The Shear Sense of the Chegualin Fault

車瓜林斷層的剪切行為

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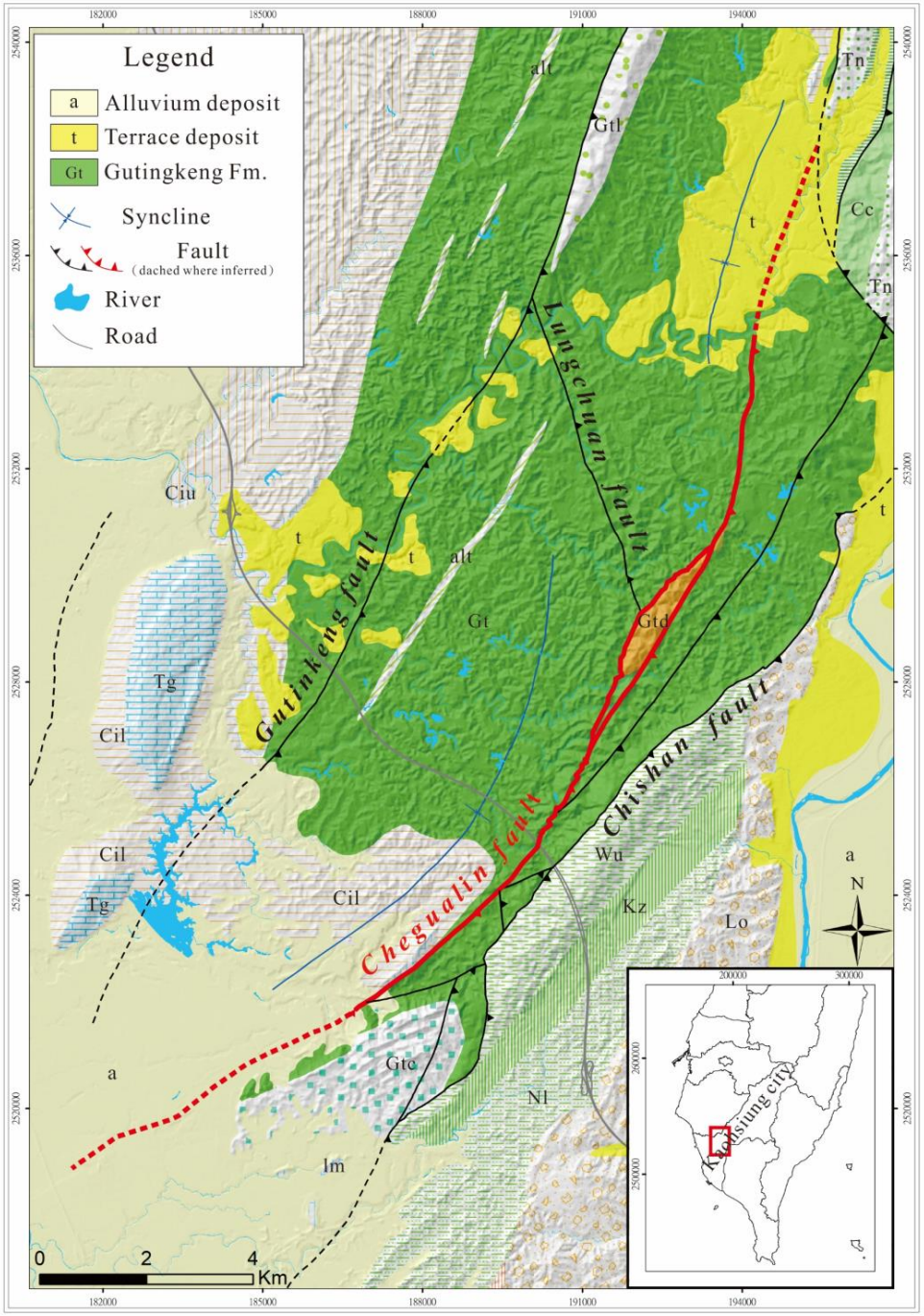
Chegualin Fault

- Chegualin fault is a thrust fault with strike-slip component, striking NE-SW and dipping to the east.

- The entire Chegualin Fault is located within the Gutingkeng Formation, which is mainly composed of massive mudstone.



