



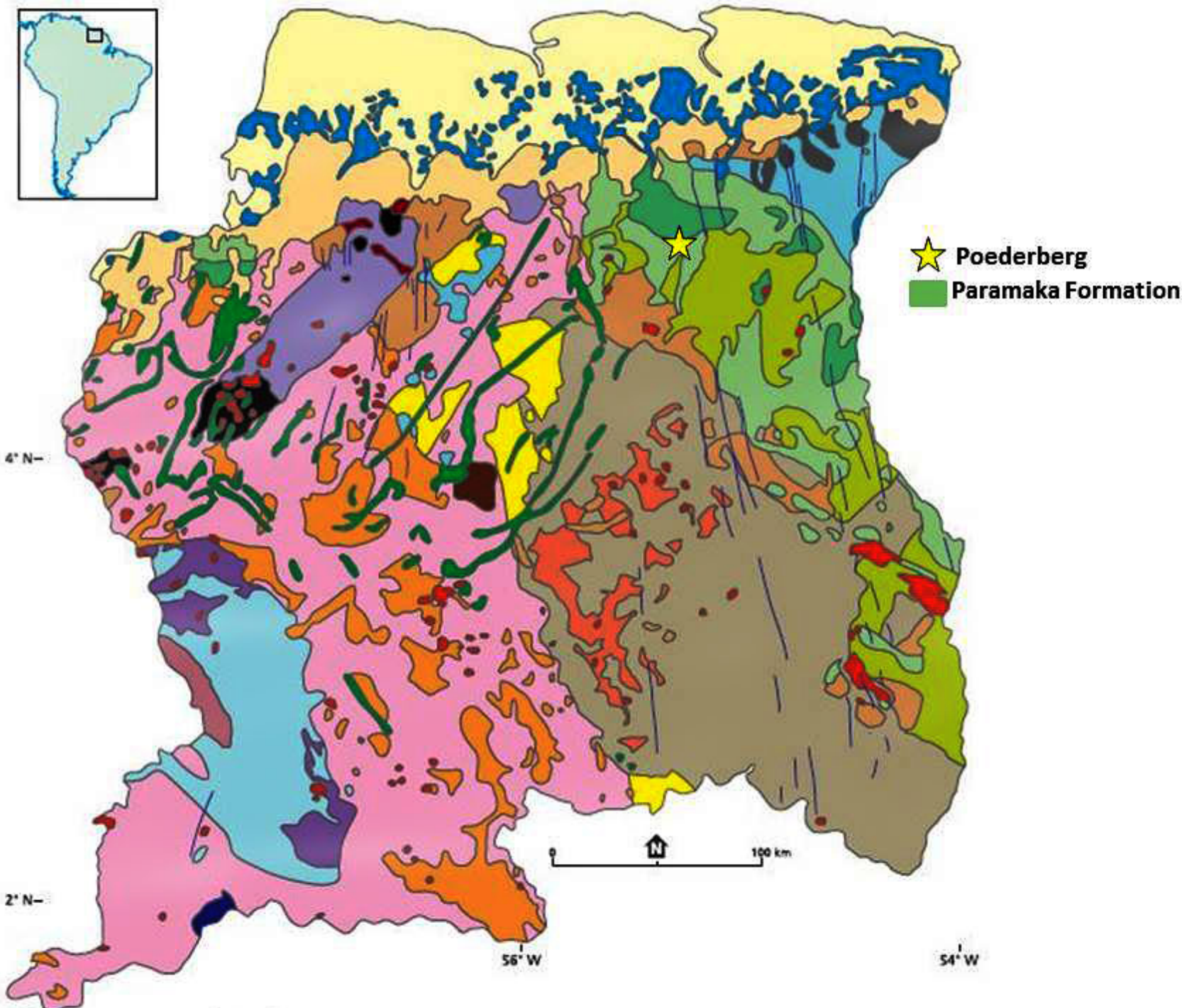
Stacey Amattaram¹, Salomon Kroonenberg¹, Theo Wong¹, Paul Mason²

¹ Anton de Kom University of Suriname, ² University Utrecht

INTRODUCTION

The Poederberg Pillow basalts of the Paleoproterozoic Greenstone Belt are part of the Paramaka Formation formed during the Trans Amazonian Orogeny (2.26 Ga) where new ocean crust is formed (Delor et al., 2003a; Kroonenberg et al., 2016).

