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Interactions between extensional shear zones and syn-tectonic granitic intrusions: the example of Ikaria Island (Cyclades, Greece)

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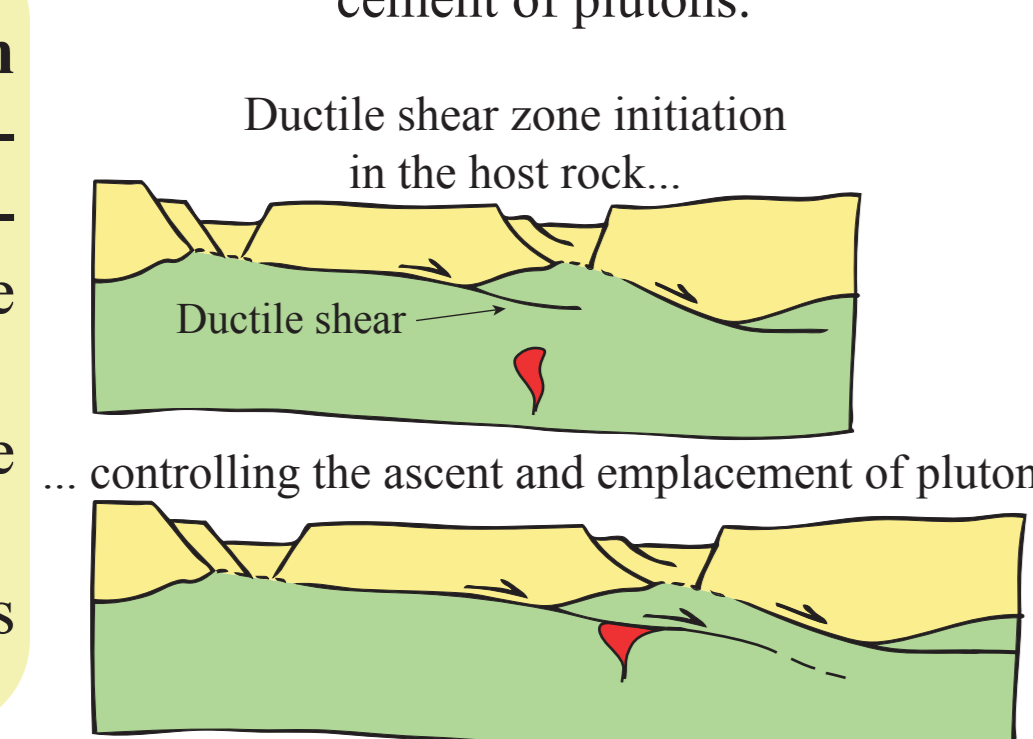
1) Introduction

The goal of the present study was to investigate the interactions between syn-tectonic granites and Metamorphic Core Complexes (MCCs) development. Two different models were described:

- Model 1: Shear zones control the ascent and emplacement of plutons.
- Model 2: Emplacement of plutons allow the initiation of shear zones.

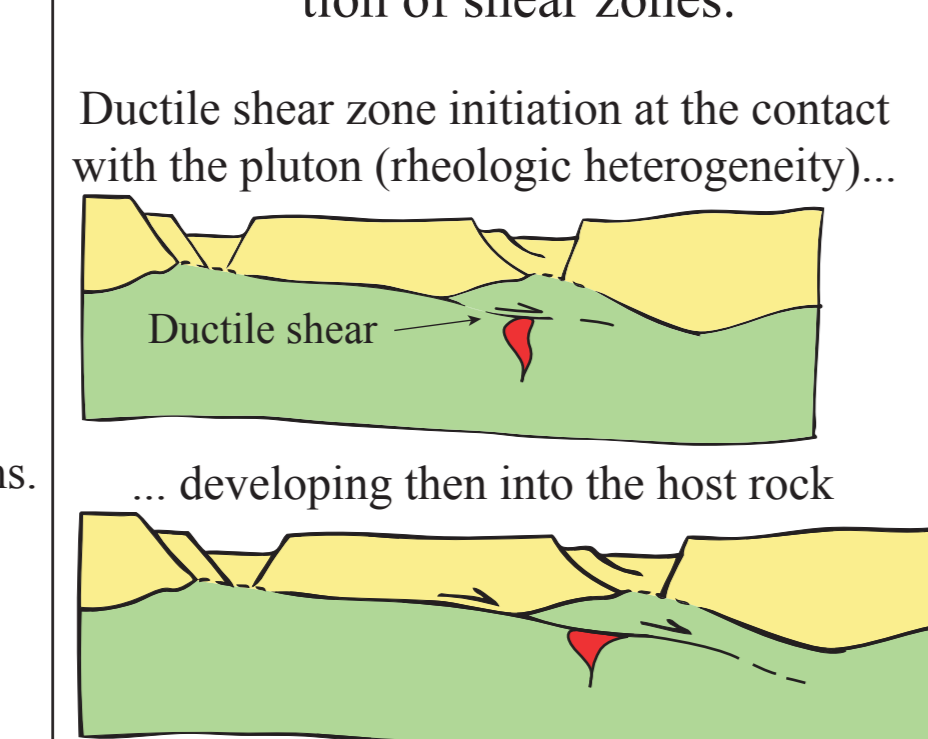
Model 1: Brown and Solar (1998a)

Shear zones control the ascent and emplacement of plutons.



Model 2: Neves et al. (1996)

Emplacement of plutons allow the initiation of shear zones.