Modified after CGS, 2013; Lin et al., 2021

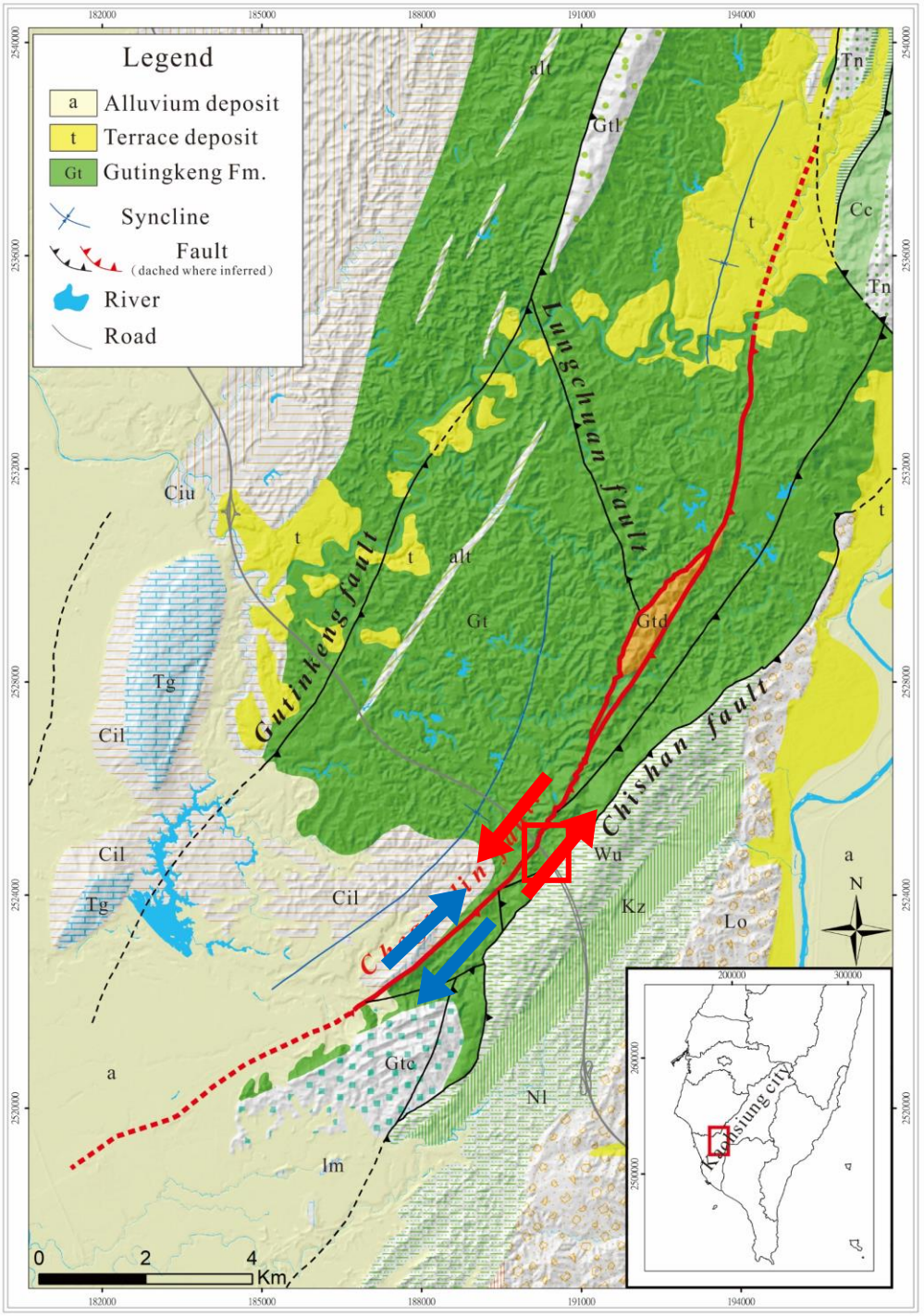
- Massive mudstone in Gutingkeng Formation.
- The dark broad band is clearly observable.
- A fault zone composed of several dark broad bands.

Jhuang, 2023

- The dark broad band is composed of many black bands.

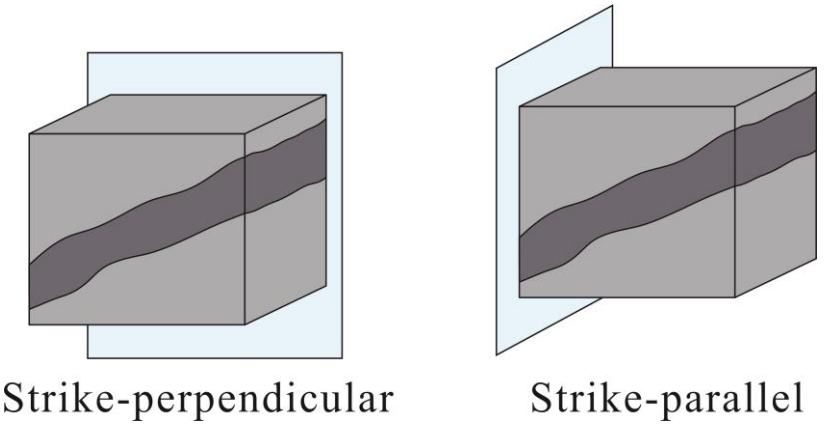
Research Problem

- Near Zhongliao tunnel region indicate relative left-lateral shearing.
- South of Chegualin fault indicate relative right-lateral shearing.
- Lack of outcrop and microstructural evidence to support these observations.