Objective: To elaborate the chemical impact of sea-water alteration, hydrothermal alteration and metamorphism on the geochemistry of the pillow lavas.

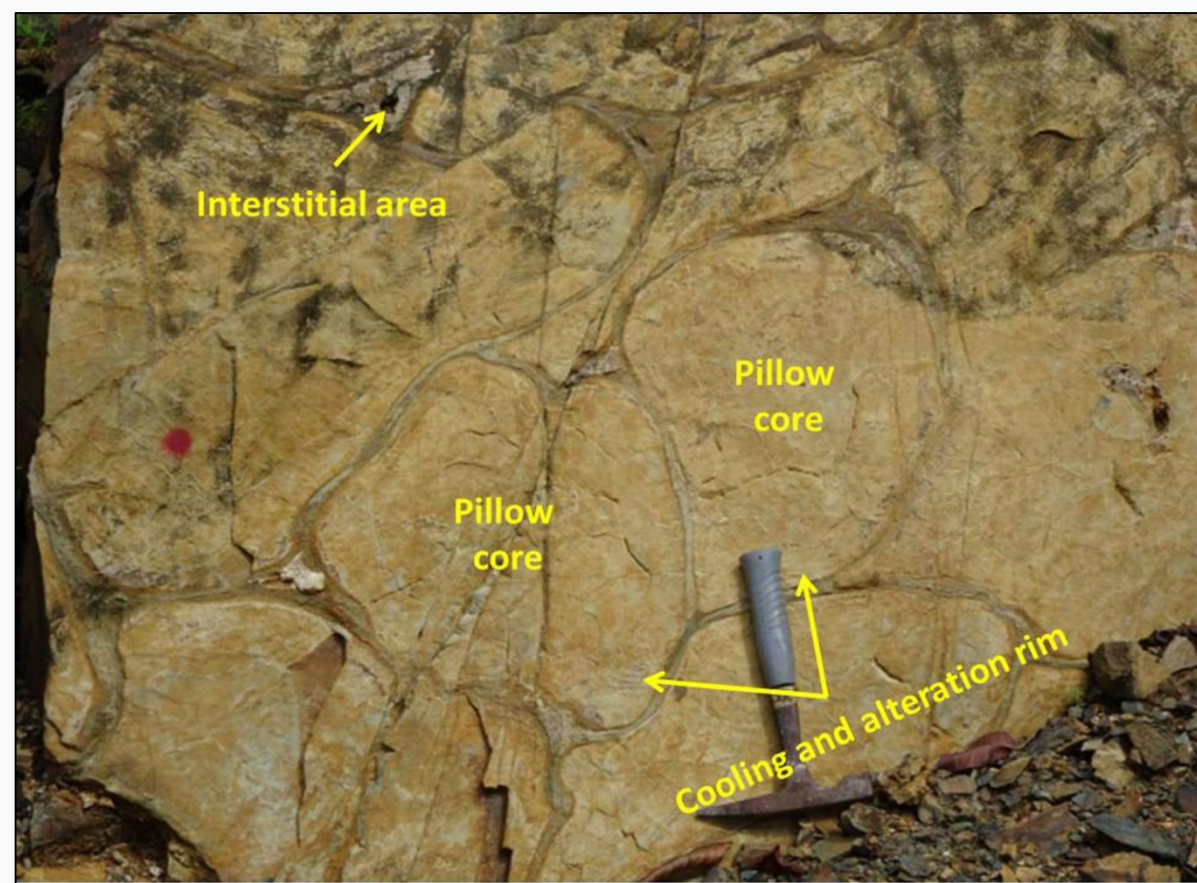


Simplified geological map with Poederberg Location after Kroonenberg et al. (2016)

RESULTS AND DISCUSSION

Morphology

- Dip of pillows is 38° with flow direction of N320°.
- The height varies from 0.2-1 m and the width varies from 0.2-1.2 m.
- Interstitial material is rarely present, radial cracks are absent and chilled margins are narrow.