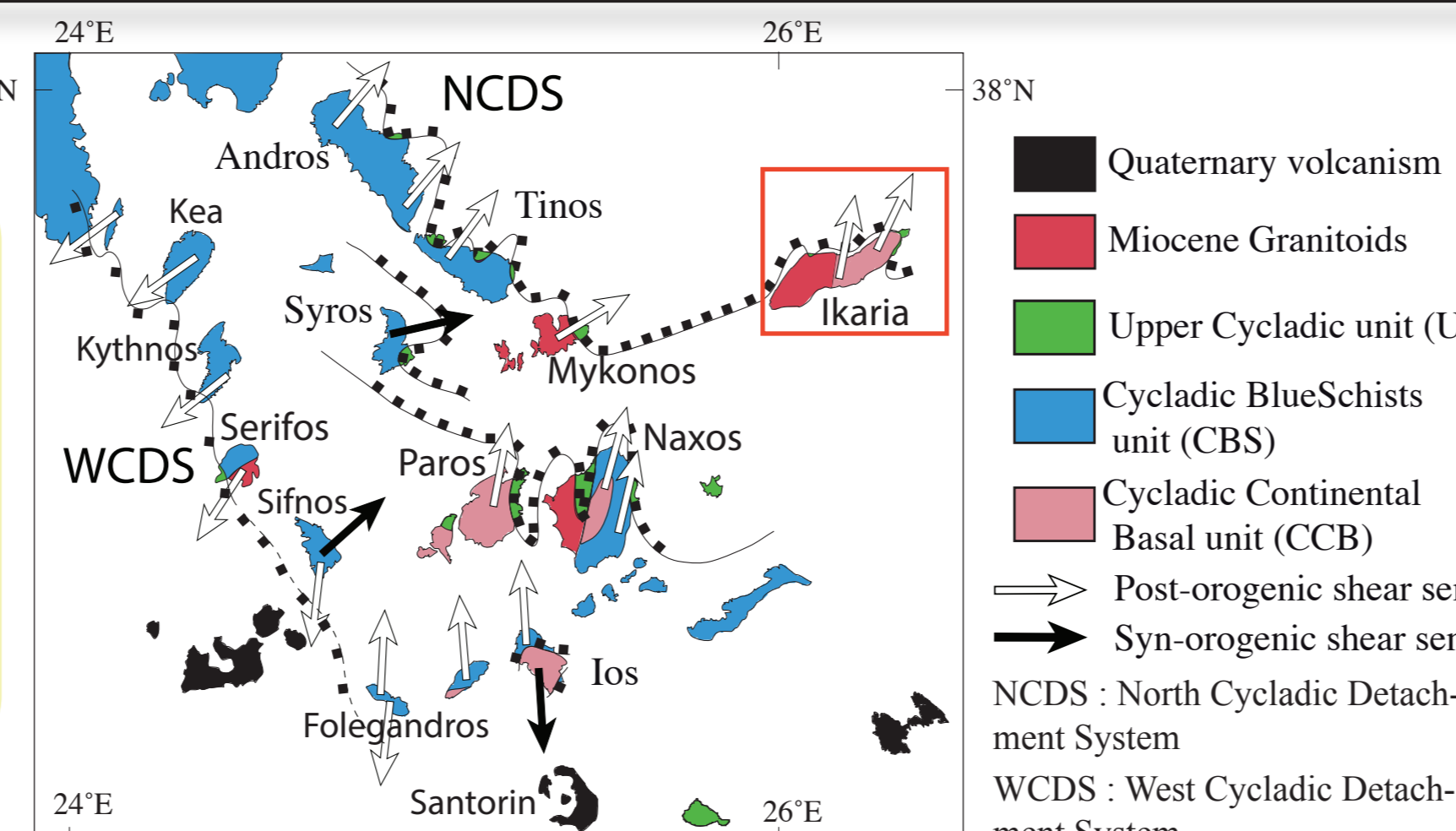


2) Geological setting

The Aegean domain is an ideal place to investigate the development of MCCs and to study the role of syn-tectonic granites on their development.

Cycladic islands are located in the center of the Aegean domain and correspond to the deepest exhumed part of the Hellenides-Taurides chain. Three tectonic units are recognized in the Cyclades:

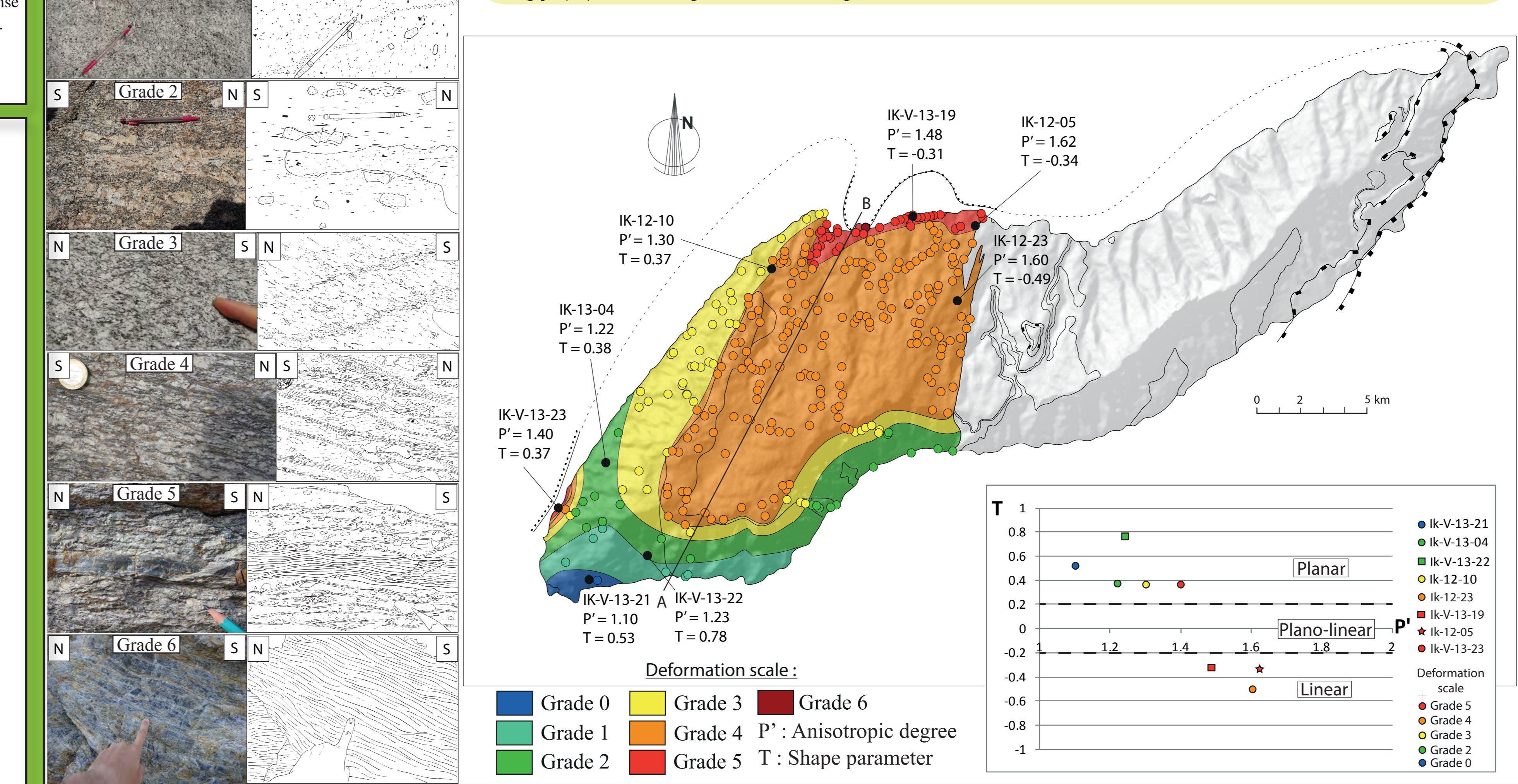
- 1) The Upper Cycladic unit (UC)
- 2) The Cycladic BlueSchist unit (CBS)
- 3) The Cycladic Continental Basal unit (CCB).