Methodology

- Outcrop observation
- Microstructral analysis



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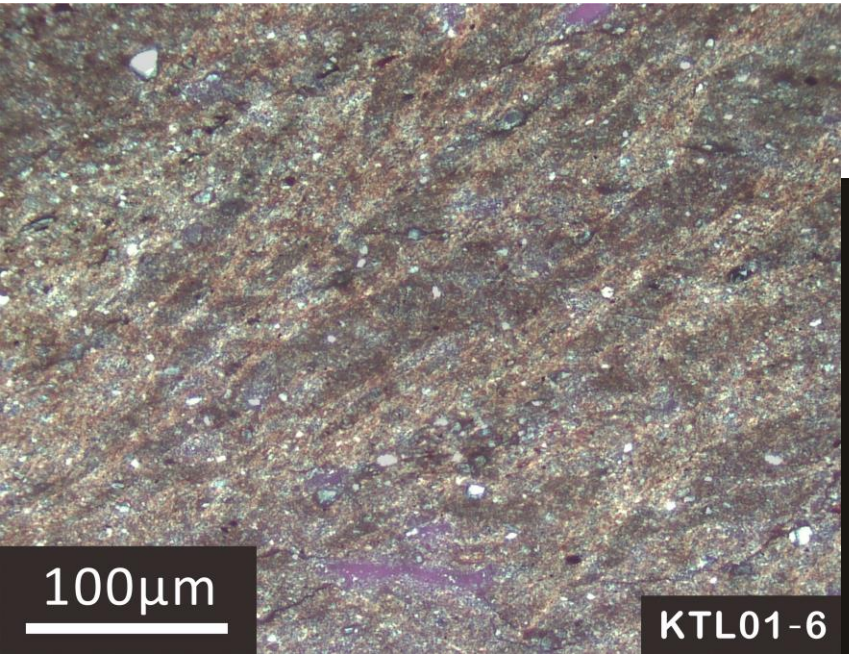


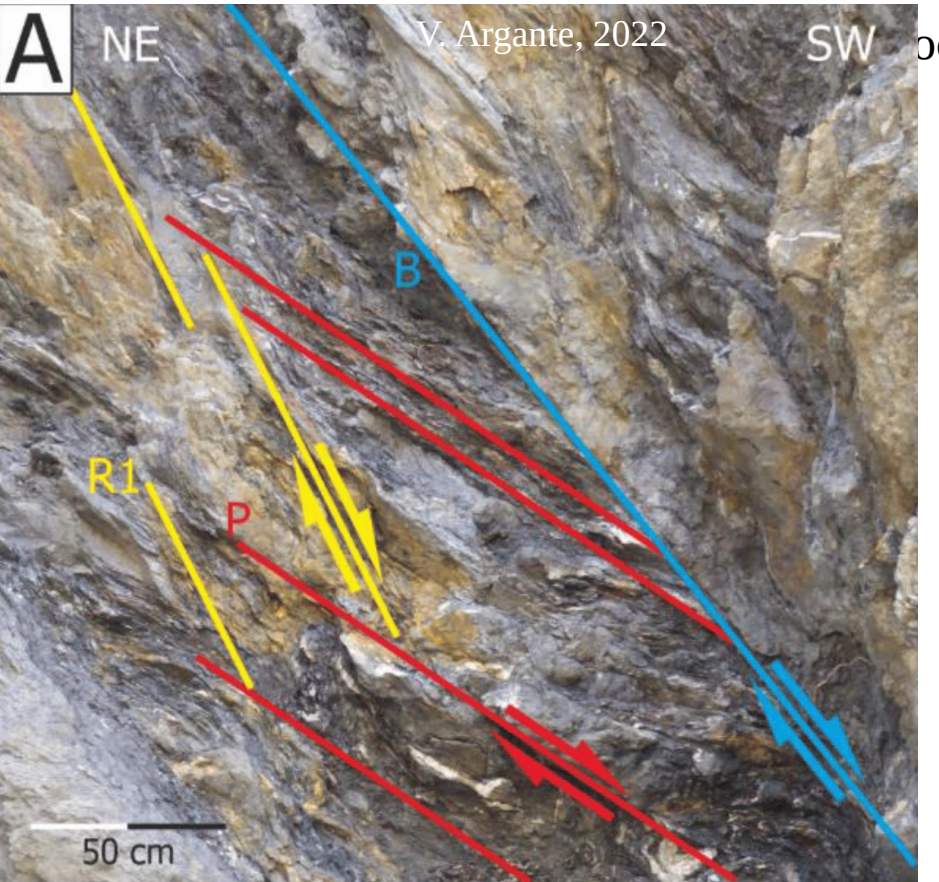
Thin section of the strike-perpendicular sample

