



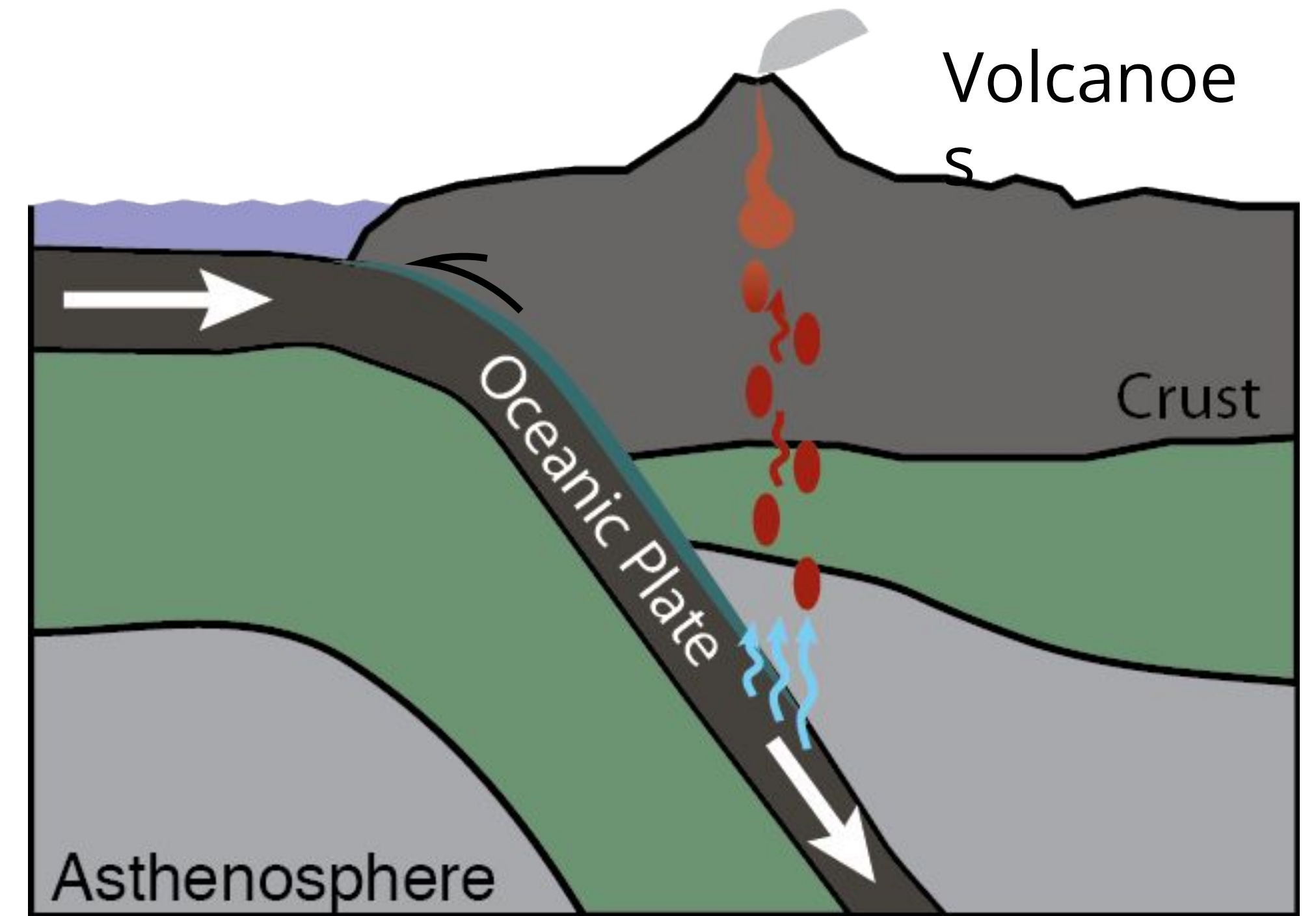
Field Geology: Methods, advances, and connections

Cailey B. Condit (she/her) - Assistant Professor - University of Washington

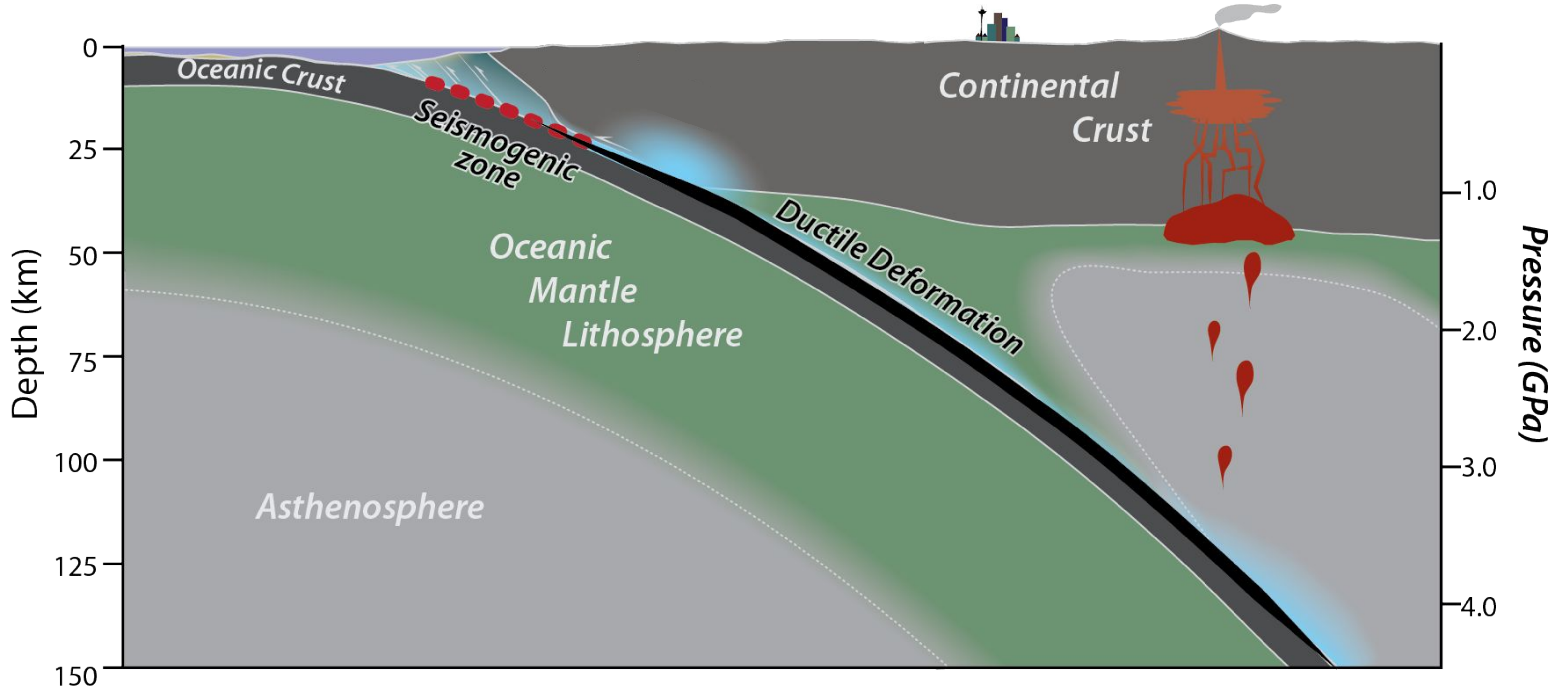
Field Geology

What can we learn from the field? So much!

- Identify
 - rock types (lithologies)
 - deformation features
 - mineralogy/petrology
 - relative & absolute timing
- Constrain
 - rheology/deformation processes
 - pressure, temperature, stress, fluid (aqueous + melt) conditions
 - material and chemical fluxes
- Link
 - to geophysical observations
 - provide constraints for modeling approaches
 - ground-truth key assumptions
- *Observations from the field are key to understanding the processes that drive subduction zone hazards*