4) Distribution and quantification of ductile deformation

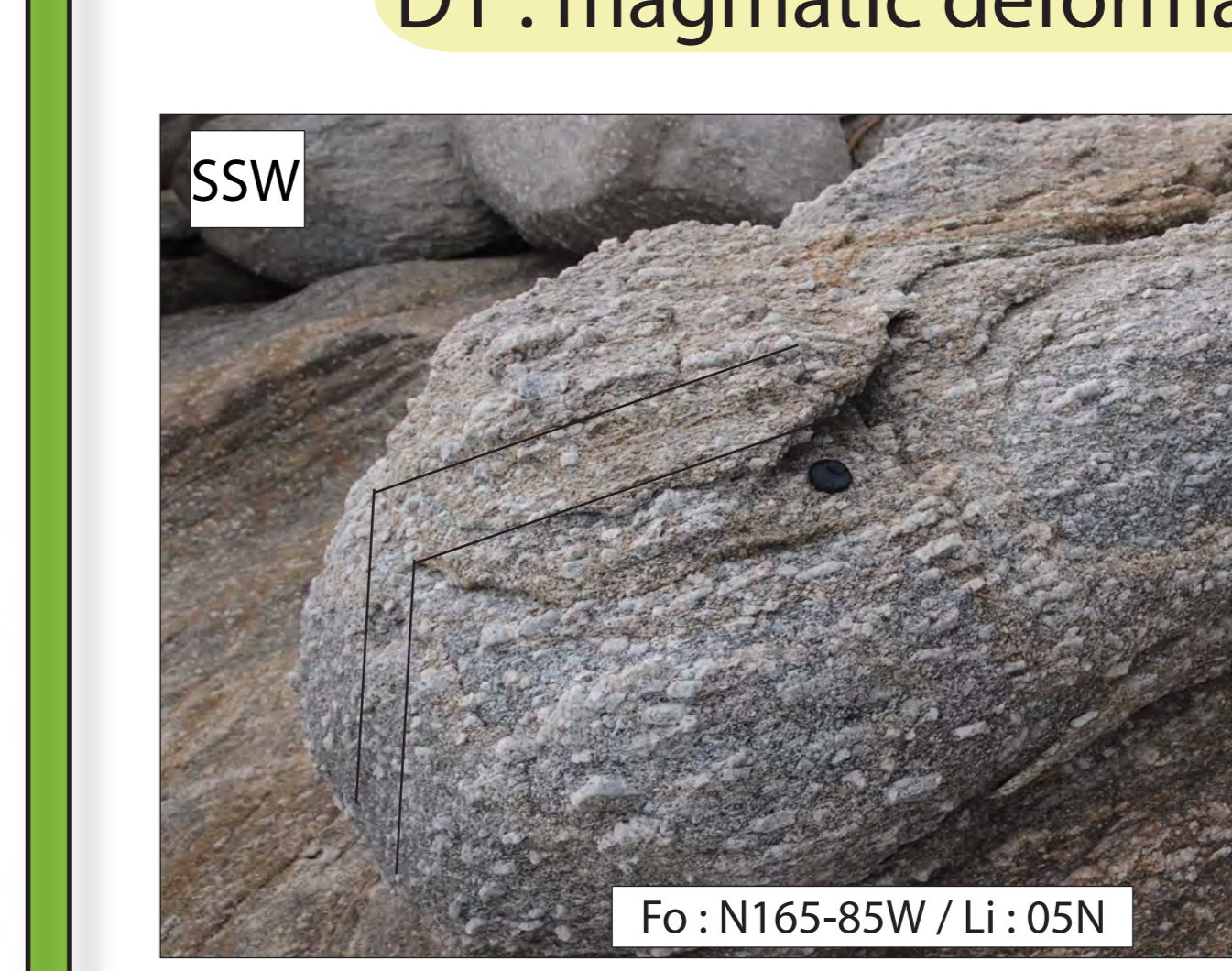
The Raches and Karkinagion granites show intense ductile deformation. In the field, a gradient of strain has been observed from south to north. In order to characterize this gradient, we used a scale of ductile deformation intensity, divided into seven grades. Each grade of deformation was based on macro-structural criteria adapted to fieldwork.

In addition, we have reconstructed by image analysis the strain ellipsoid of the Raches granite based on the shape fabric of biotites. A good correlation was observed between the degree of anisotropy (P') and the quantitative map of deformation elaborated in the field.

