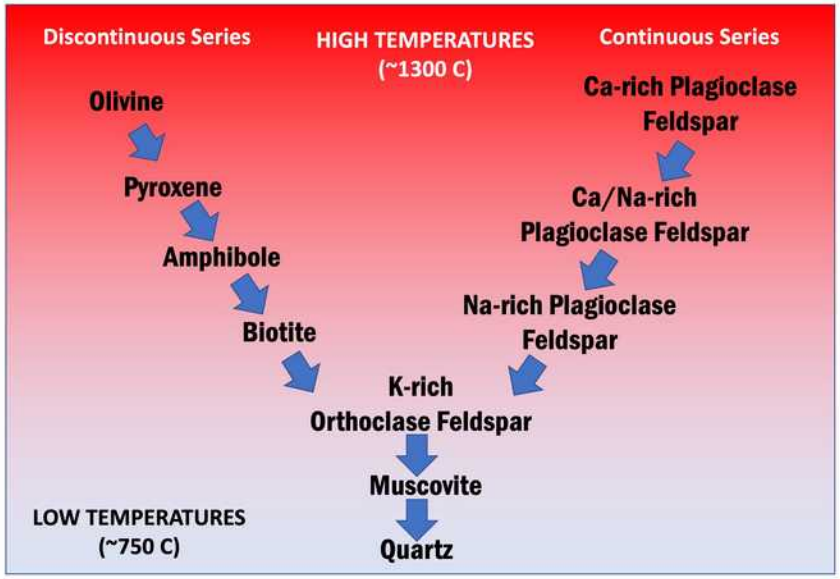
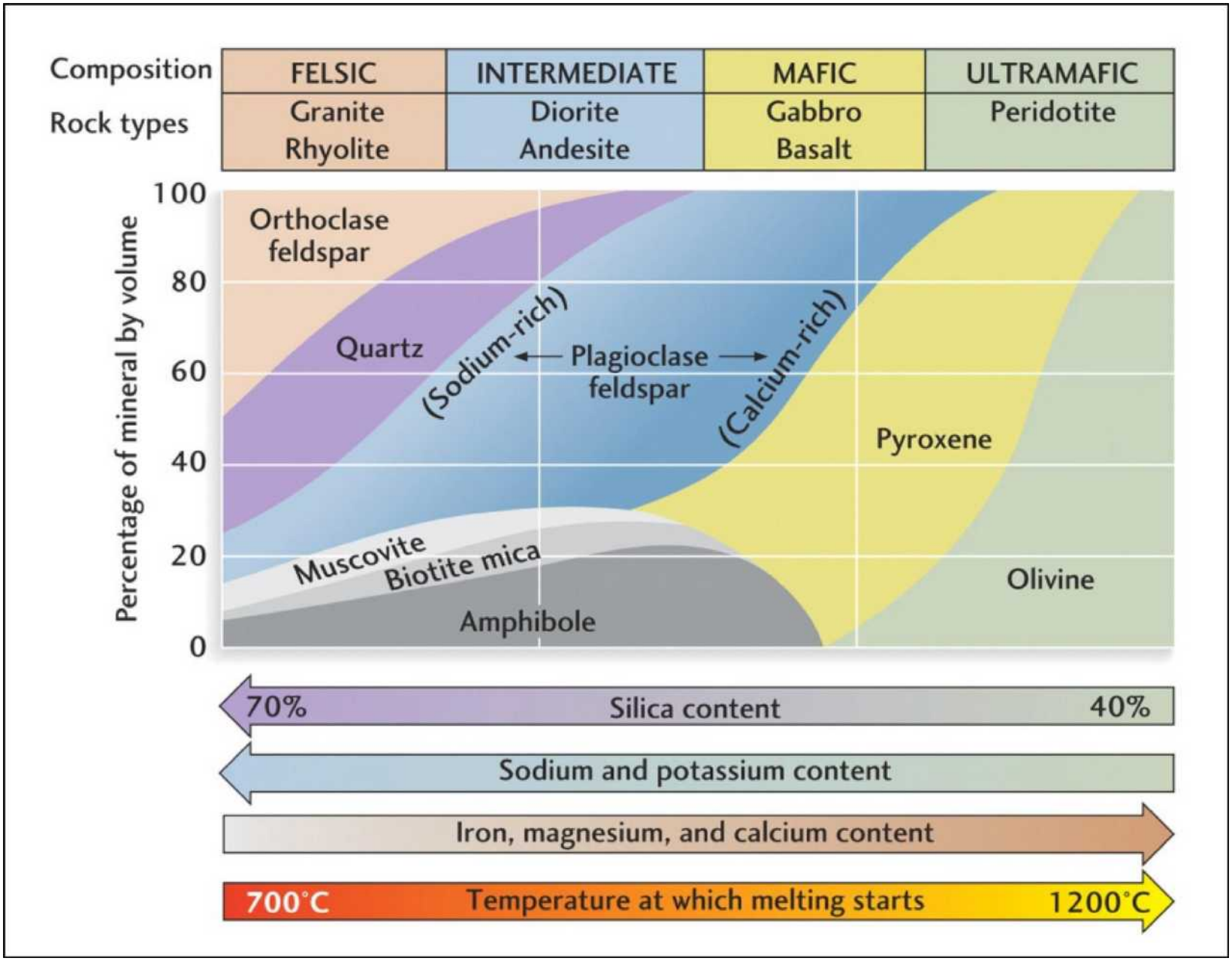
Granite