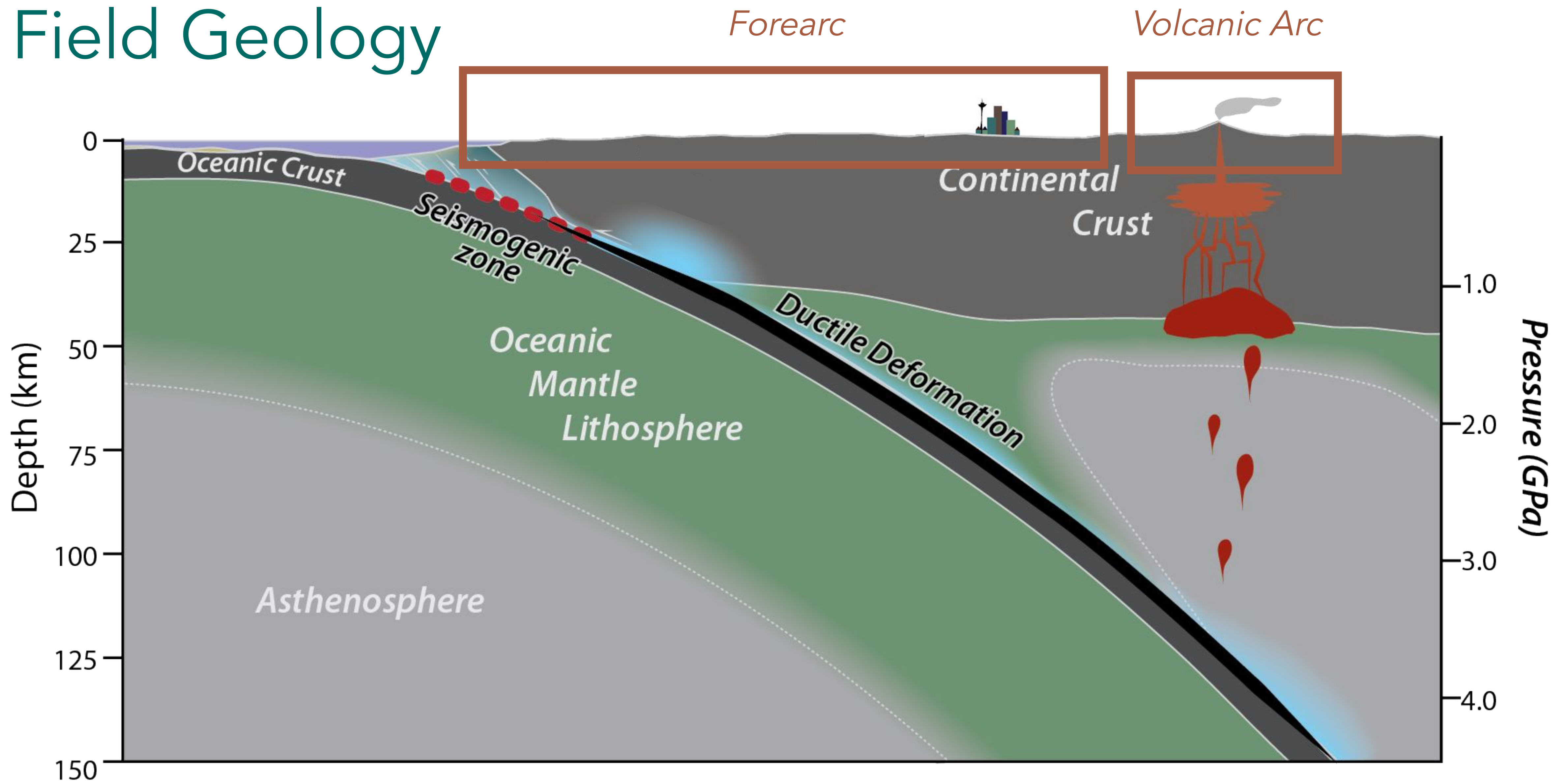


Field Geology



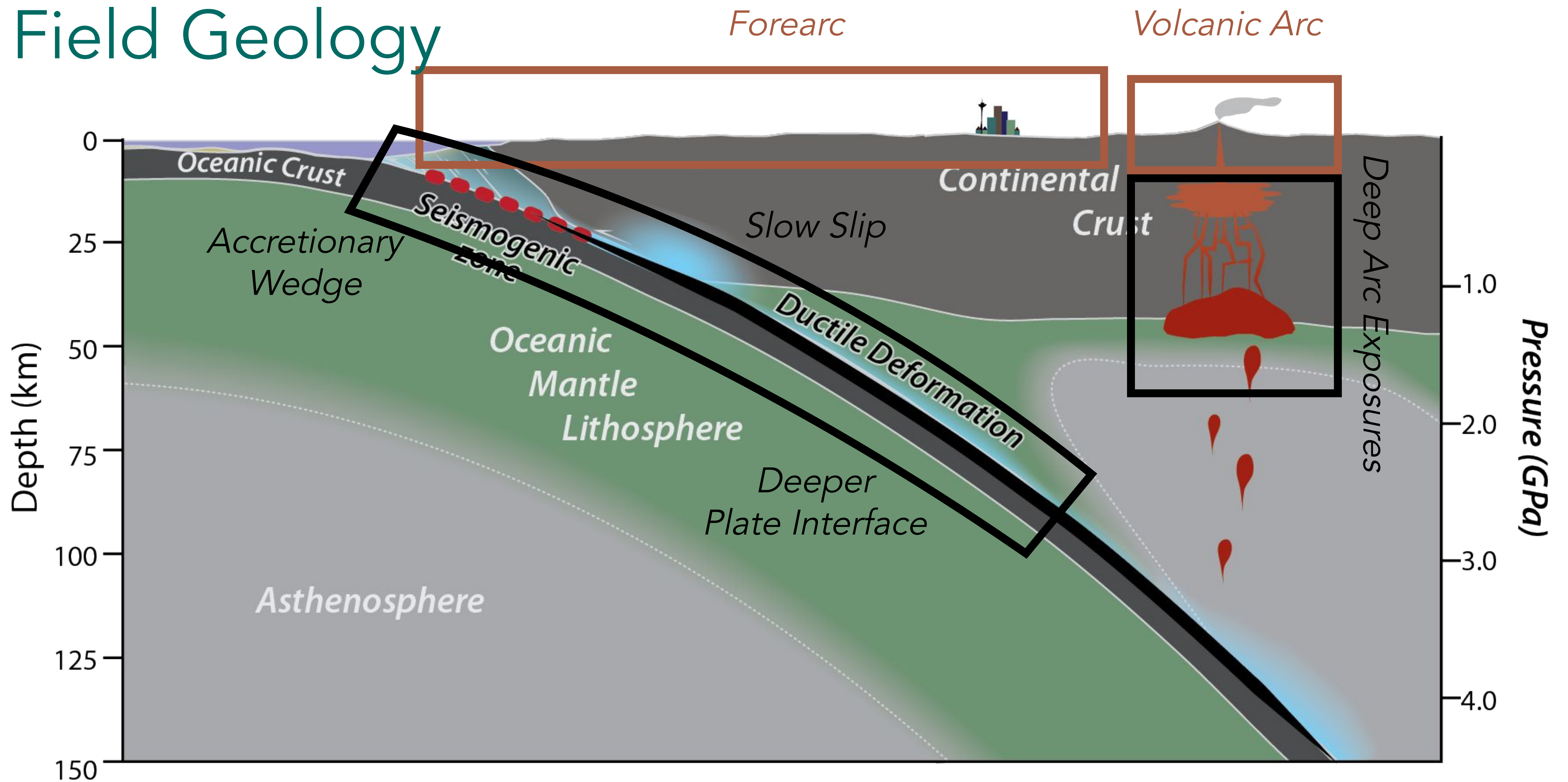
SZ4D Science Questions

Field Geology



SZ4D Science Questions ◀ *Active Systems*

Field Geology



Analog Terranes ➡ SZ4D Science Questions ◀ Active Systems

Field Geology

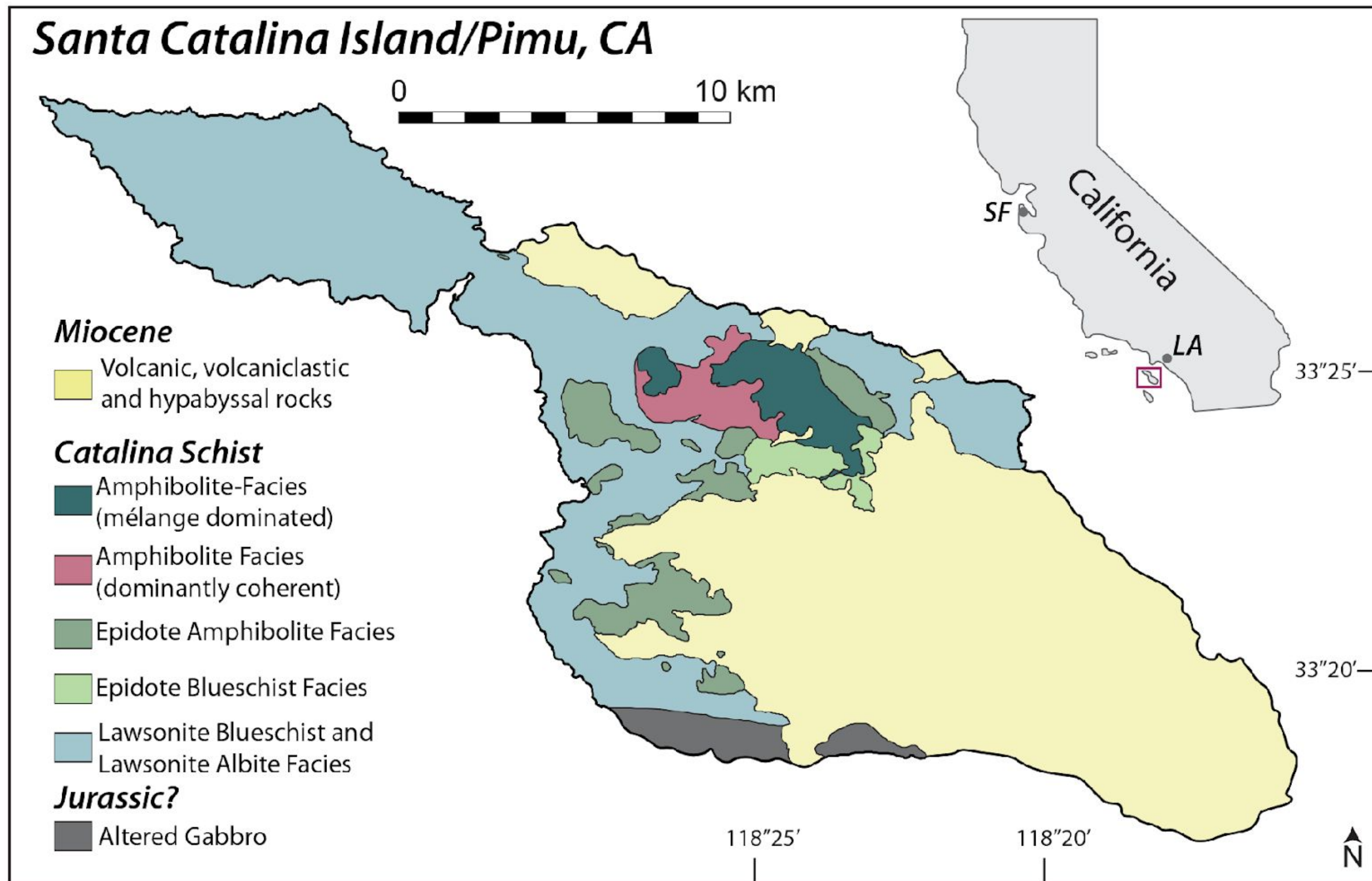
Mapping | Field Relations & Observations | Sample Collection | Structural Measurements