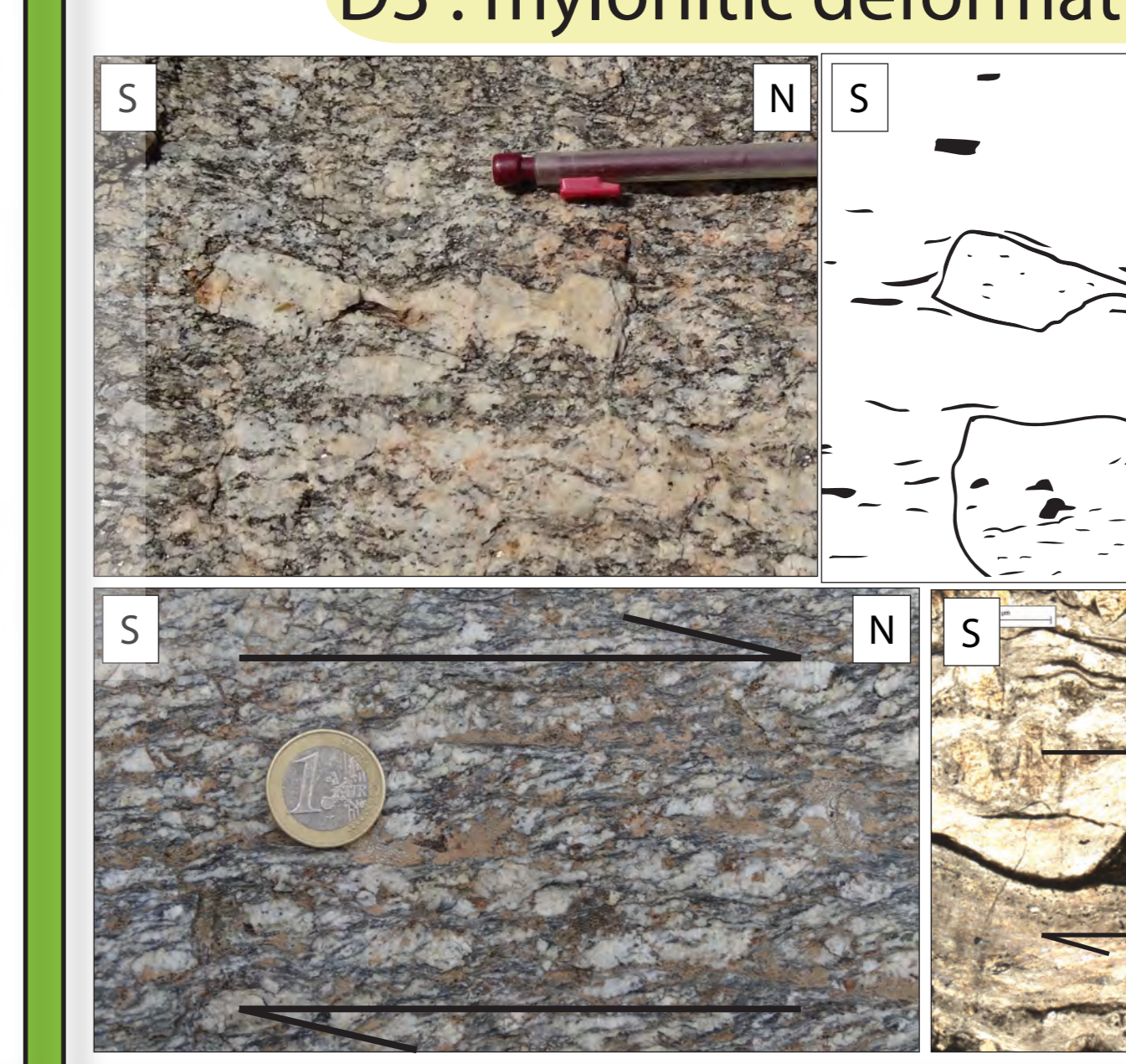


5) Evolution of deformation

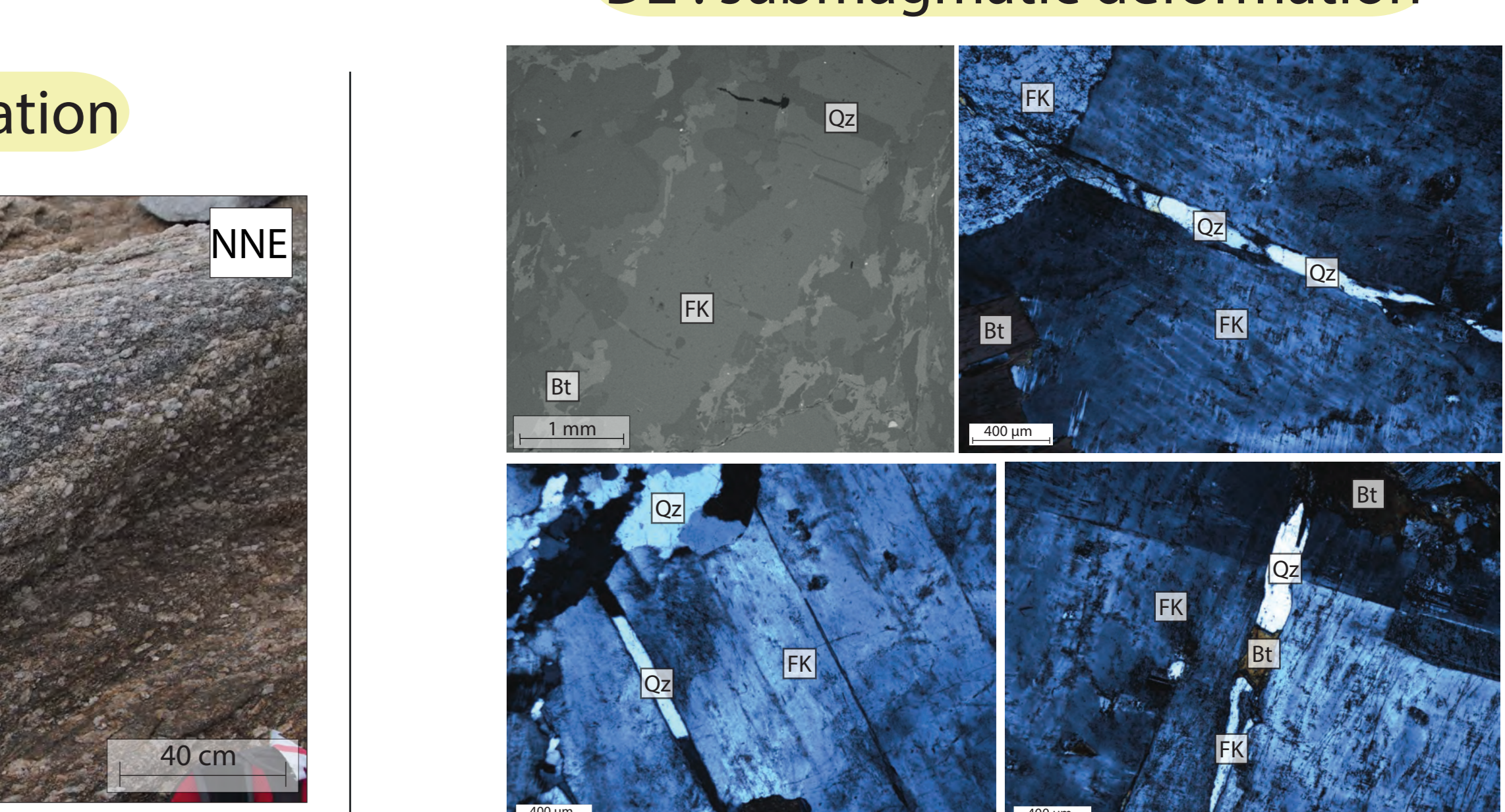
D1 : magmatic deformation



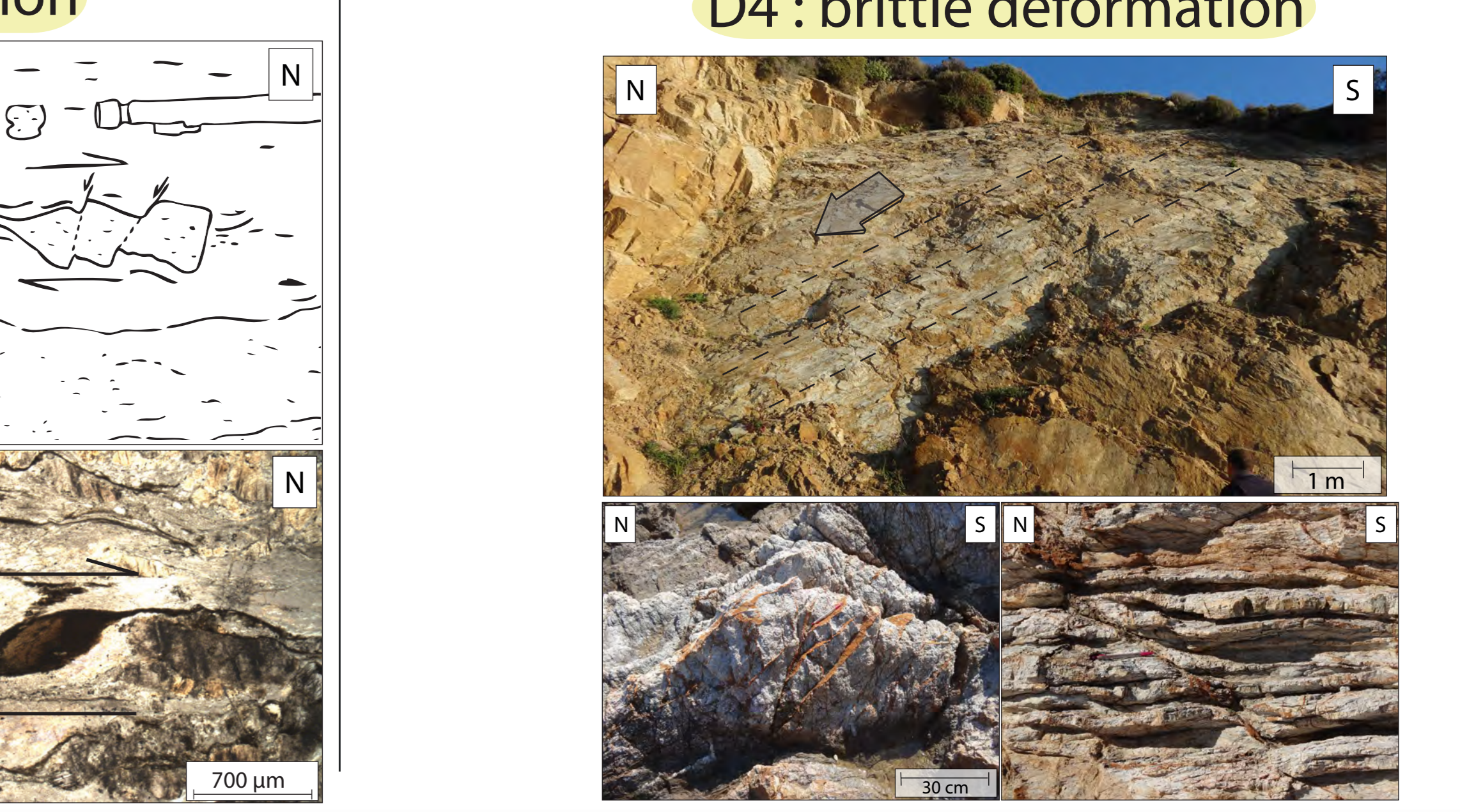
D3 : mylonitic deformation



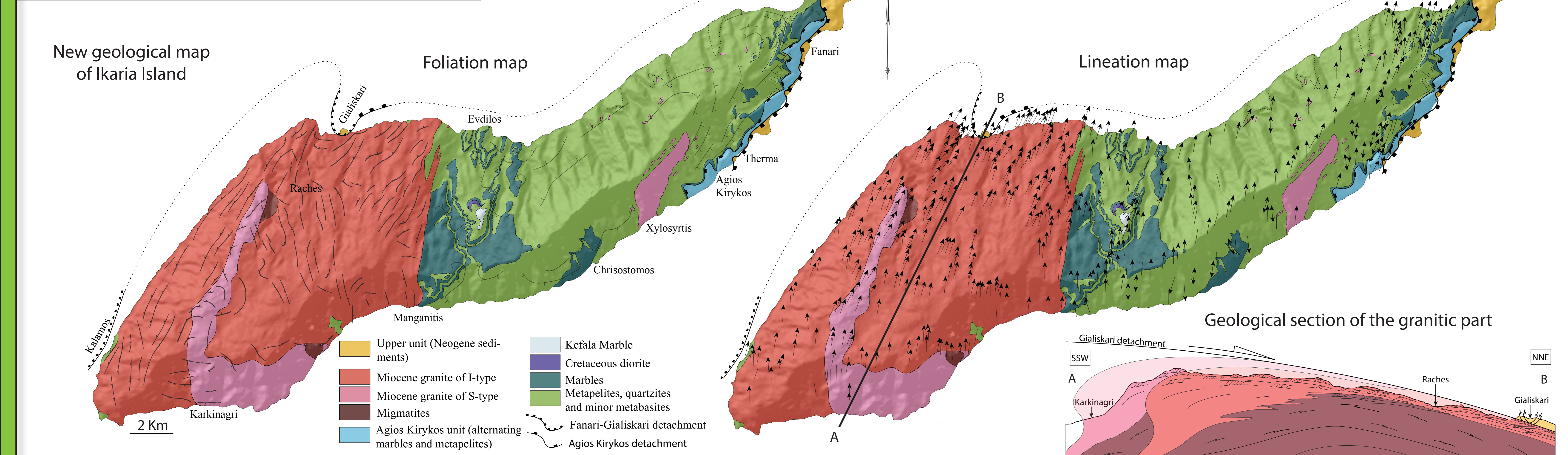
D2 : submagmatic deformation



D4 : brittle deformation

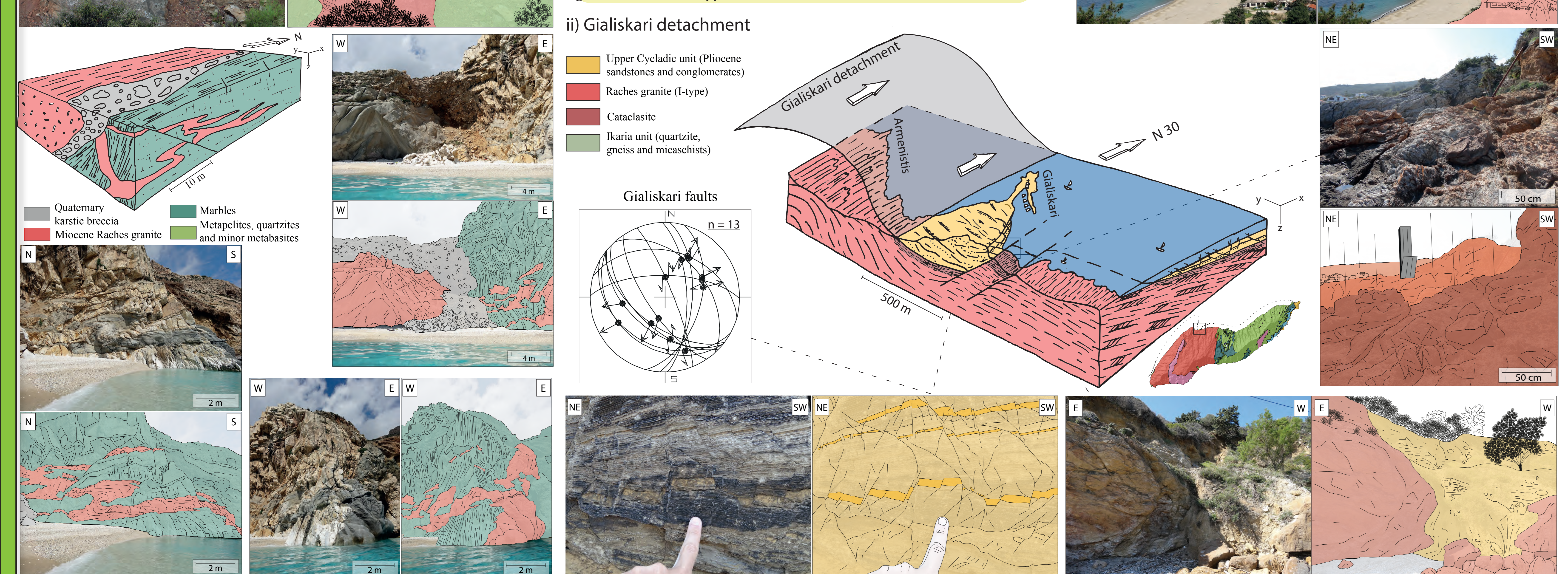