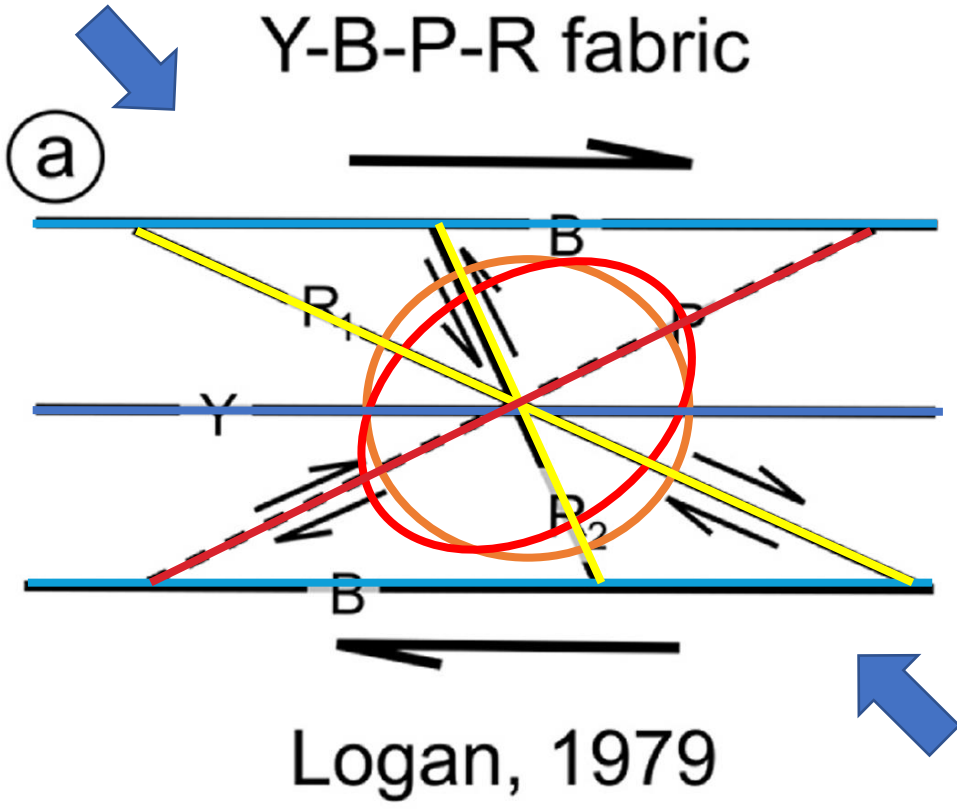
Y-B-P-R

- Y shear bands : parallel to the experimental fault boundaries. They can be discontinuous but are located entirely within the deforming gouge

- B shear bands : similar to the Y-shears, but they are continuous, wider and are located close to the boundary

ocks

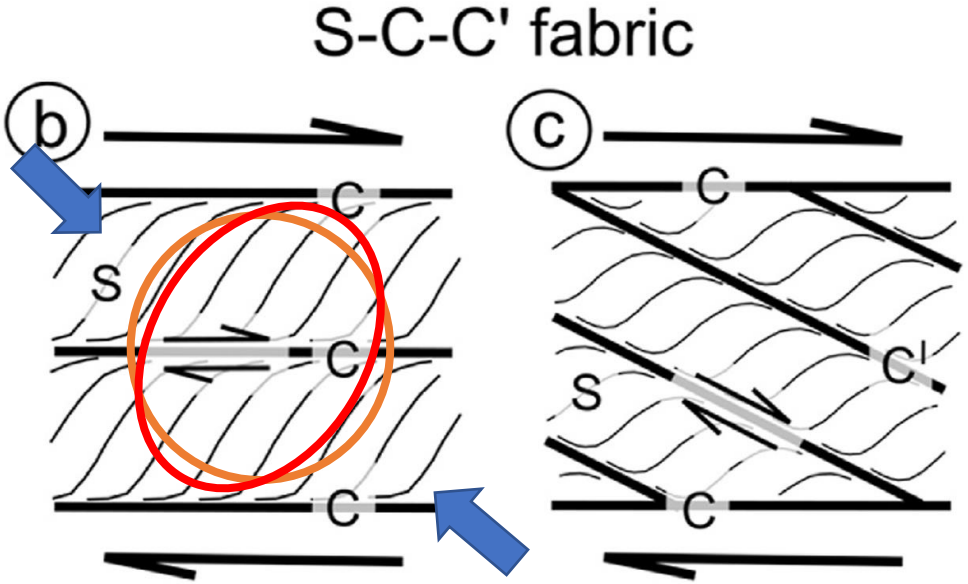




S-C-C’

- C planes (*Cisaillement*) : accommodate shear deformation parallelly to the fault boundaries
- C’ planes : conjugate shear planes oriented similarly to the R shear bands
- S foliation (*Schistosité*) : the penetrative fabric, defined by alignment of deformed minerals within the sheared rock

From https://blogs.egu.eu/divisions/ts/2021/05/19/features-from-the-field-s-c-fabrics/



Berthè et al., 1979

Literature review

G. Volpe et al.(2022) Y-B-P-R or S-C-C′? Suggestion for the nomenclature of experimental brittle fault fabric in phyllosilicate-granular mixtures