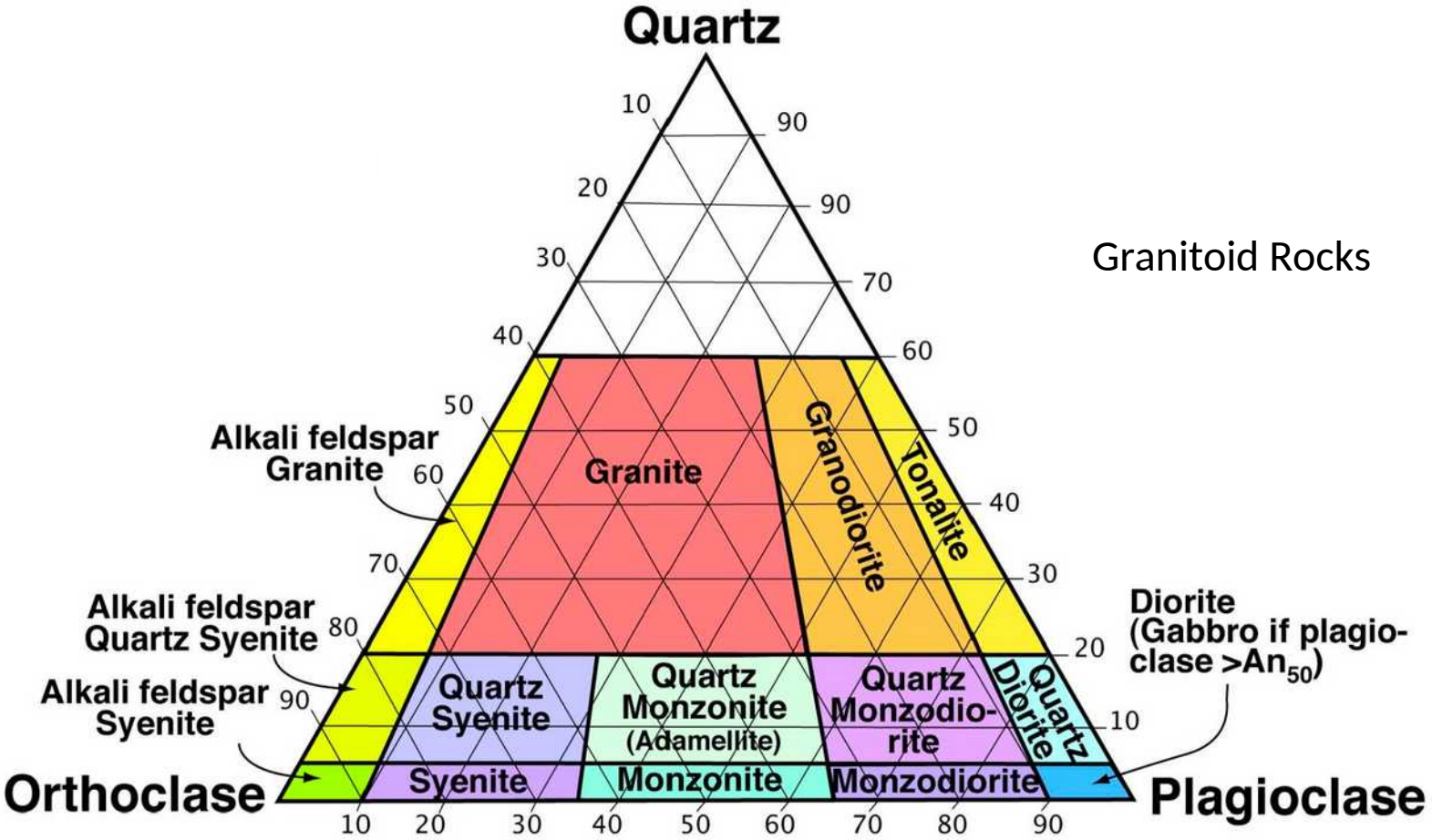
What is Granite?

- Igneous rock formed in subterranean environment (i.e. plutonic)
- Formed through slow cooling of molten or semi-molten material
- Coarse-grained with distinct, large crystals
- Comprising mainly minerals from lower levels of Bowen Series – i.e.:
  - quartz and feldspars (essential)
  - Smaller quantities of mica (biotite or muscovite), amphibole (“hornblende”), magnetite, tourmaline …




Composition
Rock types
FELSIC
Granite
Rhyolite
INTERMEDIATE
Diorite
Andesite
MAFIC
Gabbro
Basalt
ULTRAMAFIC
Peridotite
Percentage of mineral by volume
100
80
60
40
20
0
Orthoclase feldspar
Quartz
(Sodium-rich)
Plagioclase feldspar
(Calcium-rich)
Pyroxene
Muscovite
Biotite mica
Amphibole
Olivine
70%
Silica content
40%
Sodium and potassium content
Iron, magnesium, and calcium content
700°C
Temperature at which melting starts
1200°C

Composition of Granite



Granitoid Rocks

Shap Granite, UK

Shap granite is a dis.nc.ve coarse-grained granite with large pink orthoclase feldspar, that formed around 394 million years ago. The mineralogy is rela.vely simple - bio.te, quartz and two feldspars (plagioclase and K-feldspar). The large pink Carlsbad-twinned K-feldspar megacrysts dominate the thin sec.on.

Its evolu.on was, however, complex, involving repeated addi.on of basal.c magma to the magma chamber and assimila.on of country rock. Much of this history is recorded in the composi.onal varia.ons of the feldspar megacrysts.