3) Large-scale mapping and major structures

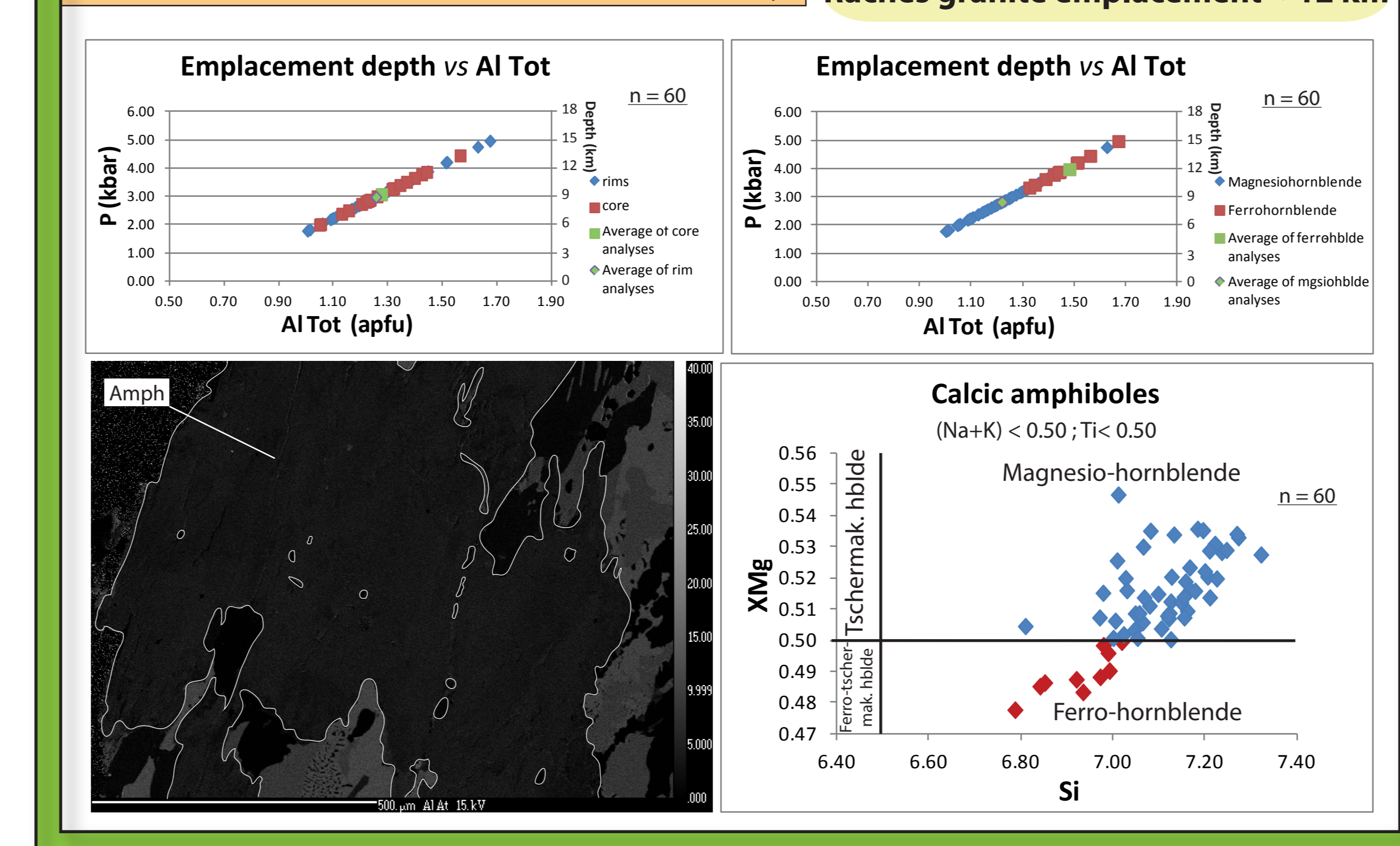


A new field study of the granitic plutons of Ikaria Island (Cyclades, Greece) was conducted and resulted in the proposition of a new geological map. Our survey shows three major structures:

- The intrusive contact between the Raches granite and the metamorphic dome, in opposition to a tectonic contact like described by Pothiadis (2002a), Kokkalas and Aydin (2013) or Kumerics et al. (2005).
- The Gialiskari detachment.
- The contact between the Raches and Karkinagion granites. Our new mapping, reveal a much larger volume of the Karkinagion granite than previously described by Ring (2007) and Bolhar et al. (2010a). We also highlight the presence of migmatites related to the Karkinagion granite. These observations led to redefine the nature of the contact between these two granites described by Bolhar et al. (2010a). It rather seemed that the Raches granite intruded the complex migmatites-Karkinagion granite and not the opposite.



