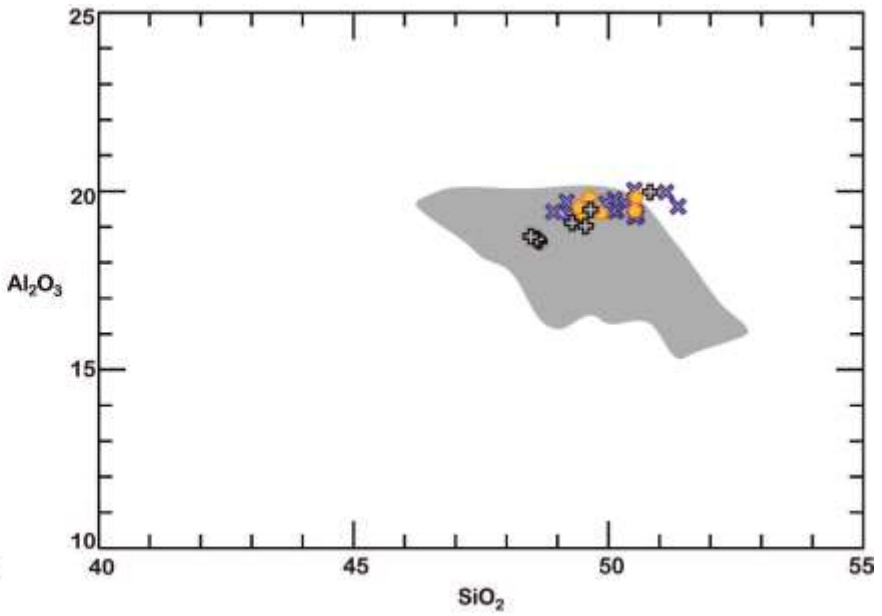


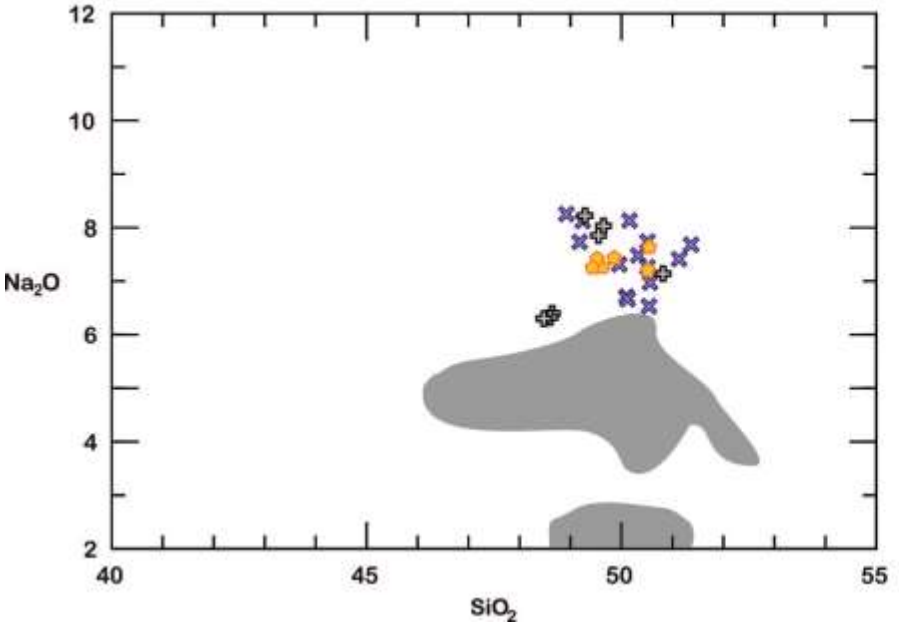
Comparison with other glass shards



Comparison with other glass shards







Good correlation with other glass shards from the BBHVF, exept for Na

Previous data: Németh et al., 2003; Martin & Németh, 2004

Summary

- The textural features and modal composition of the juvenile basalt fragments of the pyroclastics and the lava rocks are similar → they represent similar magmas

→ Contaminated whole-rock compositions

→ Eliminating the effect of contamination caused by xenocrysts

- Major element geochemical modelling of glass shards → almost the only plausible method to approach the parental magma composition in the case of pyroclastic sequences

Future plans:

- Whole-rock geochemical analysis of the juvenile basaltic pyroclasts
  → separation of xenocrysts
- reanalyzing the composition of glass shards with WDS (EMPA)
- Study of additional crystal-poor glass shards
  → trace element compositions (LA-ICP-MS analysis)

Thank you for the attention!

Acknowledgements:

Dr. Harangi Szabolcs, Jankovics M. Éva, Kiss Balázs, Dr. Dobosi Gábor, dr. Józsa Sándor and the members of the MTA-ELTE Volcanology Research Group and the Department of Petrology and Geochemisty