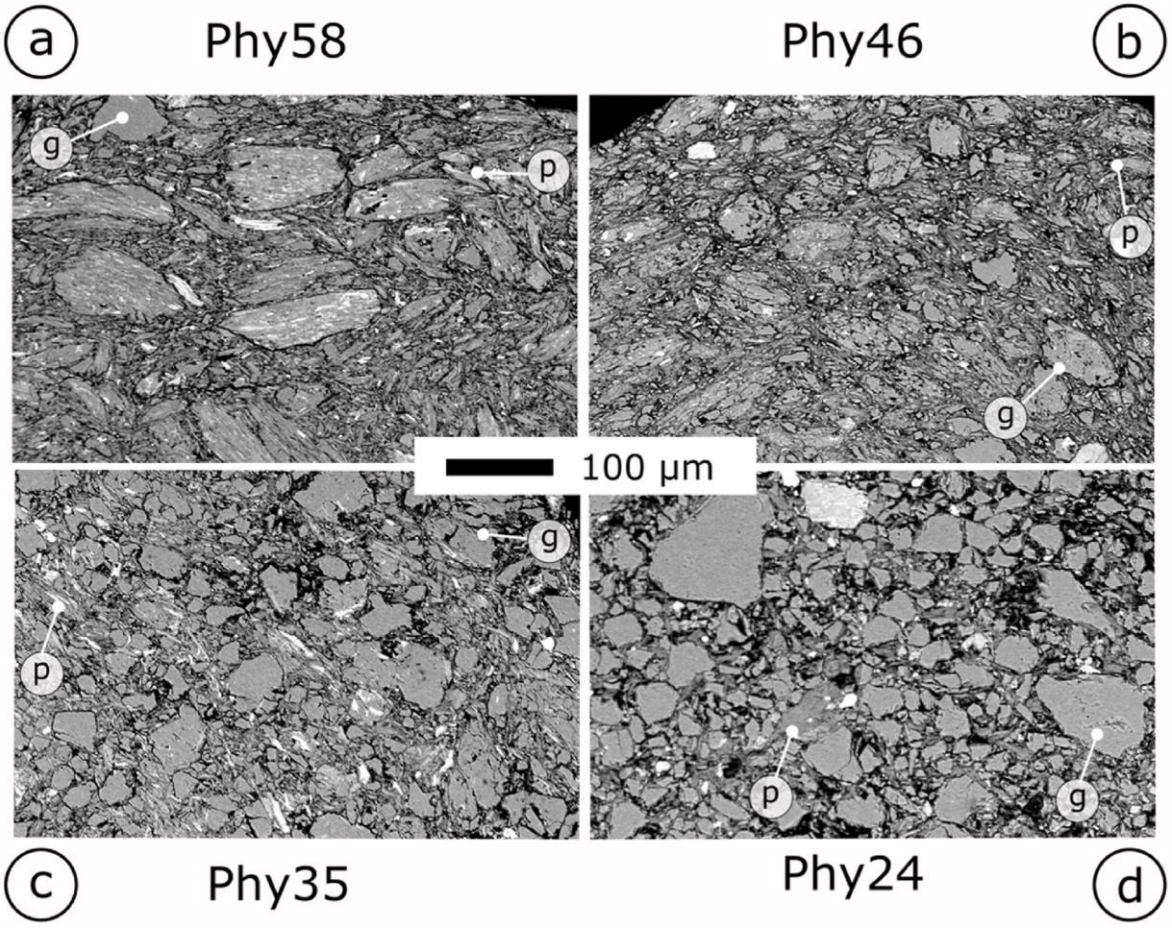
Microstructure

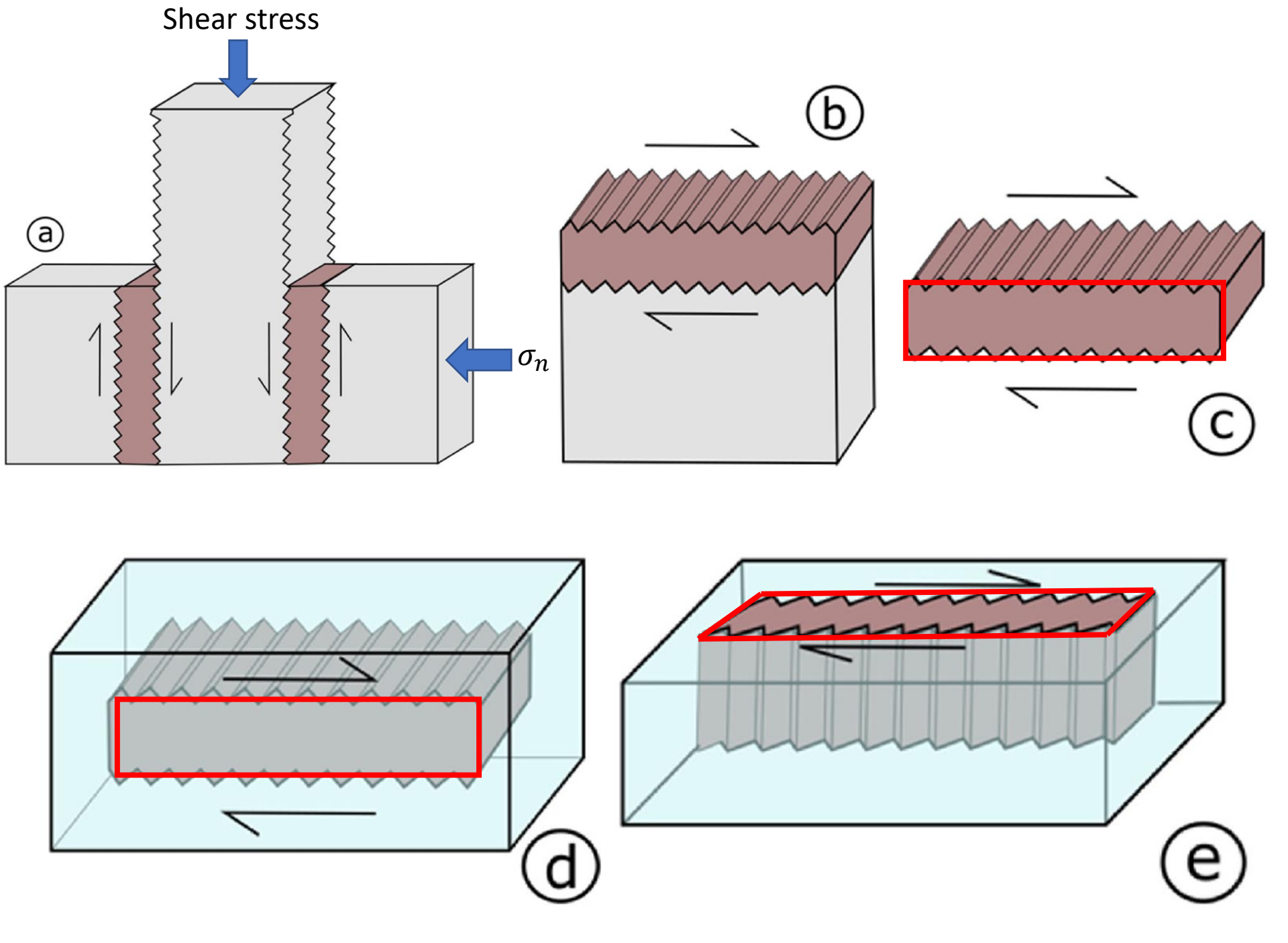
Experimental procedure

- Selected four rocks from shear zones of the Apenninic basement.
- XRD analysis provided semi-quantitative mineralogical analysis of the rocks.
- The starting materials were prepared by crushing the sampled rocks and sieving the powders between 63 and 125 μm.

Mineral composition of the tested gouges.