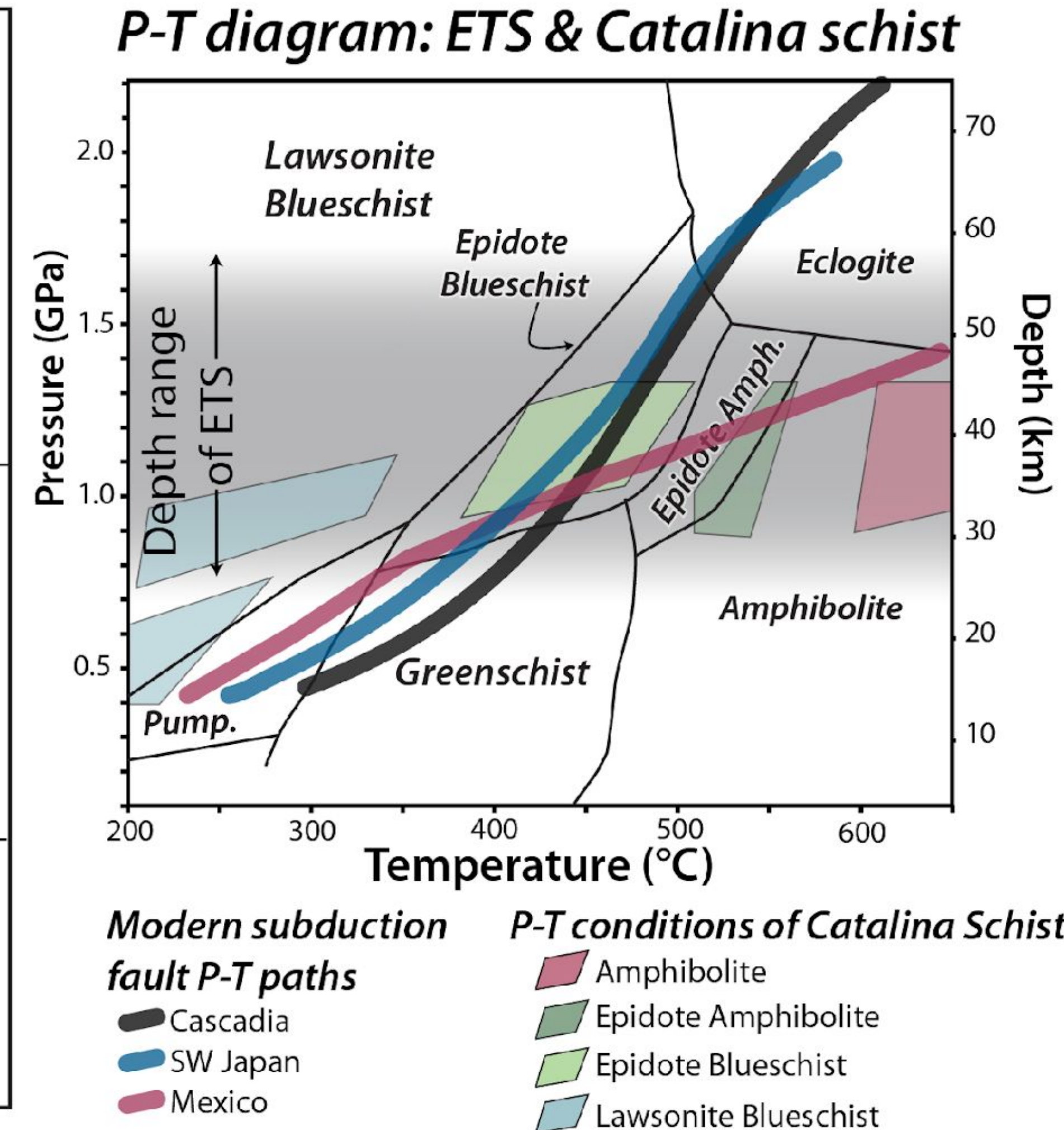
Catalina Island/Pimu · CA, USA

Field Geology

Chemical changes (metasomatism) & subduction fault slip behaviors
Catalina Island/Pimu CA - Hoover et al., 2022