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virtualmicroscope.org/sites/de

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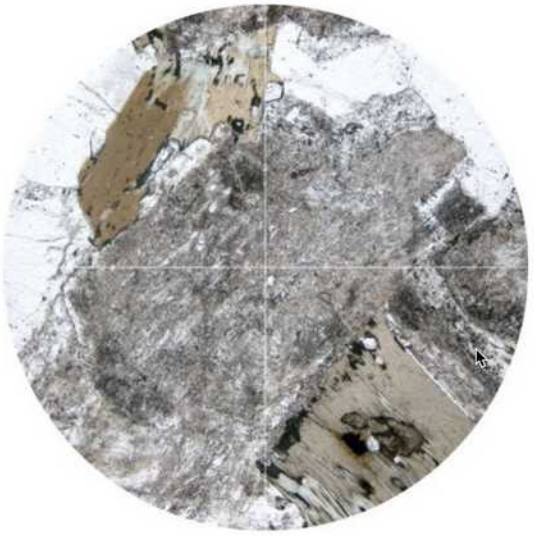
Rotation 2

plane polarised light



between crossed polars

28°

1mm

Back Share

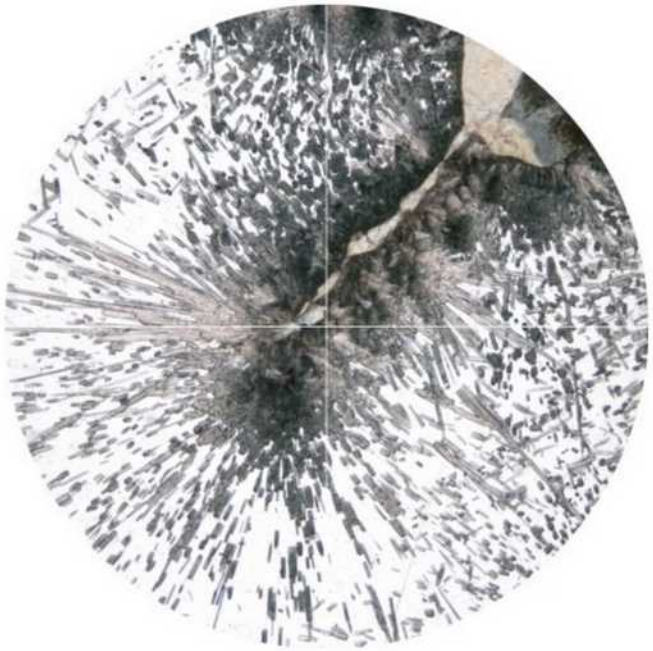
Luxallianite, Cornwall

Luxullianite is a rare type of tourmaline-rich granite named after Luxulyan in Cornwall. It is formed by partial melting of a pre-existing granite. In hand specimen the rock appears to consist of two main parts –salmon pink tabular feldspar crystals, and black tourmaline that appears to infill voids.

This sample shows two phases of tourmaline crystallisation: an early blocky magmatic phase exhibiting characteristic tourmaline colours, and radial sets of needles forming ‘suns’ that grew late in the formation of this rock.