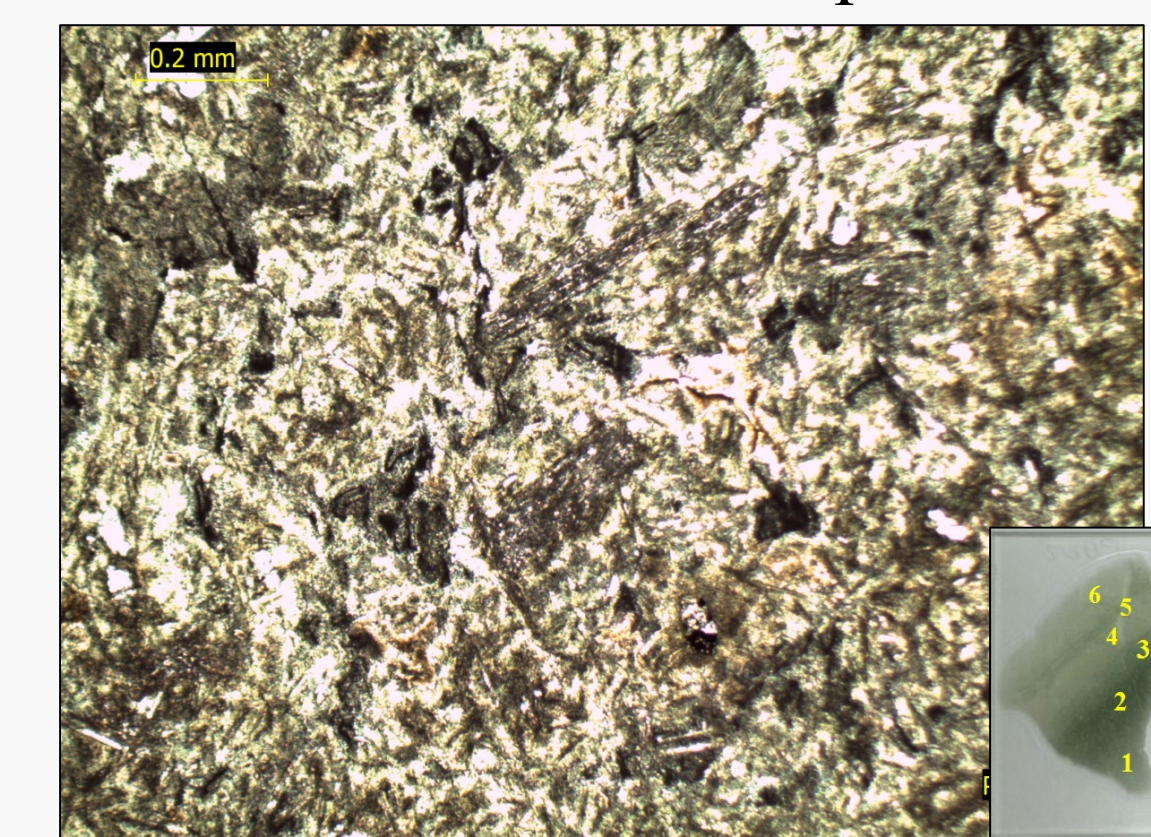
- No hyaloclastite nor vesicles are present suggesting deposition in a submarine environment at water depths of at least 2000 m (Lonsdale & Batiza, 1980).

These results are similar to studied pillows formed at ancient BAB.

Sharp pointed pillows underside indicate that the pillows are in normal nearly horizontal position