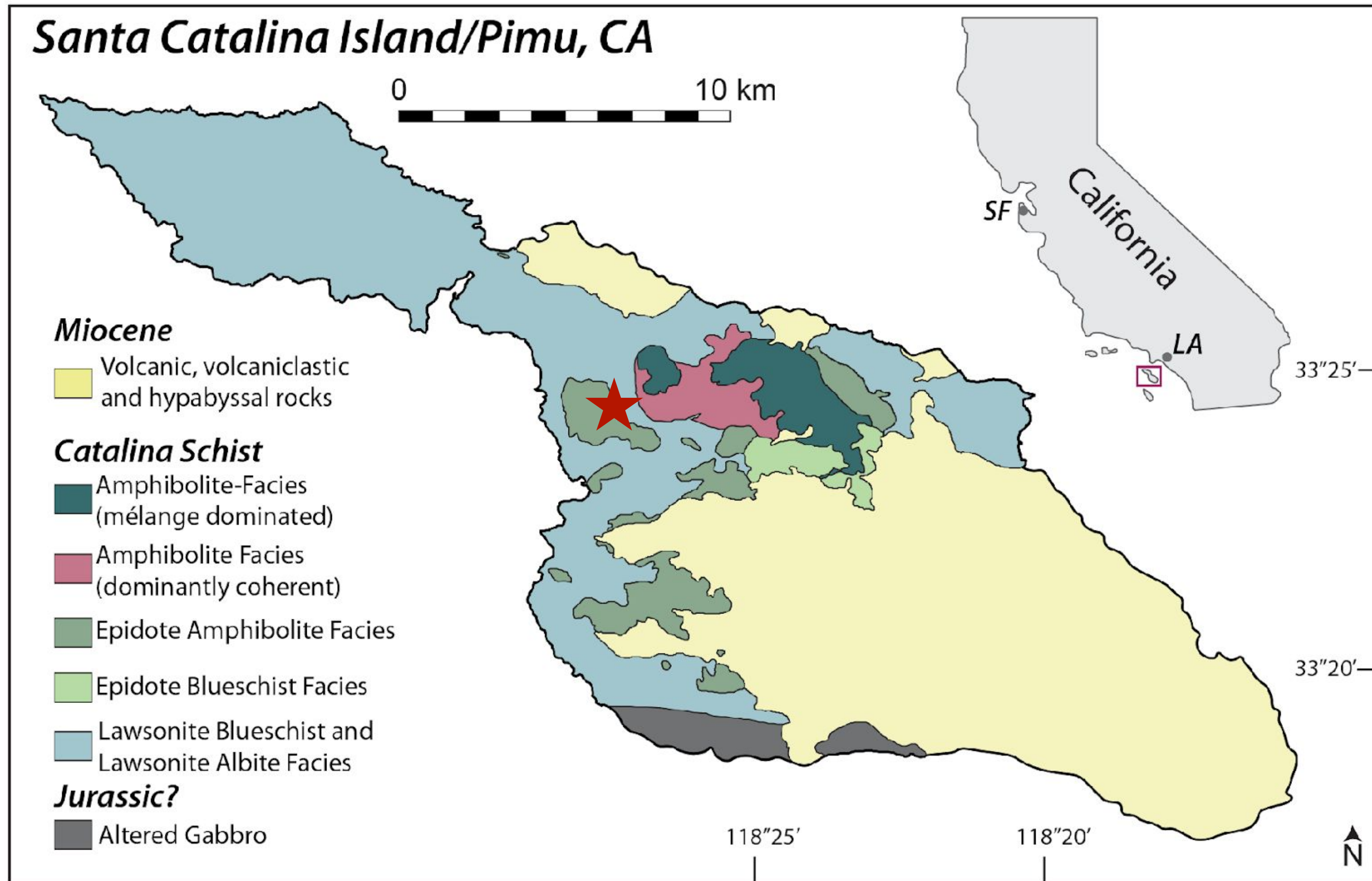


After Platt, 1976

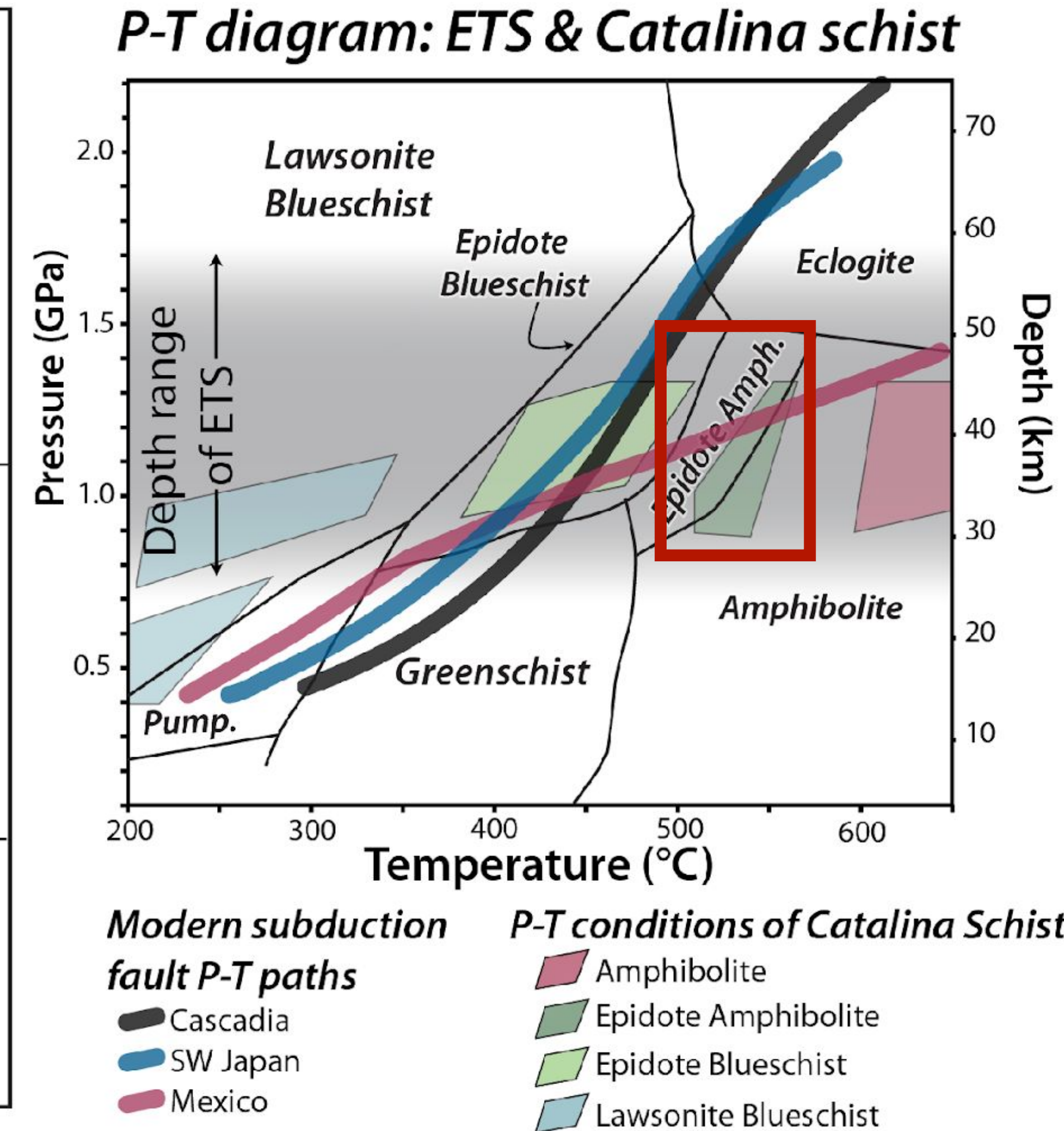


Field Geology

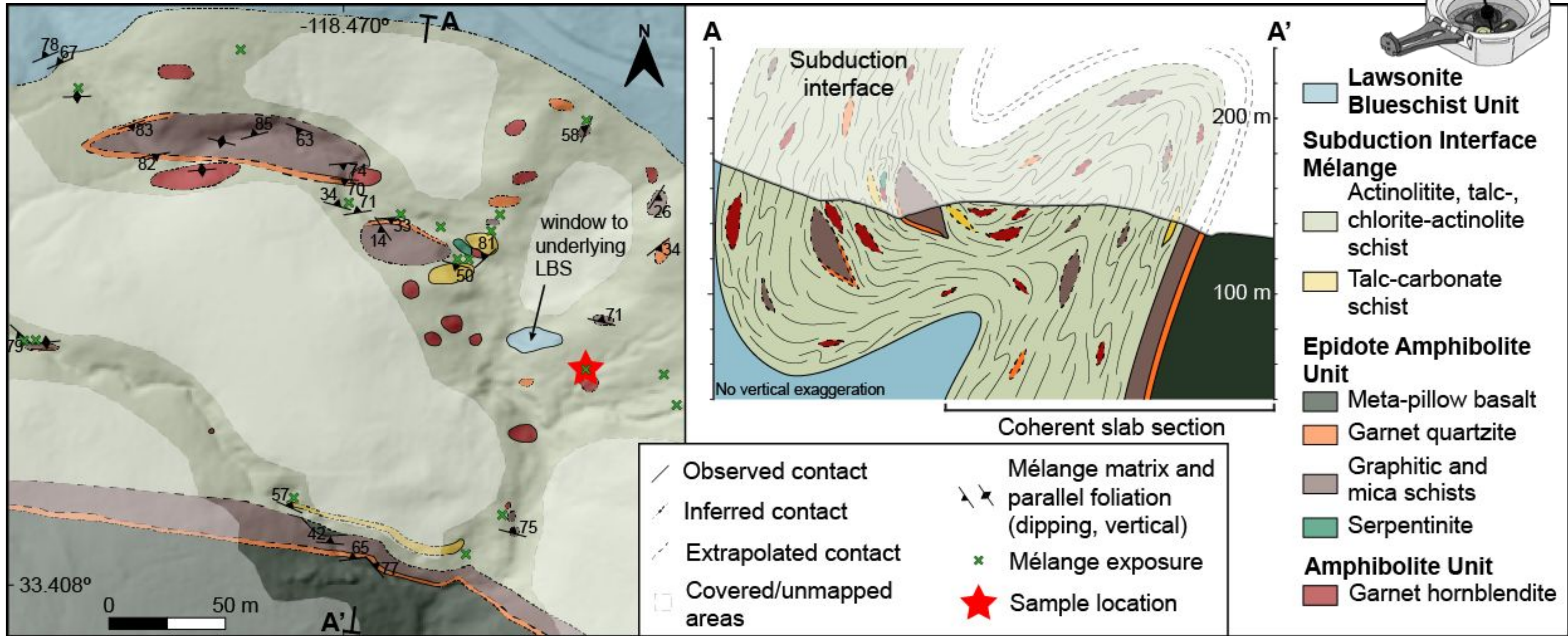
Chemical changes (metasomatism) & subduction fault slip behaviors
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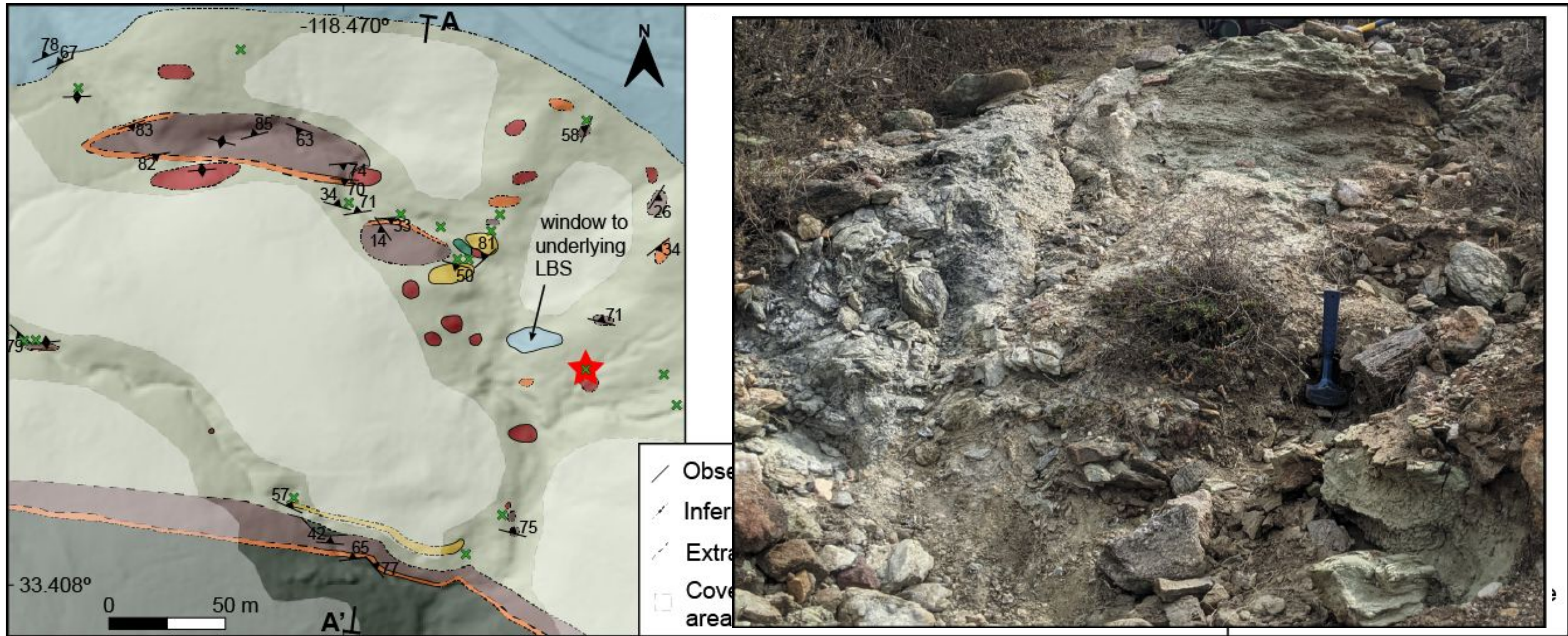