Rotation 1

plane polarised light

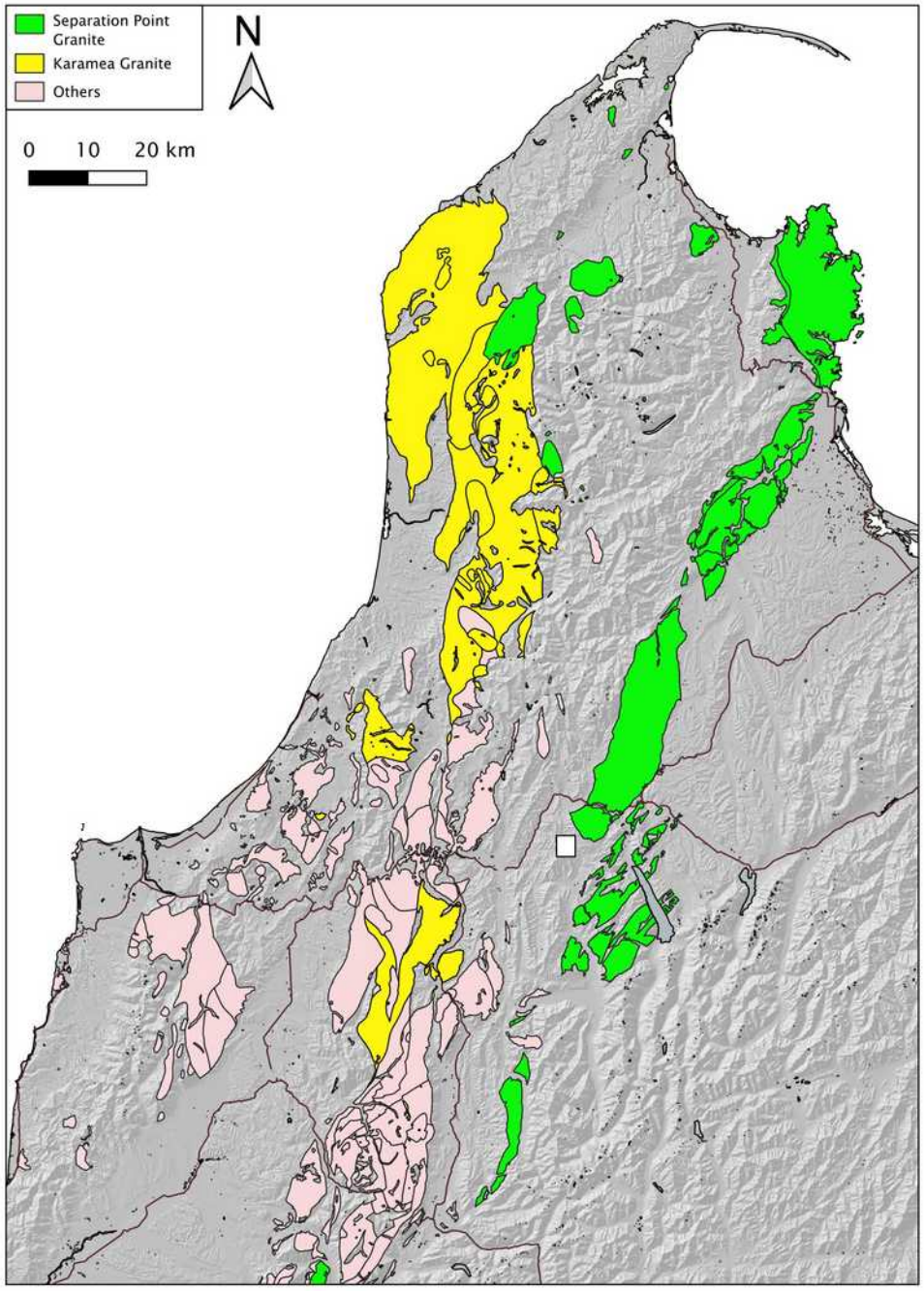


between crossed polars

0°

1mm

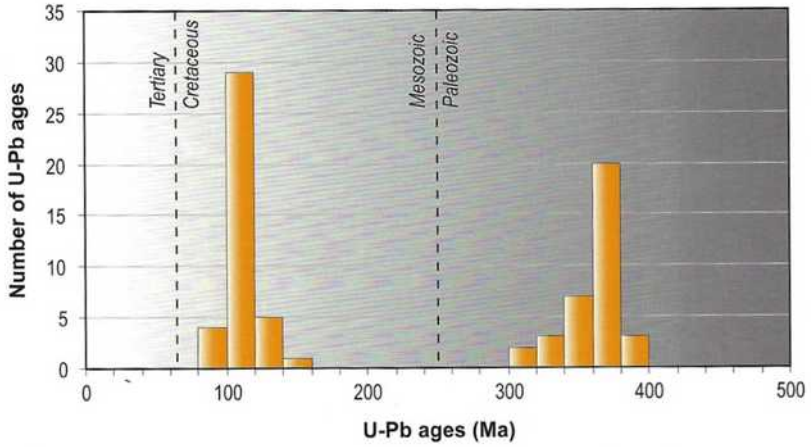
Nelson Region Granites

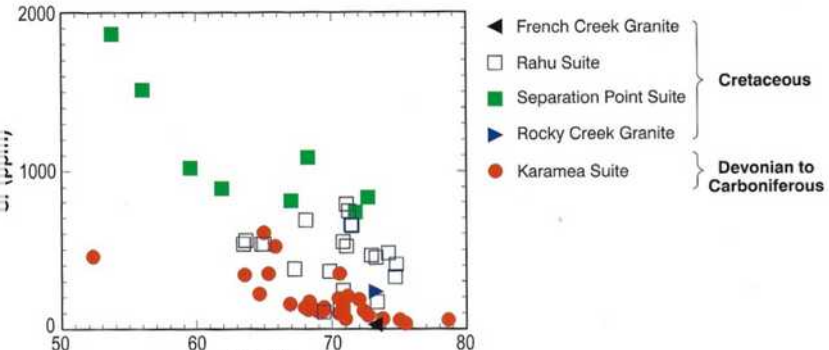


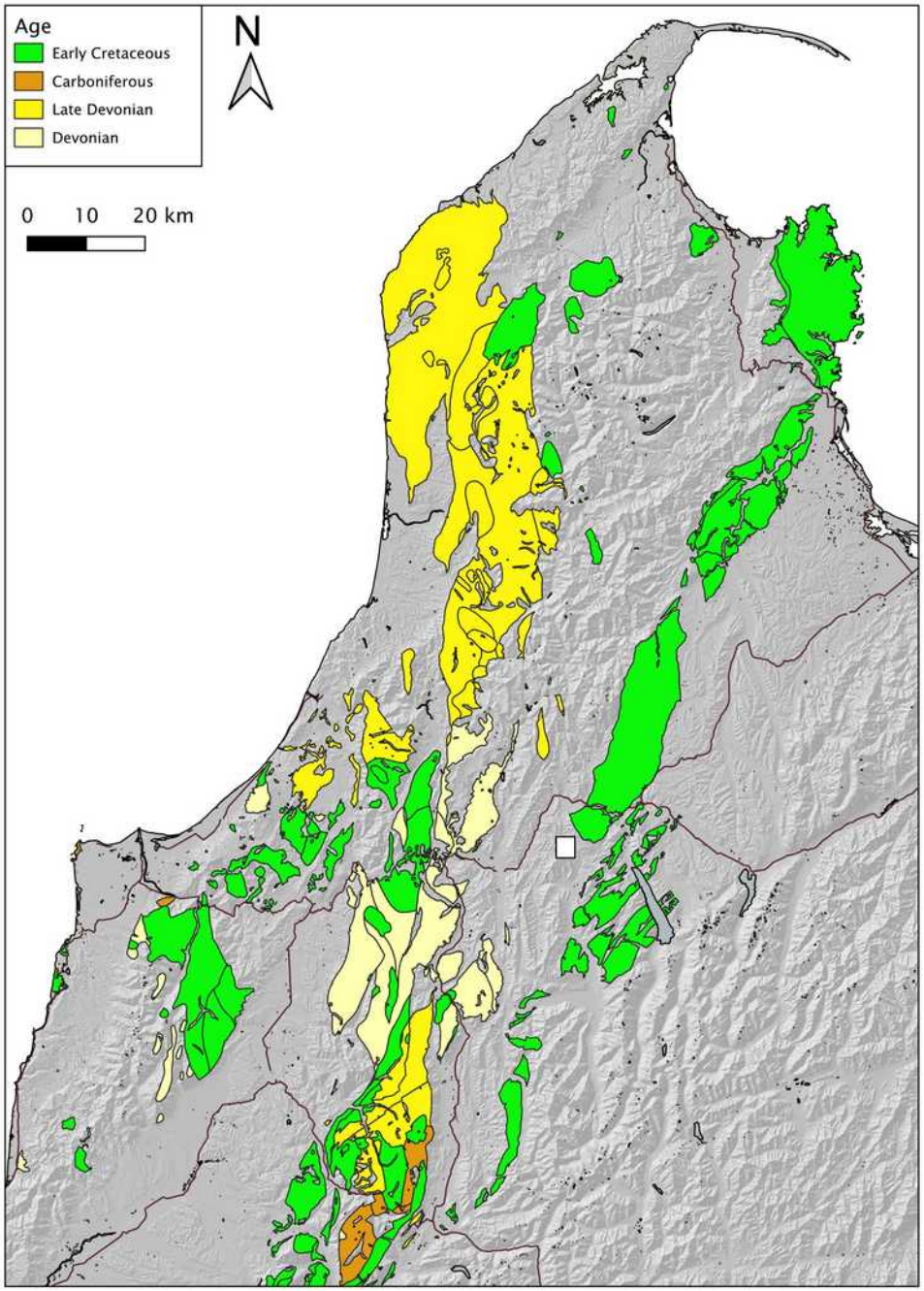
Ages of Granite
Emplacement

Separation Point

Karamea







Karamea Granite

Composi1on: White/pink potassium feldspar + quartz + muscovite ± bio1te

Structure: OAen foliated or porphyri1c (in east)

Age: Devonian (ca. 350 m years ago)

Associated with tonalite, diorite, gneiss

Separation Point Granite

Composition: White/pink sodium feldspar + quartz + biotite ± hornblende

Structure: Equigranular

Age: Cretaceous (ca. 120-140 m years ago)

Associated with granodiorite, diorite, hornfels (at margins)

Separation Point Granite Rots!

How Do Granites Form?