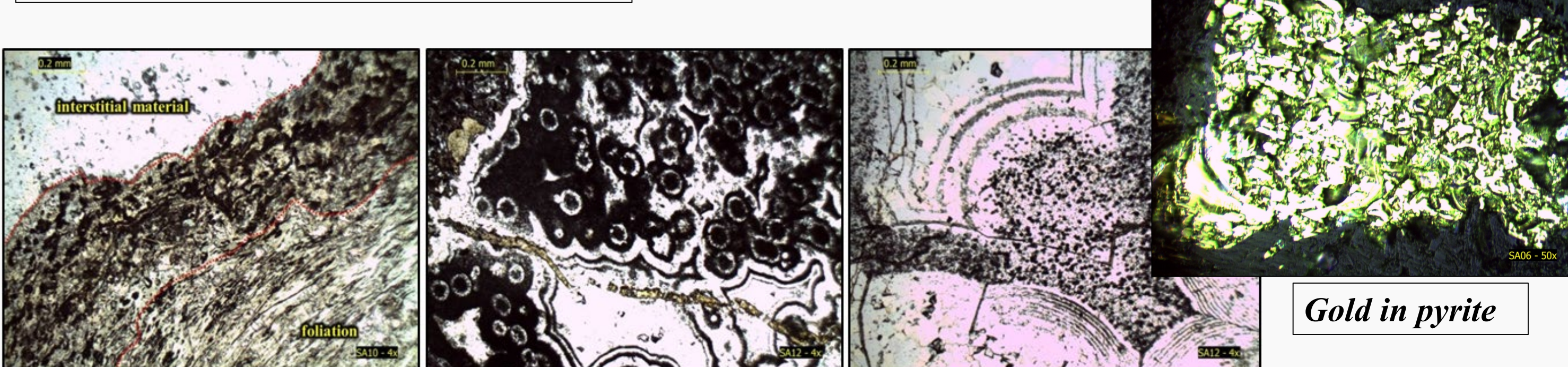
Petrography

- Pillow core:** actinolite, chlorite, epidote, plagioclase phenocrysts and albite.
- Pillow rim:** in PB02 six textural zones, while in SA10 only 4 zones are present. Zone 2-6 are formed by metamorphism of palagonite.
- Interstitial material:** quartz and some amphibole.



- Zone 1:** altered metabasalt (actinolite, chlorite, epidote).
- Zone 2:** metabasalt + palagonite.
- Zone 3:** spherulites of tremolite, actinolite + epidote.
- Zone 4:** foliated zone of chlorite, epidote spherulites, calcite + albite.
- Zone 5:** micro-folds with epidote, titanite, quartz, epidote-calcite-quartz veins.
- Zone 6:** chlorite, epidote, muscovite + chlorite-epidote-quartz veins

PB02 Zone 2 metabasalt and palagonite



Gel-like mass of epidote, quartz + actinolite on top of pillow rims Some show concentric bands.

REFERENCES

Delor C., Lahondère, D., Egal, E., Lafon, J., Truffert, C., Théveniaut, H., et al., 2003a. Transamazonian crustal growth and reworking as revealed by the 1:500,000-scale geological map of French Guiana (second edition), *Geologie de la France*, issue 2-3-4, p. 5-57.

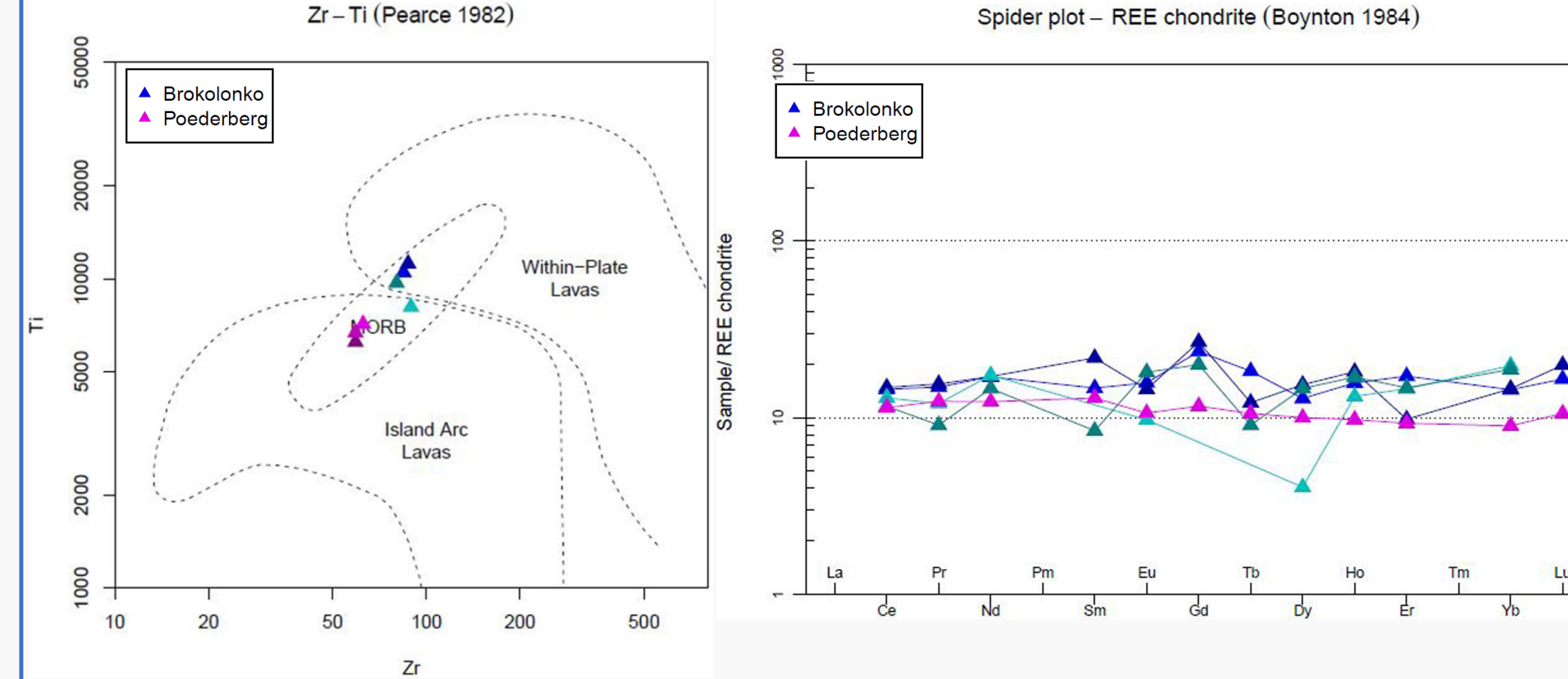
Holland H.D., 2006. The oxygenation of the atmosphere and oceans. Dep. of Earth and Planetary Sciences, Harvard University, Cambridge, USA, p. 903-9015.