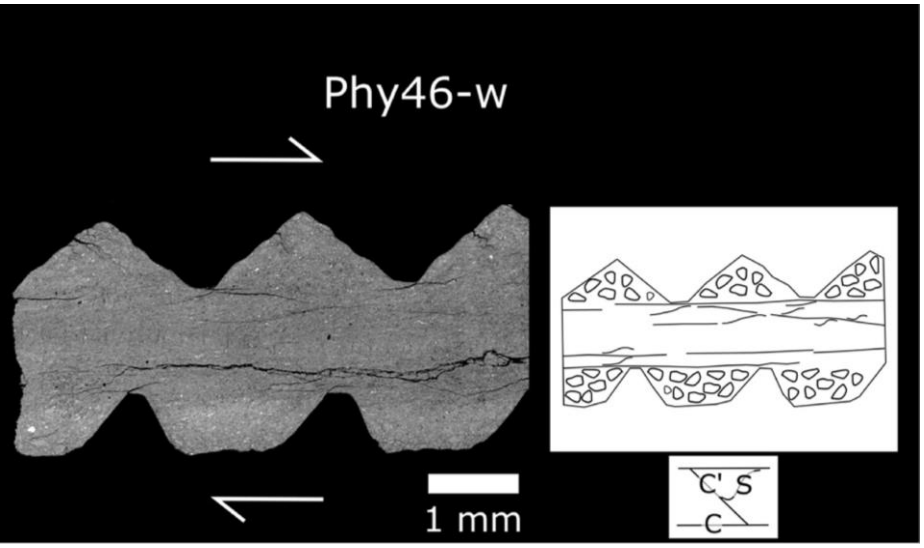
Label	Mineralogy			
	Phyllosilicates		**Granular minerals**	
Phy58	**58%**	Muscovite Paragonite Clinochlore	**42%**	Quartz Rutile
Phy46	**46%**	Muscovite Clinochlore	**54%**	Quartz Hematite Rutile
Phy35	**35%**	Muscovite Paragonite Clinochlore	**65%**	Quartz Rutile
Phy24	**24%**	Muscovite Pyrophyllite Clinochlore	**76%**	Quartz Carbonates Hematite