Plate Tectonics and Granite Formation

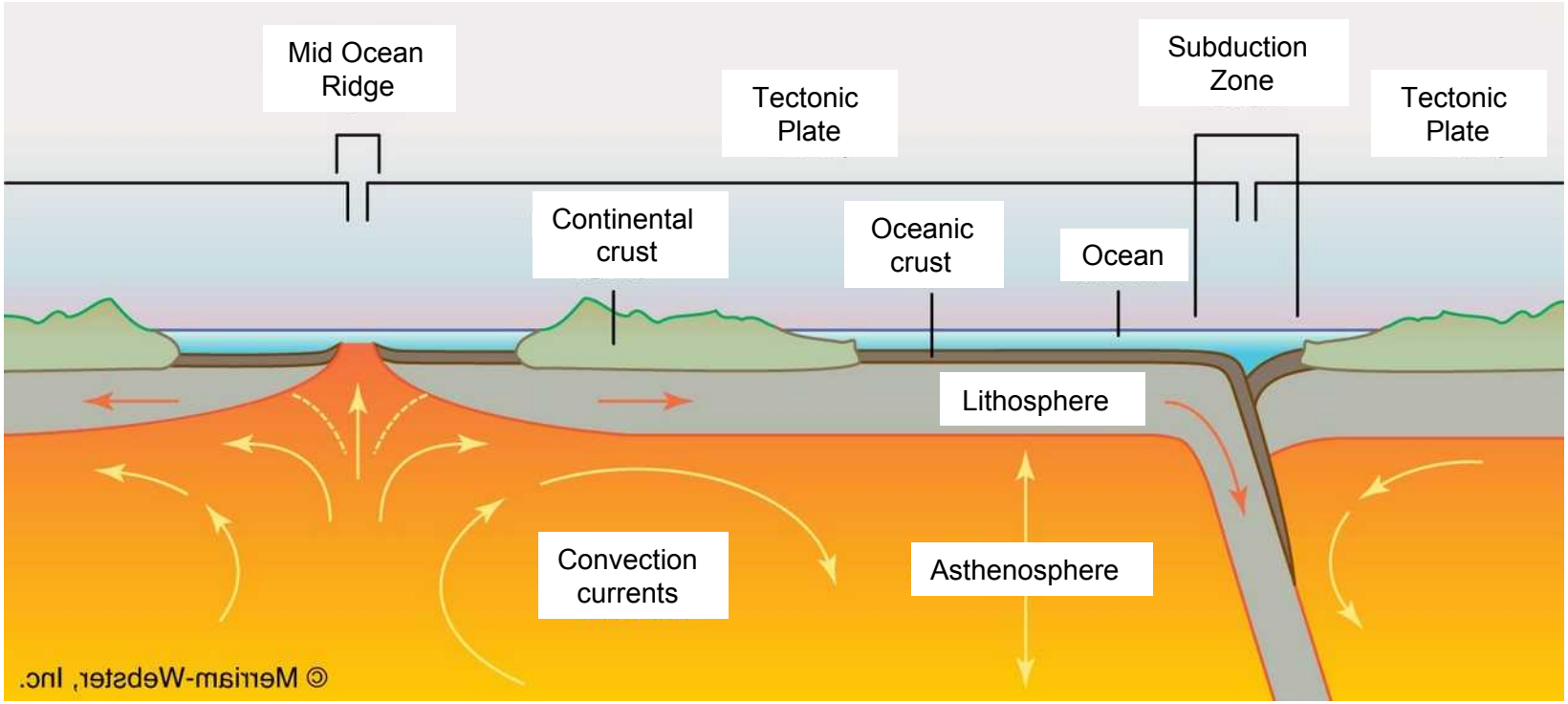
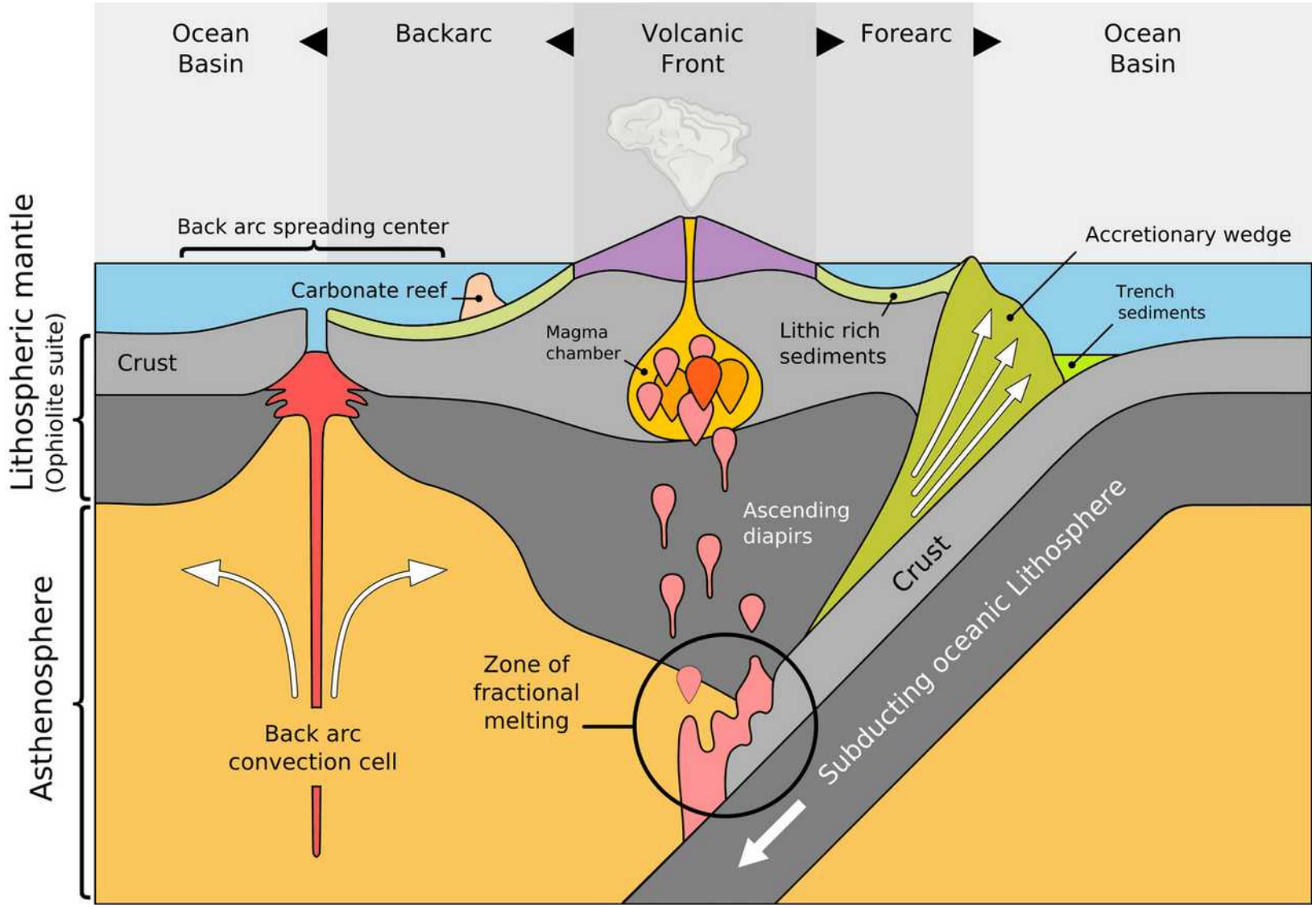