Kroonenberg S.B., de Roever E.W.F., Fraga L.M., Reis N.J., Lafon J.M., Cordani U., Wong T.E., 2016. Paleoproterozoic evolution of the Guiana Shield in Suriname: A revised model, *Netherlands Journal of Geosciences*, *Geologie en Mijnbouw*, p. 491-522.

Lonsdale P., Batiza R., 1980. Hyaloclastite and lava flows on young seamounts examined with a submersible. *Geol. Soc. America Bull.*, v. 91, p. 229-255.

Sessions A.L., Doughty D.M., Welander P.V., Summons R.E., Newman D.K., 2009. The Continuing Puzzle of the Great Oxidation Event. *Review. Current Biology*, v.19, p. 567-574.

Geochemistry

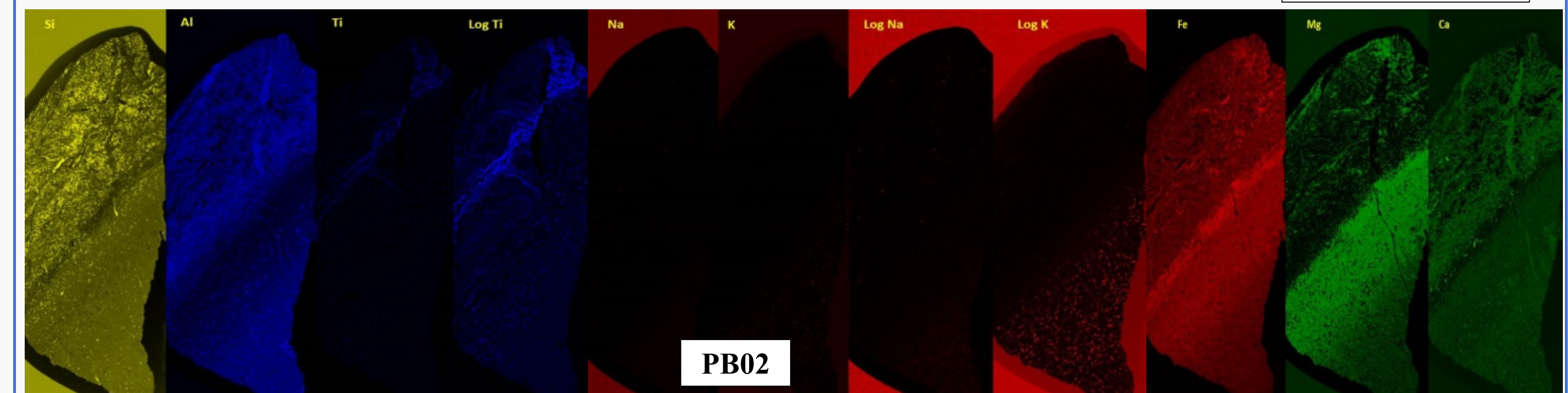


Poederberg pillows and Brokolonko basalts show MORB characteristics. A flat chondrite-normalized REE indicating deposition at spreading zones.