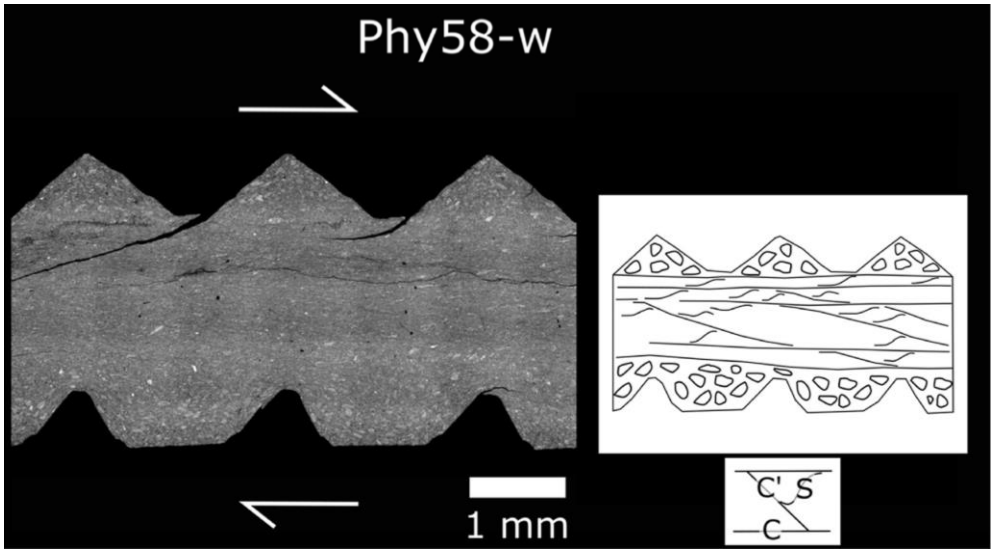


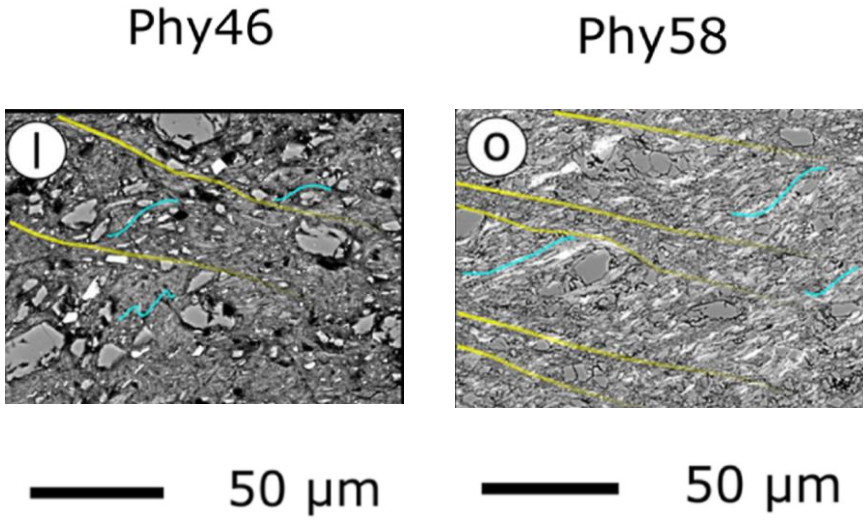

Shear stress
a
σ_n
b
c
d
e

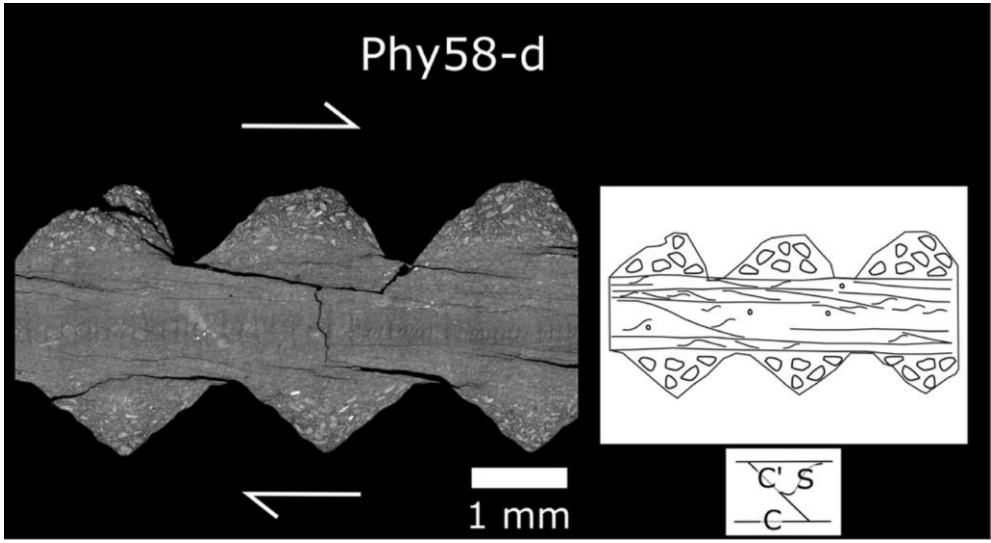
Microstructure

Result (Phyllosilicate rich gouges)