Field Geology: Mapping



Field Geology: Mapping

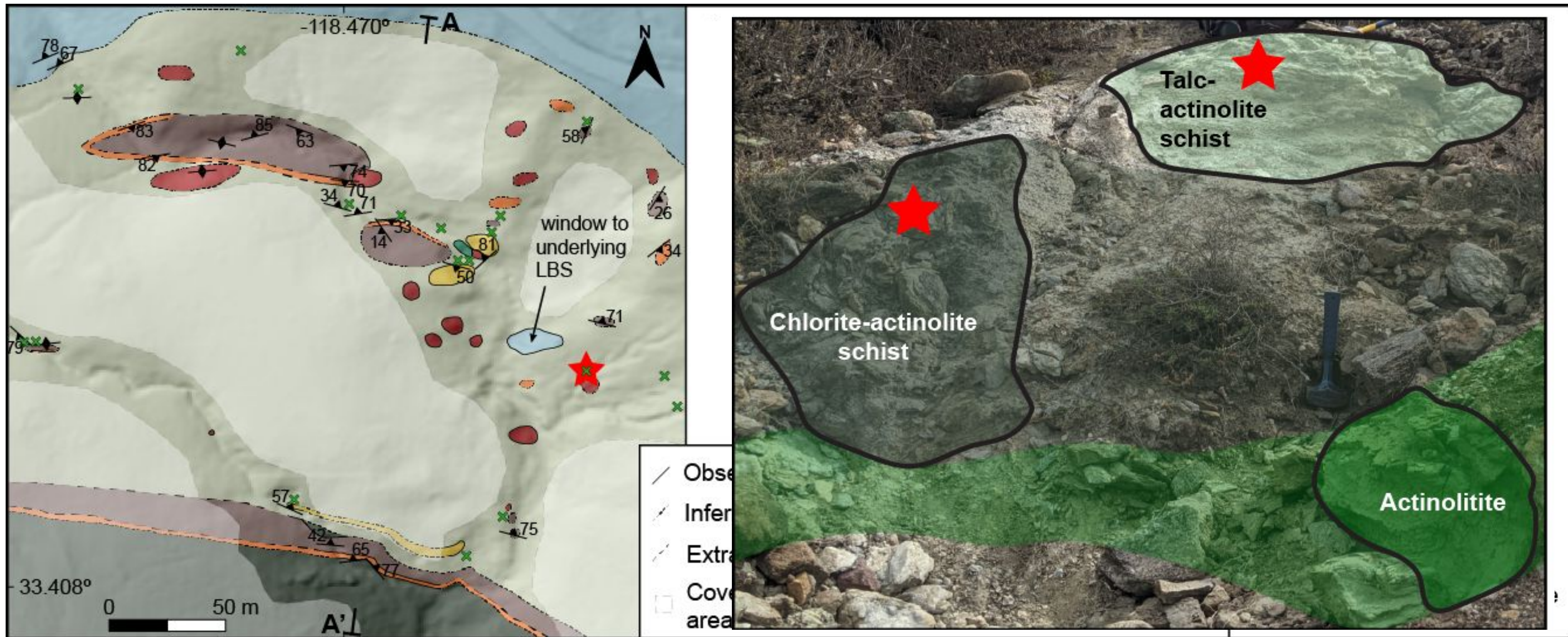
*Melange within a subduction fault
from ~40 km depths*



Hoover et al., 2022 GRL

Field Geology: Mapping

*Melange within a subduction fault
from ~40 km depths*



Hoover et al., 2022 GRL

*block and matrix structures, but also continuous layers
and chemical reaction pathways*

Field Geology

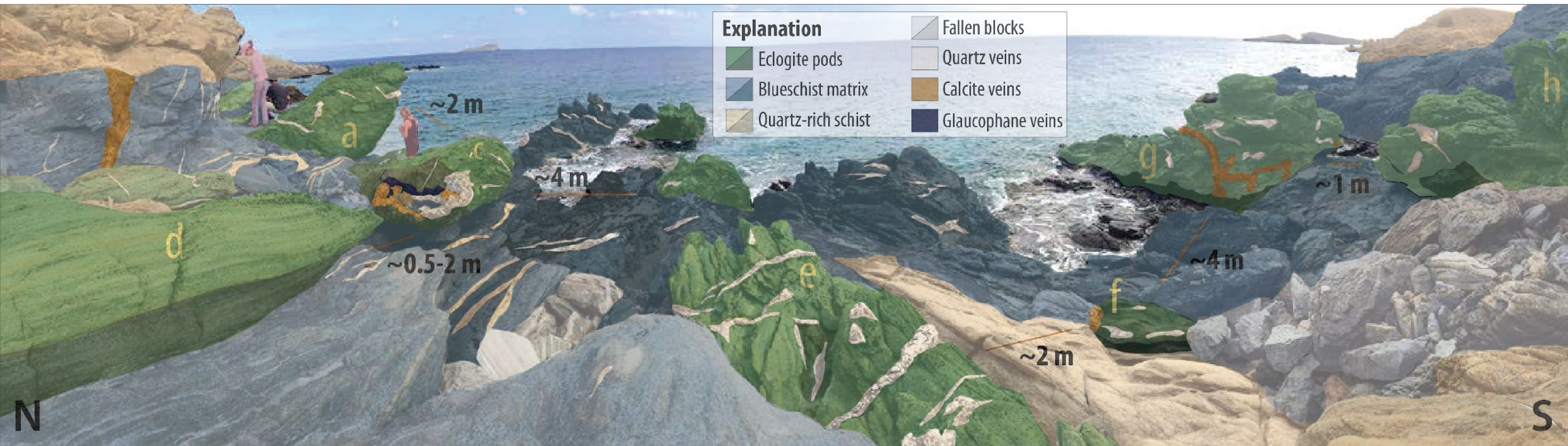
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Blueschist-eclogite transition
Syros Greece - Kotowski & Behr, 2019

Field Geology

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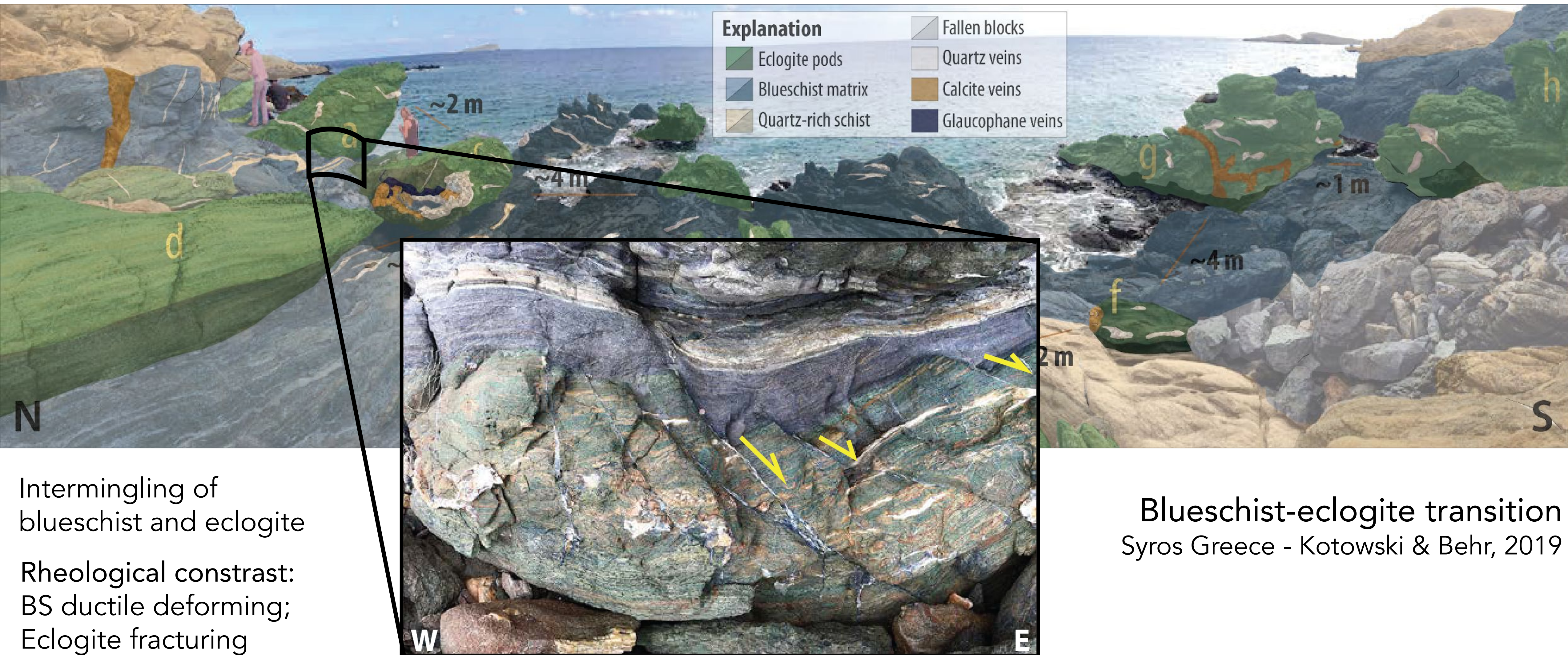