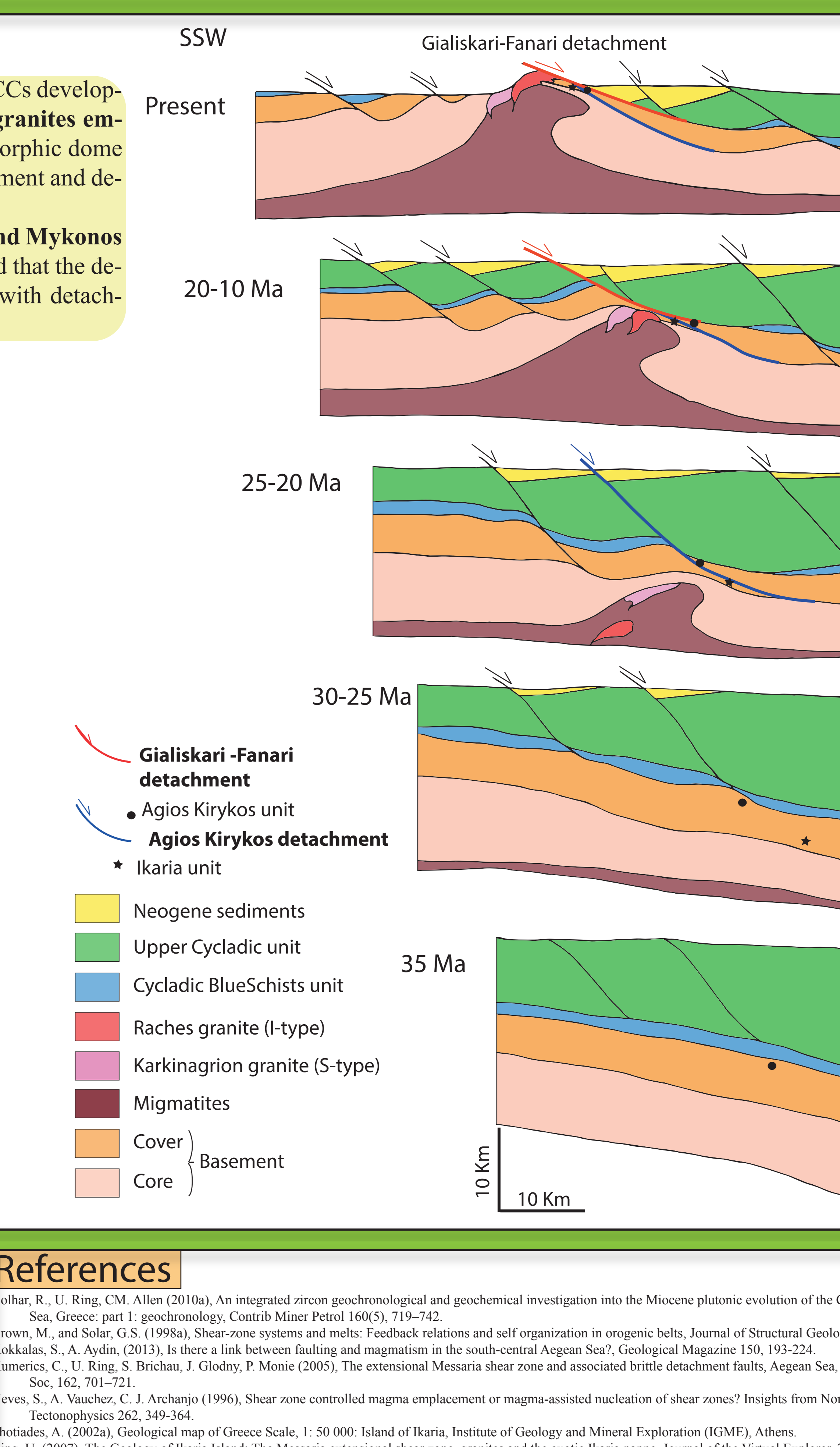
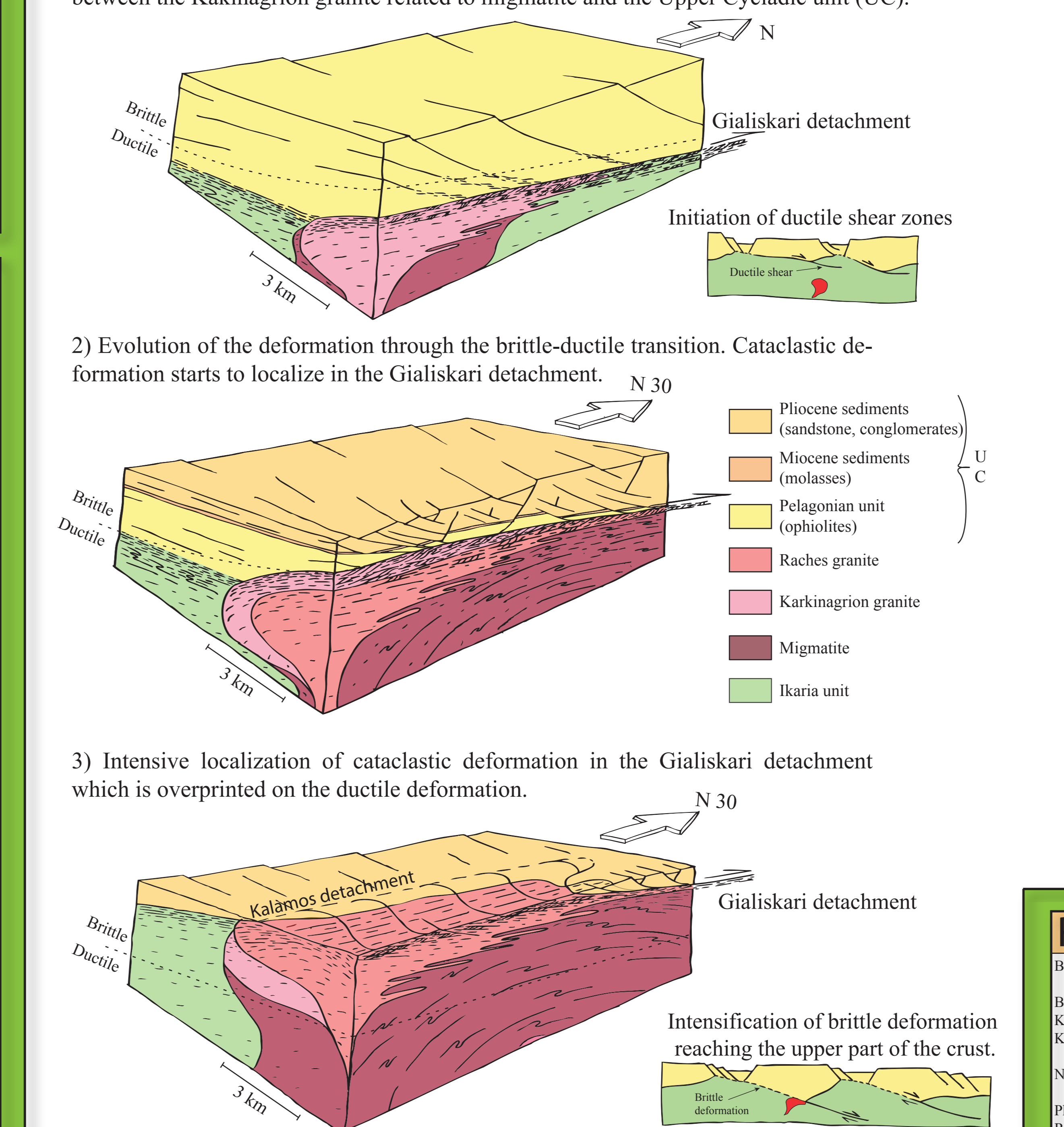
6) Al-in-hornblende barometry



7) Discussion and interpretation

The objective of this work was to study interactions between syn-tectonic granites and MCCs development. Based mainly on field observations, we conclude that the Karkinagion and Raches granites emplacement postdated the initiation of the Ikaria MCC. While the exhumation of the metamorphic dome involved the Agios Kirykos detachment during the first stages, the plutons intruded this detachment and deformation migrated upward when granites were emplaced.

This complex interaction between detachments and intrusions were found also on Tinos and Mykonos within the NCDS. It suggested that the plutons did not initially localize detachments, instead that the detachments localized and controlled the ascent of the plutons. The intrusions then interacted with detachments, making them migrating upward.



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