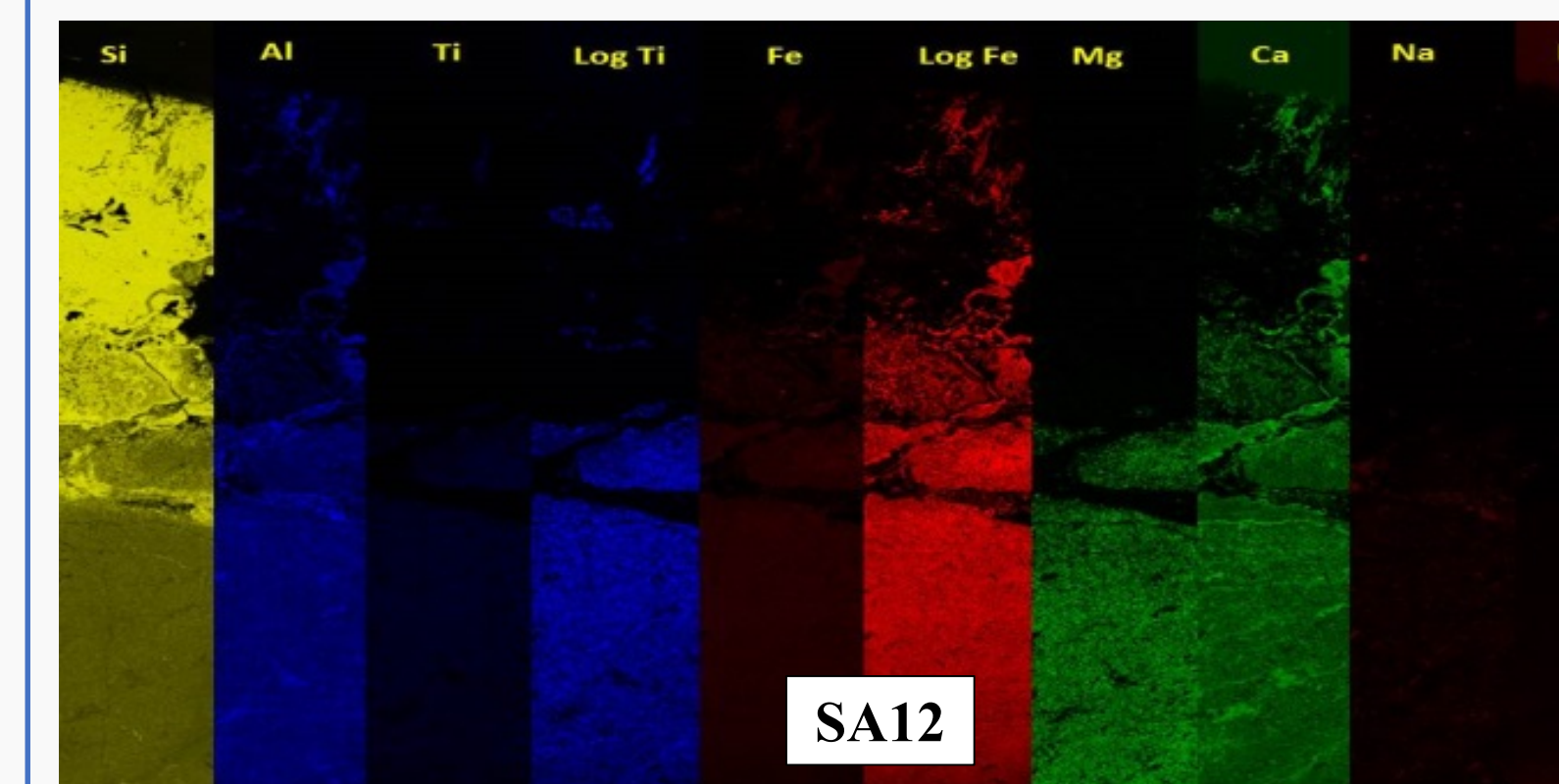
Micro XRF

- Given results are relative amounts in terms of counts or intensities.

++ : enriched
-- : depleted



PB02: Si ++ outer zones → palagonite. Al ++ zone 4 and 5. Ti ++ → titanite. Fe+Mg ++ zone 1 and zone 2. Ca ++ outer zones → carbonate+calcite veins. K included in plagioclase in zone 1 → still a low concentration in this zone. K+Na -- in other zones → no enrichment by seawater.



SA12: Si ++ in interstitial material → quartz and quartz veins. Al, Ti, Mg+Fe ++ in zone 1 and transition to interstitial material.

PB02 and SA12 → 2 different types of pillows rims.