Intermingling of
blueschist and eclogite

Blueschist-eclogite transition
Syros Greece - Kotowski & Behr, 2019

Field Geology

Mapping | Field Relations & Observations | Sample Collection | Structural Measurements



Field Geology

Mapping | Field Relations & Observations | [Sample Collection](#) | Structural Measurements



*Foliated pelitic schist
riddled with quartz crack-seal veins*

XPL

Full thin section



- Blocky elongate quartz veins
- Crosscut the viscous foliation



XPL

Full thin section



XPL

5 mm

- Blocky elongate quartz veins
- Crosscut the viscous foliation

P-T conditions of foliation:
~300-350°C, 0.90 GPa (30 km)

- Crack-seal features
- Dynamic recrystallization microstructures



- Formed over repeated fracturing & precipitation events
- Experienced recrystallization at peak T: syn-subduction

Samples allow us to reconstruct host of characteristics back in the lab

XPL

Full thin section



- Blocky elongate quartz veins
- Crosscut the viscous foliation

P-T conditions of foliation:
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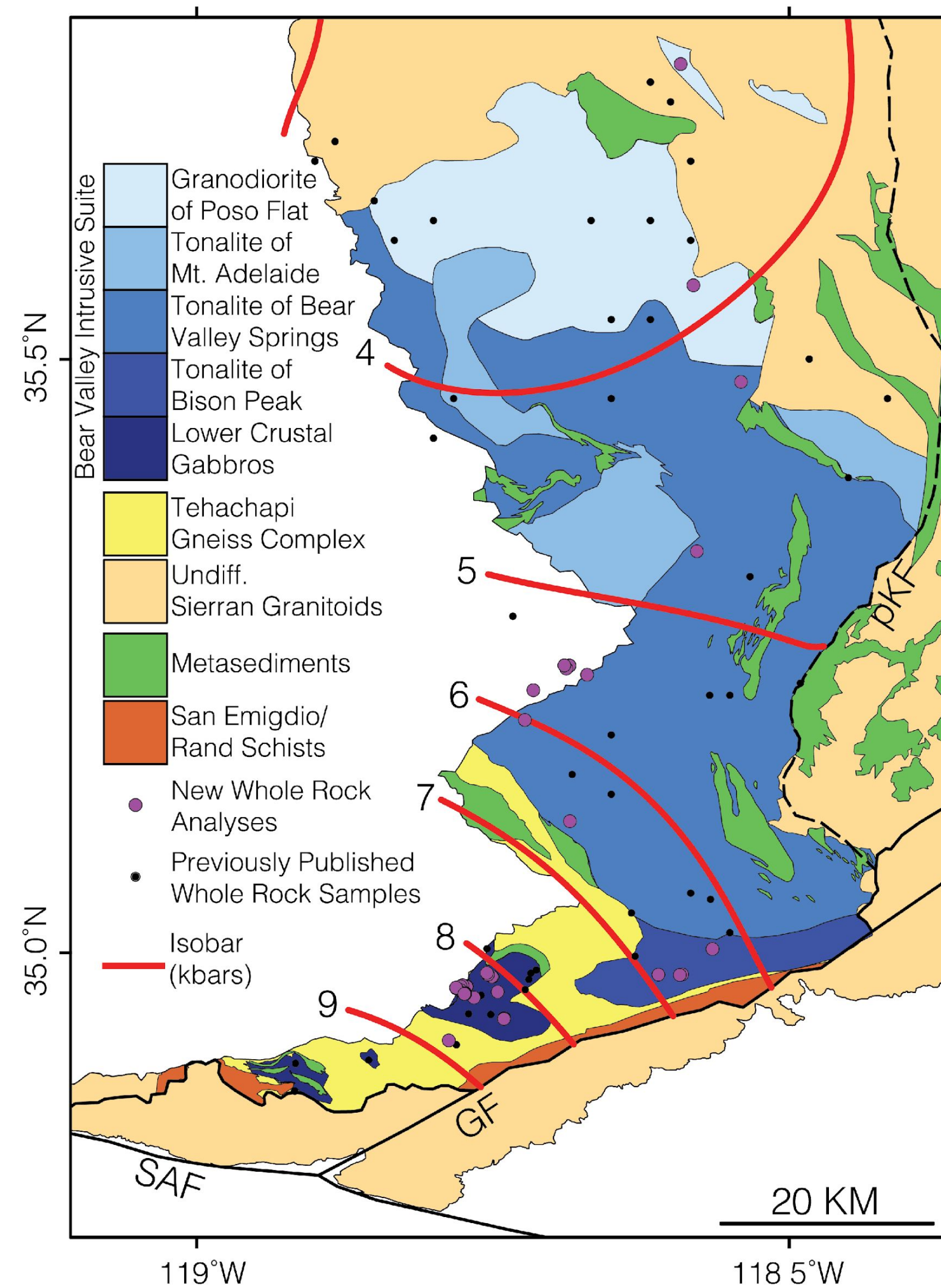
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Field Geology