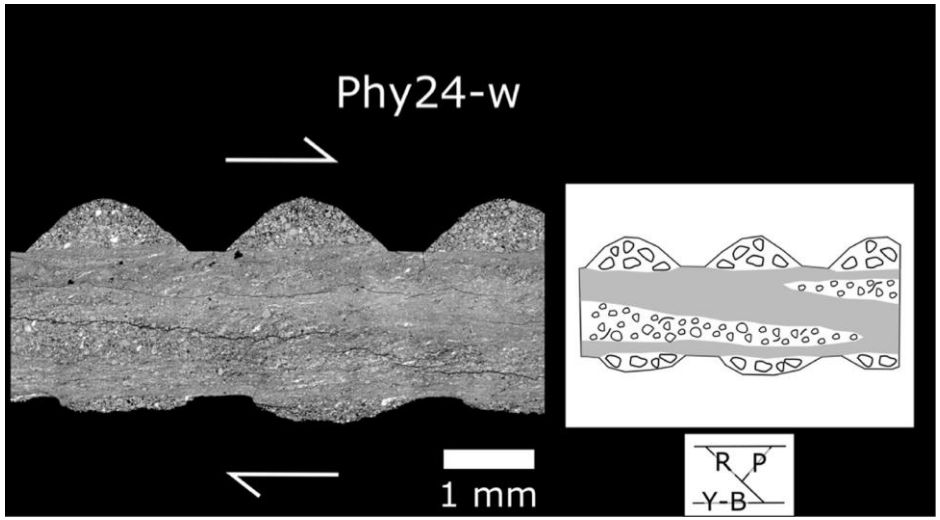


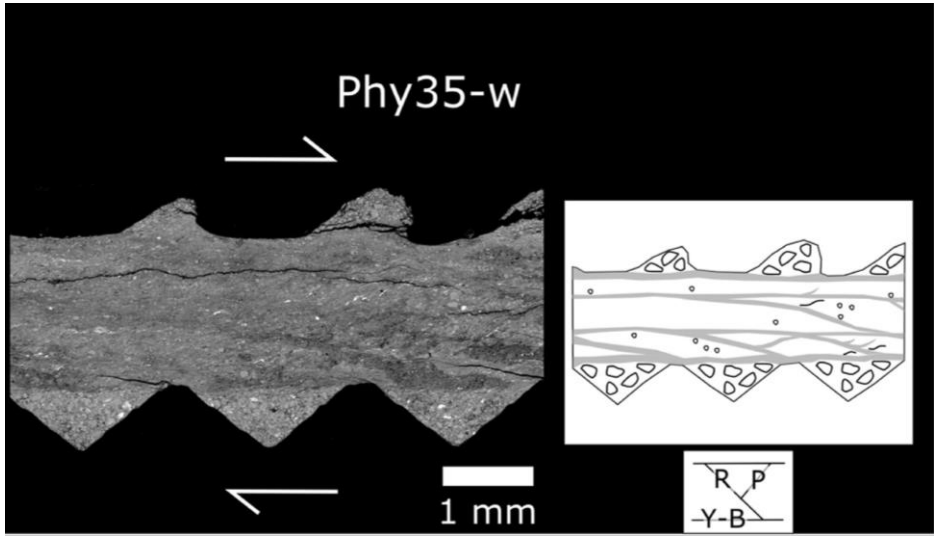


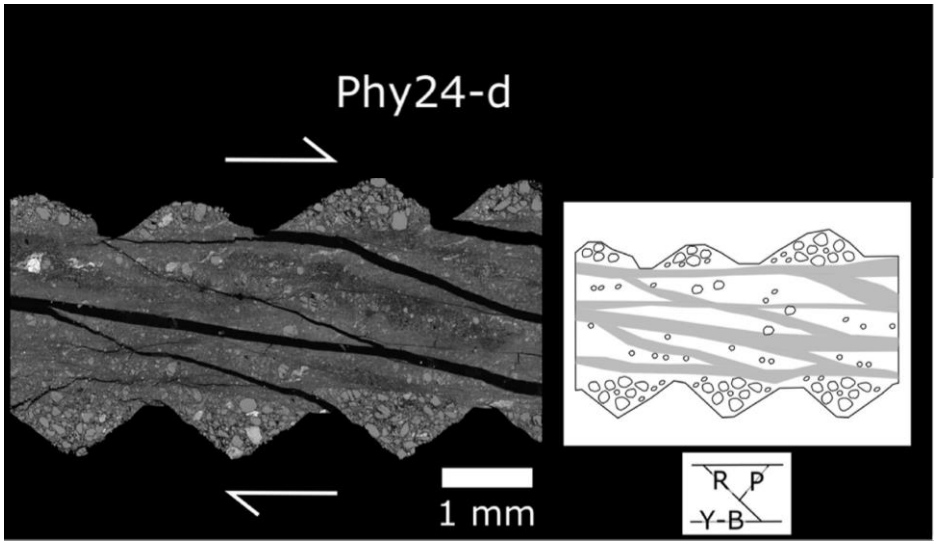
Yellow lines represent C’ planes. Foliation (S planes) is highlighted in cyan.

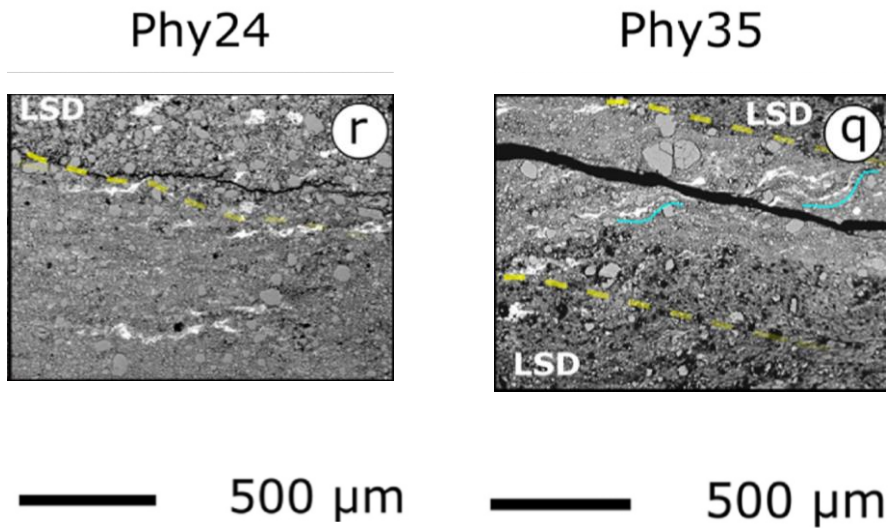
Microstructure

Result (Granular-rich gouges)









Dotted Yellow lines represent the boundaries of low strain domains (LSD).

Conclusion

- Y-B-P-R fabric, associated to strong faults, where shear deformation is accommodated by cataclastic processes and strain localization.

- S-C-C’ fabric, associated to weak faults, which are characterized by frictional sliding along phyllosilicate foliae as main deformation mechanism.

- The transition from Y-B-P-R to S-C-C′ is observed for phyllosilicates content >30%.

Future work

- Identifying of thin section
- XRD analysis of the sample

Thank you for your listening