Plate Tectonics and Granite Formation



Types of Granite

Con1nent-con1nent collision

Island arc

Continental arc

Within-plate

S-type granite

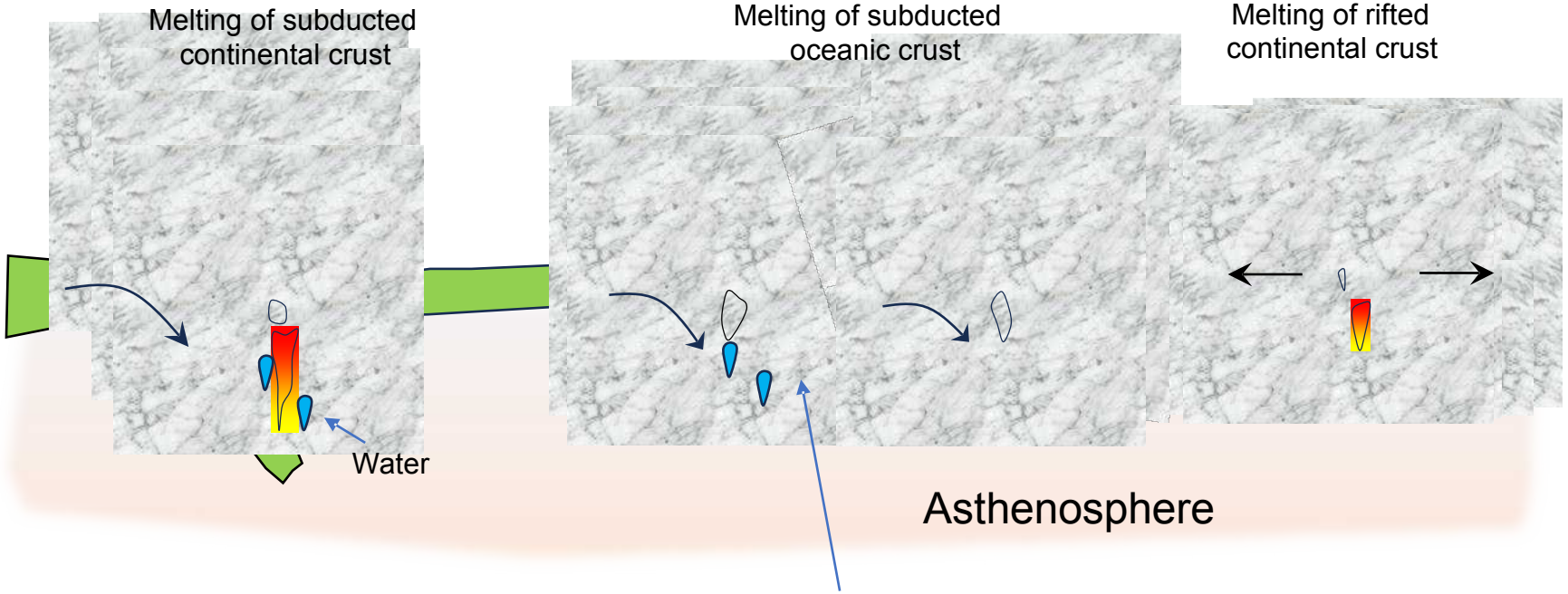
Melting of subducted continental crust

I-type granite

Melting of subducted oceanic crust

A-type granite

Melting of rifted continental crust

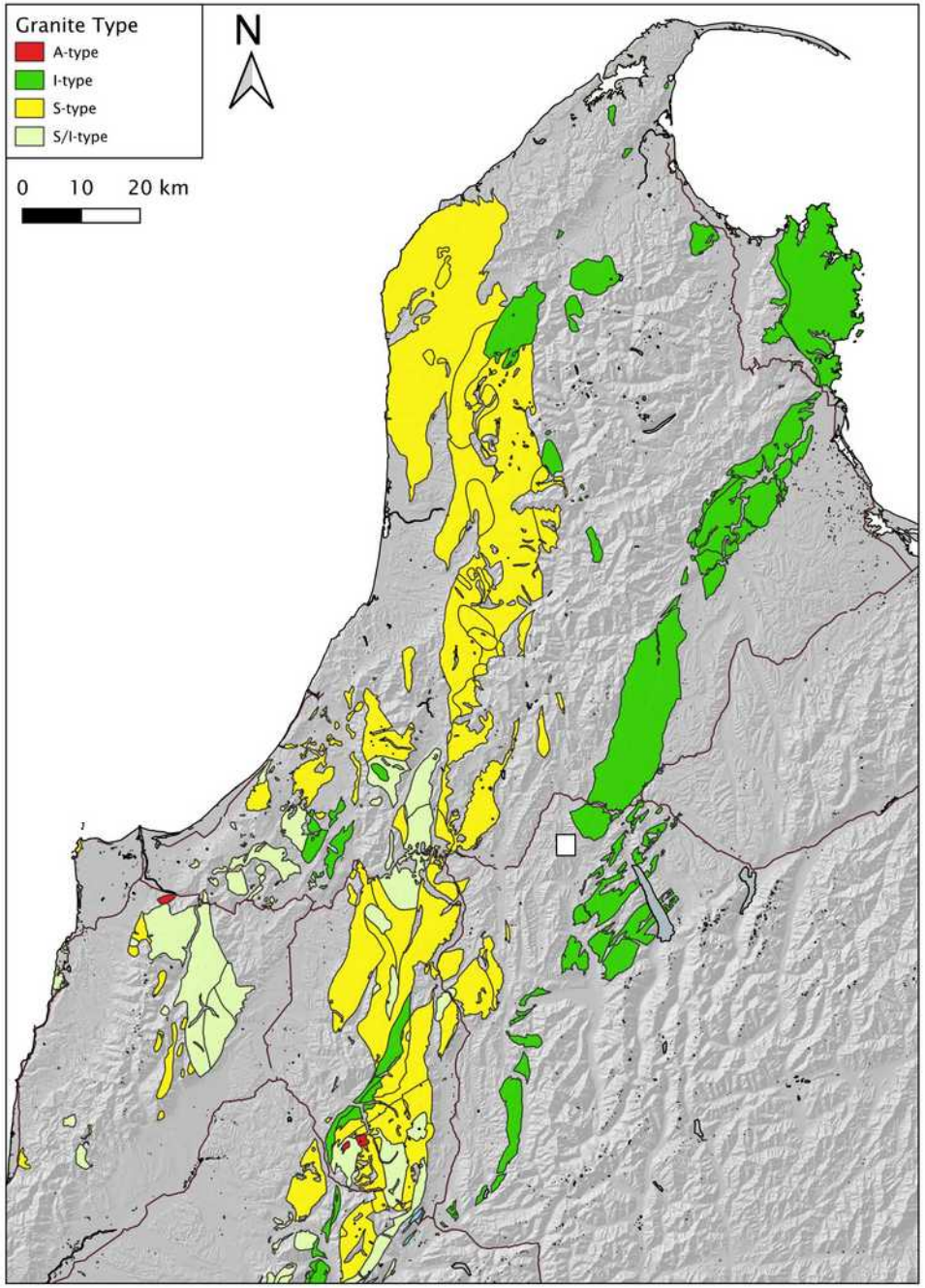
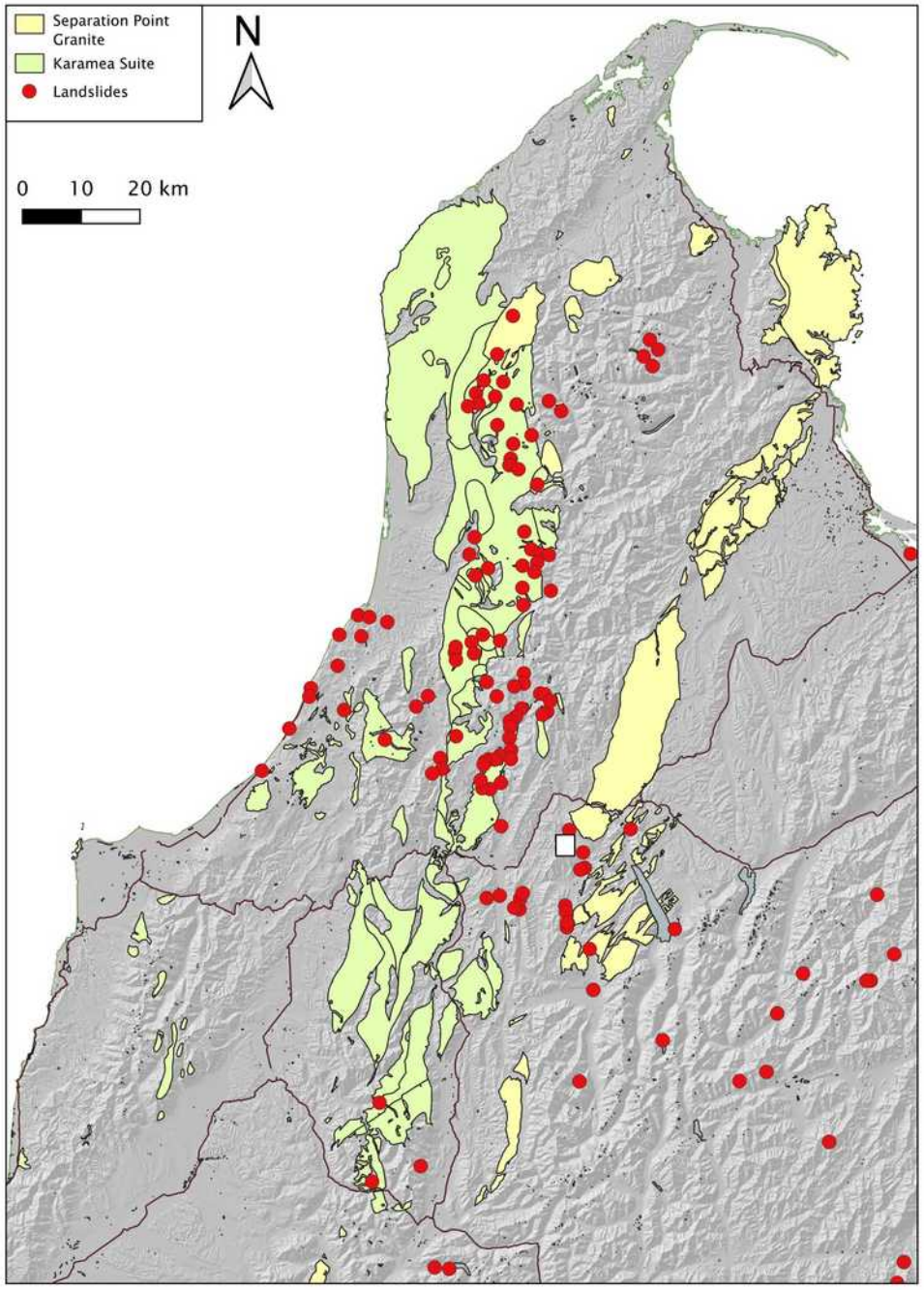


±M-type

formed directly from basaltic mantle in island arc (rare)

	S-type	I-type
Main locations	Subduction zones – continental crust	Subduction zones – oceanic floor
Source material	Sedimentary rocks	Igneous rocks (basaltic)
Temperature regime	Low	High
Silica concentrations	High	Low
Oxidation state	Low (ilmenite)	High (magnetite)
Aluminium concentrations	High (supersaturated)	Low
Other marker minerals	Cordierite, andalusite, sillimanite, garnet, monazite, biotite brown with haloes	Hornblende, titanite, allanite, biotite darker – red/brown
Alkali feldspars	White	Pink
Zircon trace elements	Low Th/Ur ratios	High Th/Ur ratios

Granite Types



Granite and Landslides