Anatomy of a magmatic arc -Southern Sierra Nevada
Klein & Jagoutz, 2021

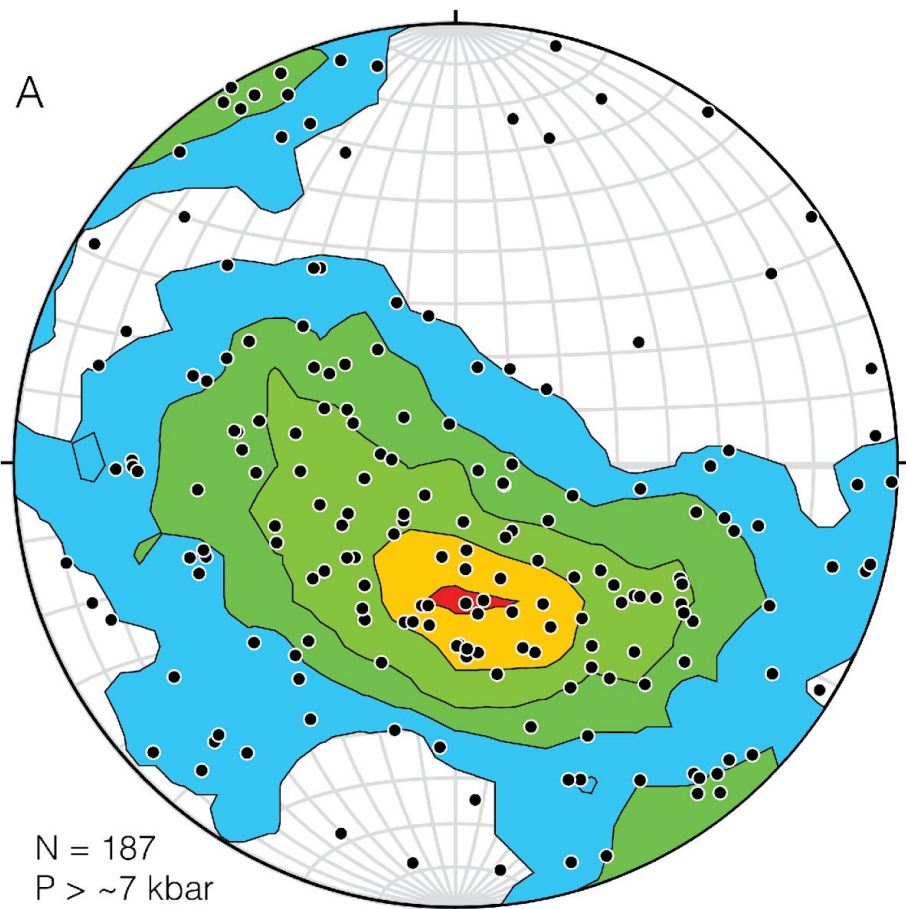
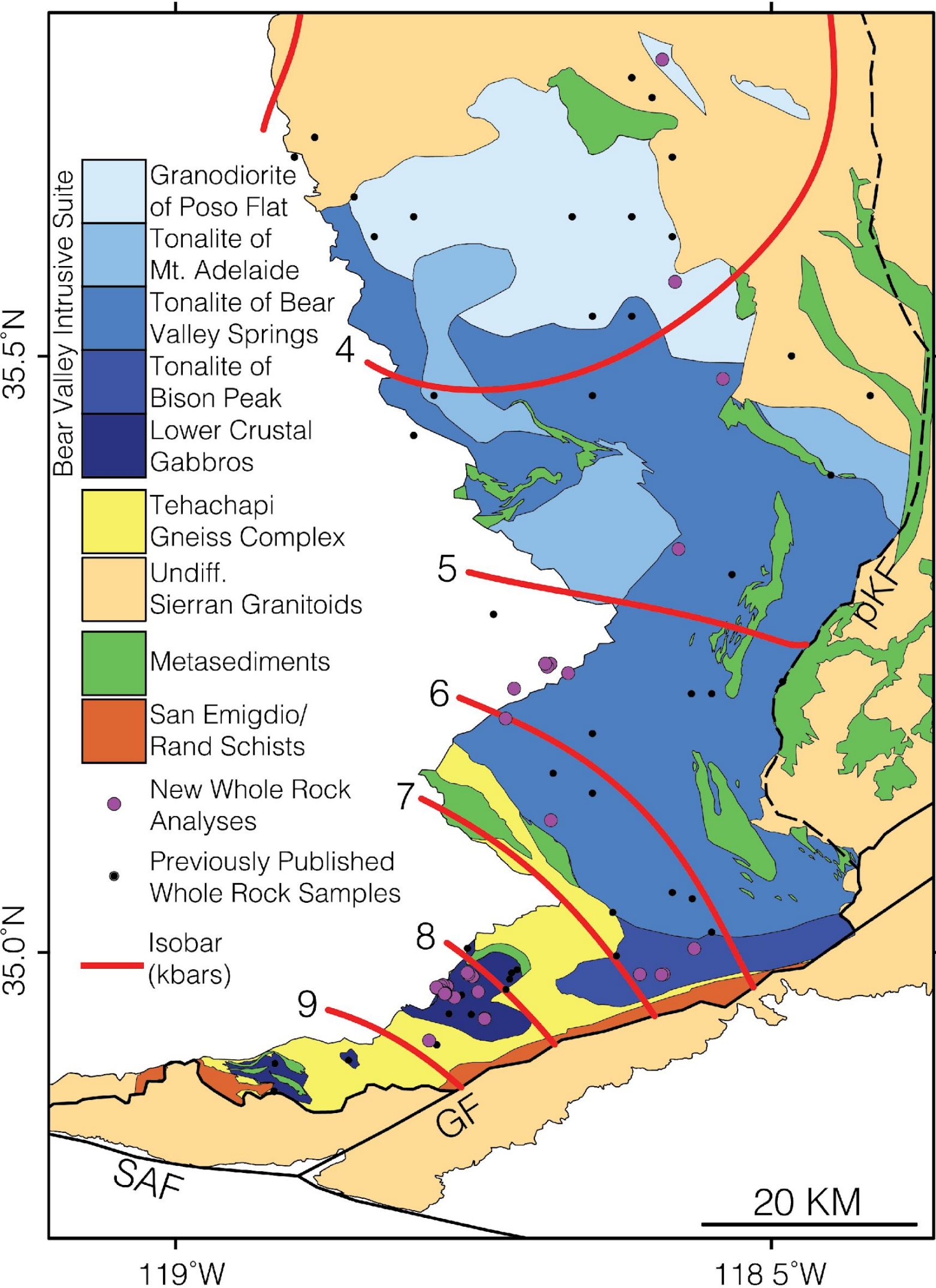
Mapping | Field Relations & Observations | Sample Collection | Structural Measurements



Field Geology

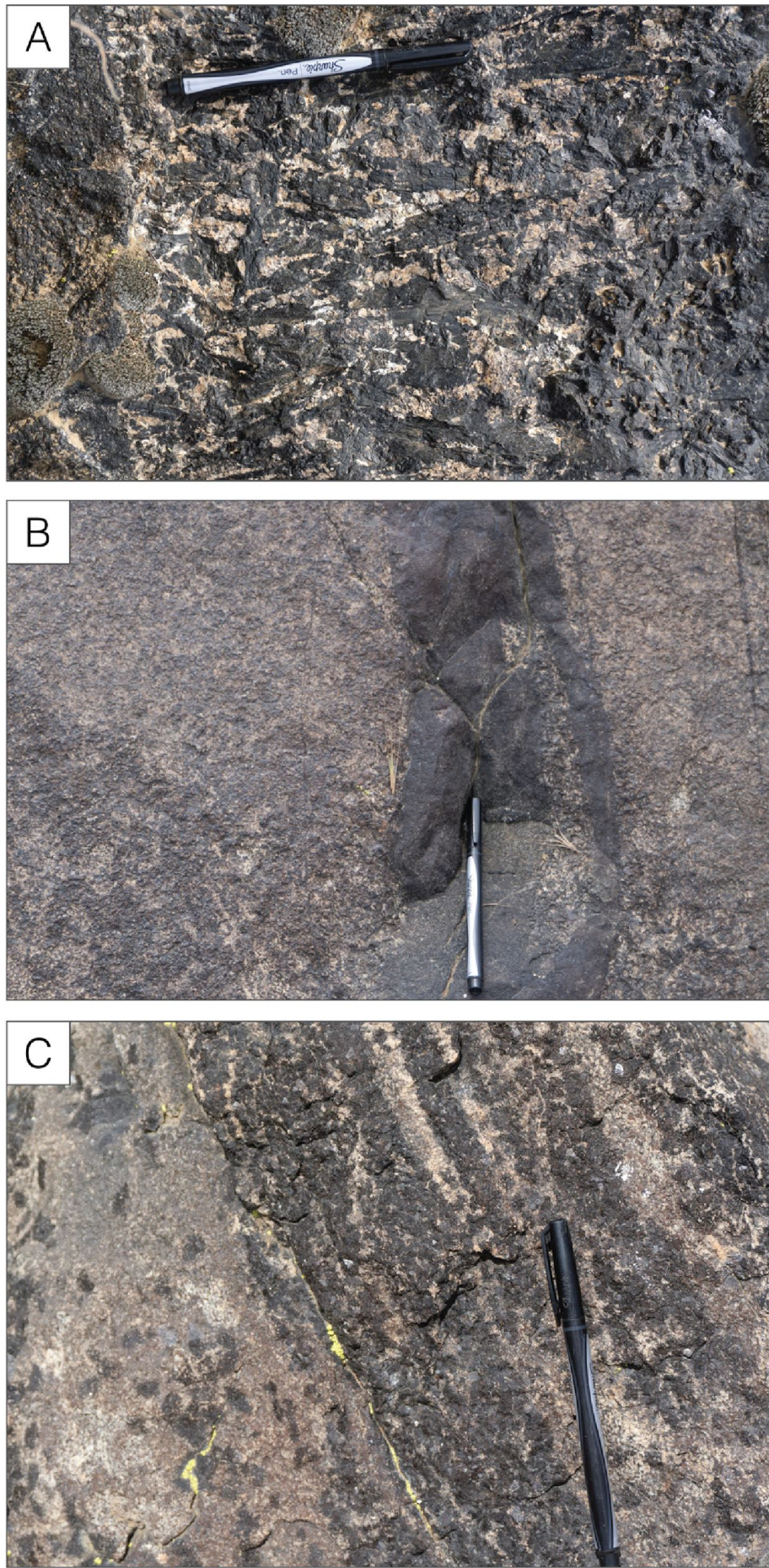
Anatomy of a magmatic arc -Souther Sierra Nevada
Klein & Jagoutz, 2021

Mapping | Field Relations & Observations | Sample Collection | Structural Measurements