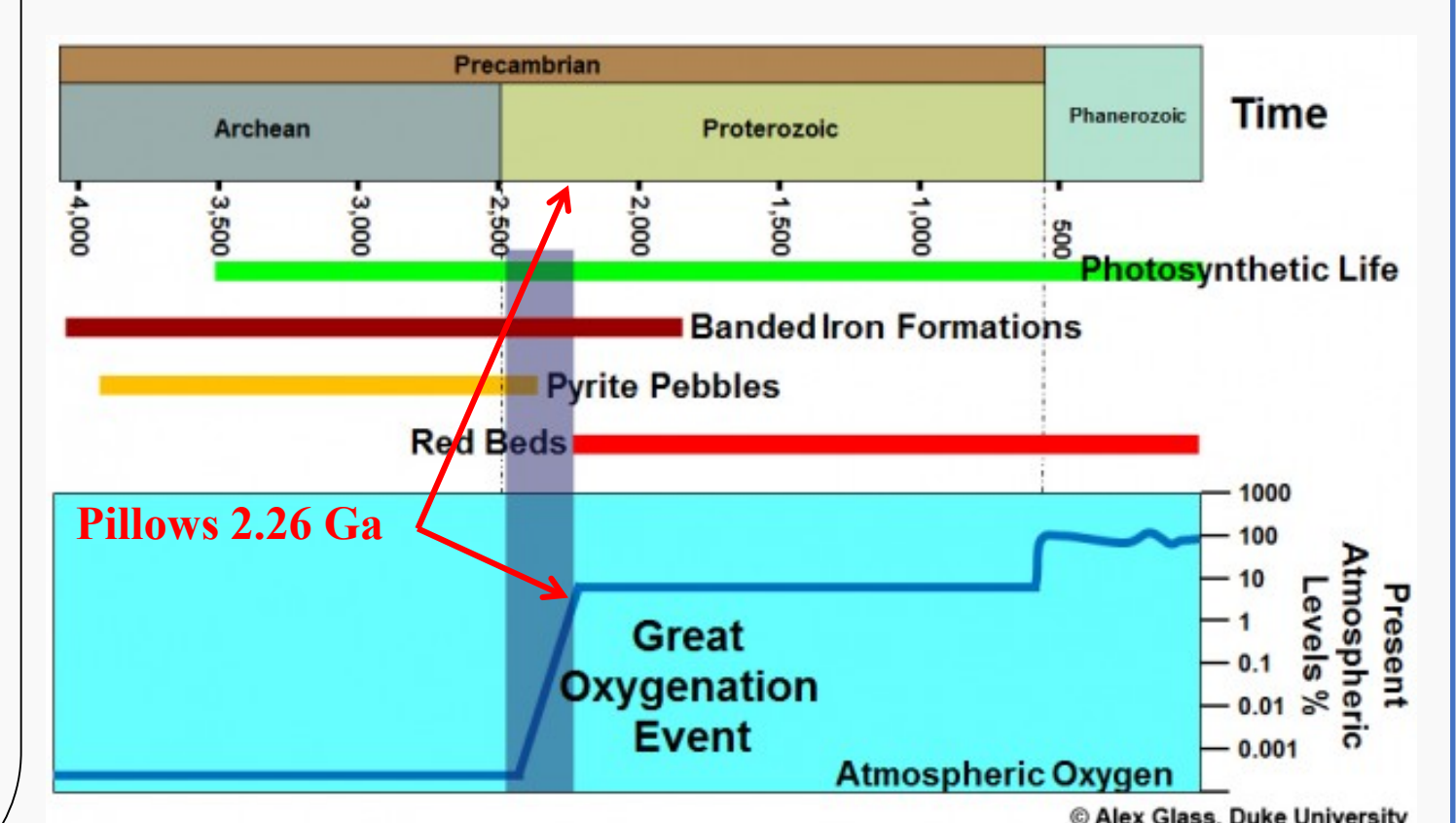
CORRELATION MINERALOGY AND PETROLOGY

PB02

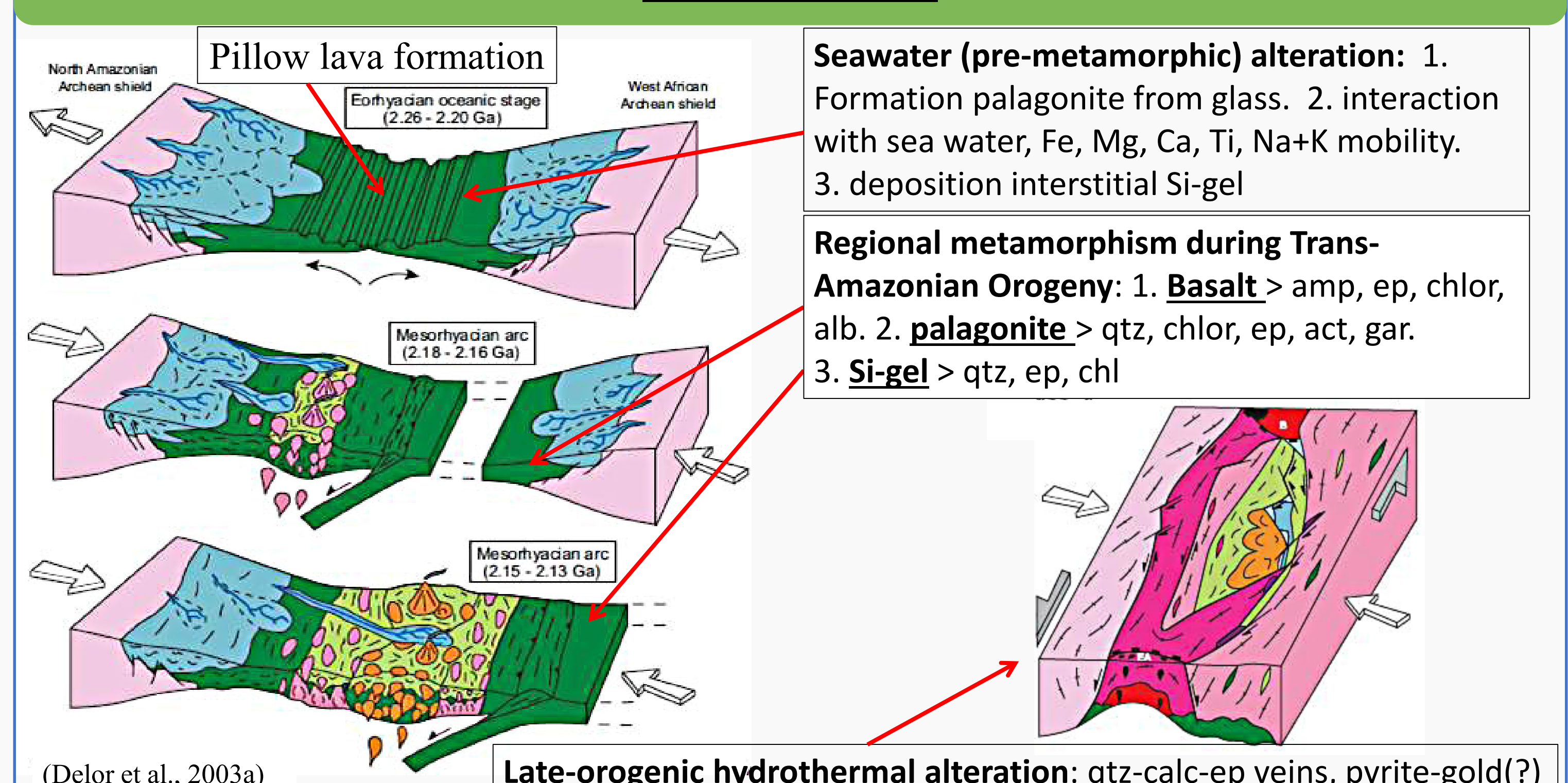
- Altered palagonite
 - Na and K dissolved in seawater during deposition.
 - Epidote concentrated Fe, while chlorite have varying proportions of Mg and Fe (zone 1-4).
 - Fe in rims** less than zone1-4 but still enriched → epidote crystals
- Beginning of GOE during pillow lava deposition (2.26 Ga). Deep ocean was still anoxic (Holland, 2006; Session et al., 2009) → Fe (reduced state, mobile) migrated inwards → formed actinolite, chlorite.
 - Epidotization → pseudomorphism after actinolite and plagioclase. But first, actinolite must have been metamorphosed after palagonite.

SA12

- No altered palagonite. Gel on top of metabasalt
- Enrichment in rims → Gel with concentric bands altered to epidote, quartz + some amphibole.
- Fe depleted.



CONCLUSION



ACKNOWLEDGEMENT

The Master in Mineral Geosciences program is sponsored by Rosebel Goldmines N.V., subsidiary of IAMGOLD CORPORATION. Prof. Dr. Salomon Kroonenberg is genuinely thanked for his guidance and support. Sanne Braat is thanked for chemical analyses.