Deep: Flat Magmatic Fabrics

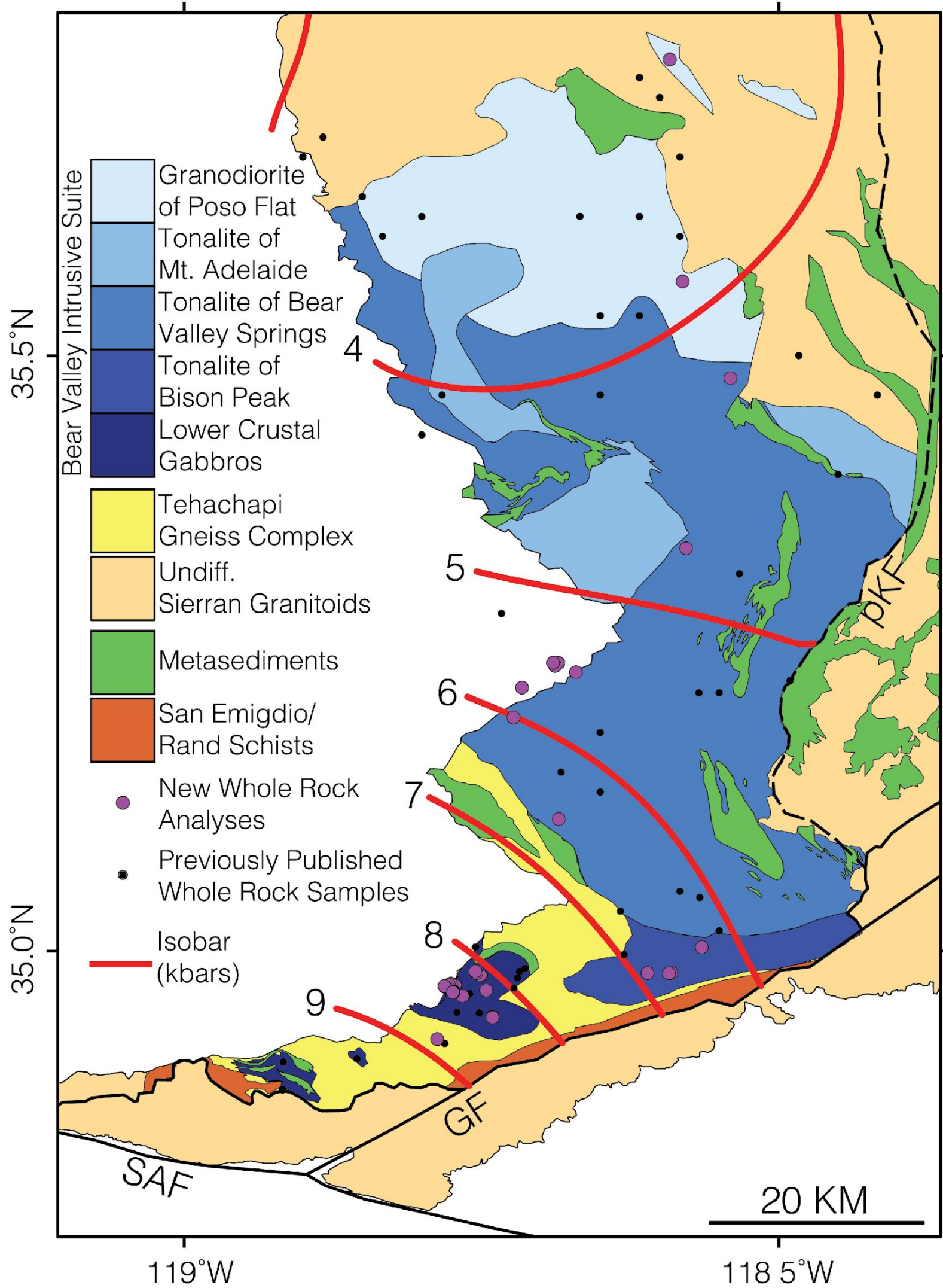
Deep: Cumulates, flat fabric



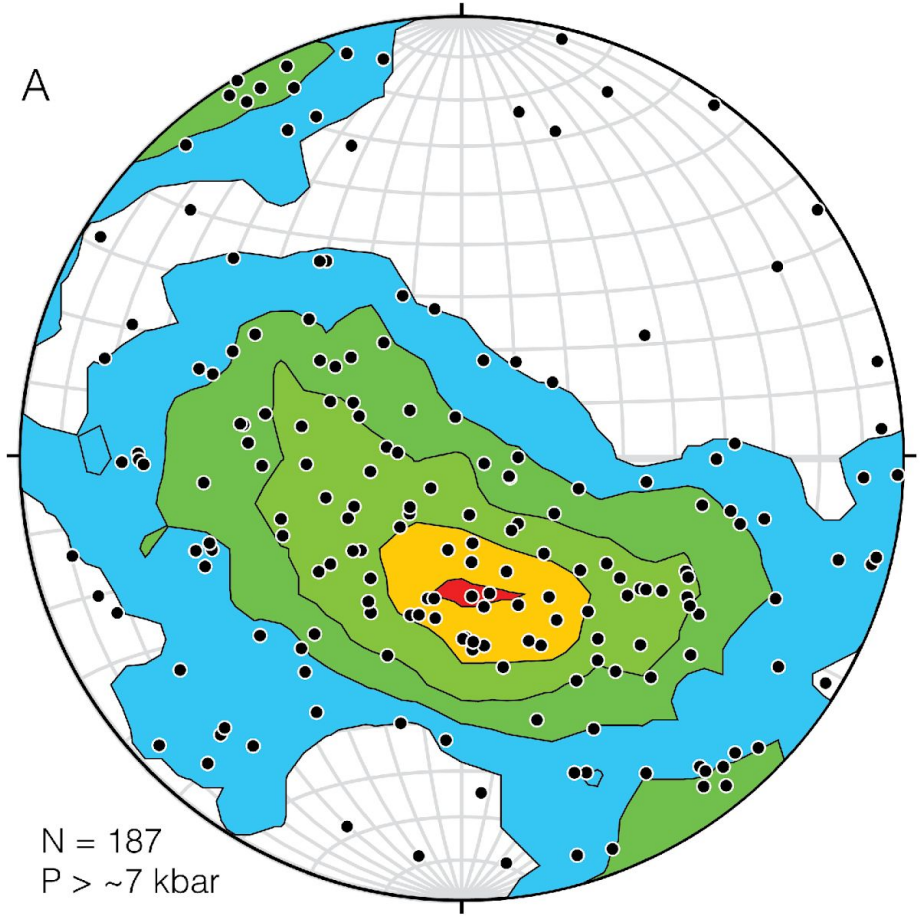
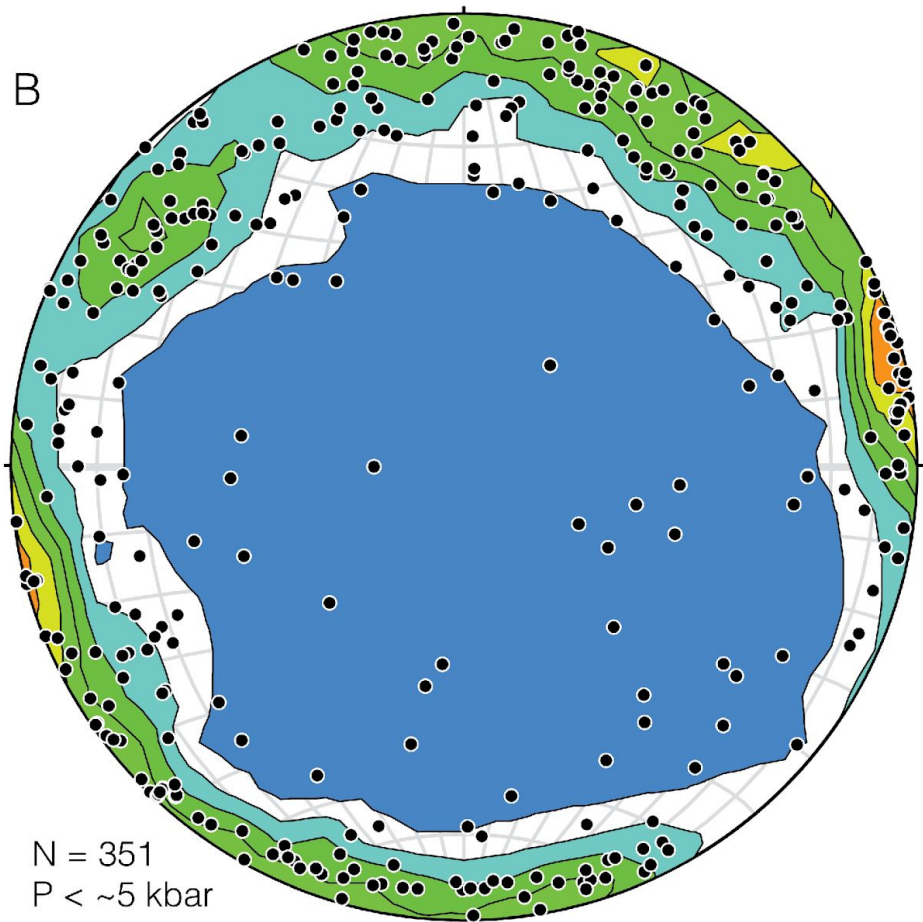
Field Geology

Anatomy of a magmatic arc -Souther Sierra Nevada
Klein & Jagoutz, 2021

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Shallow: Vertical Magmatic Fabrics



Deep: Flat Magmatic Fabrics

Deep: Cumulates, flat fabric Shallow: Tonalites, steep fabric



Field Geology

Advances in Field Geology:

- *Collective field work*
 - Approach analog field sites similar to IODP model
 - Geologists, geochemists, petrologists, geochemists, structural geologists etc all working together toward a common goal:

Constraining key subduction zone processes from the rock record from a wide range of geologic perspectives

Represents a step change in our approach (away from sole-PI driven science) and will yield interdisciplinary results

