List of Figures

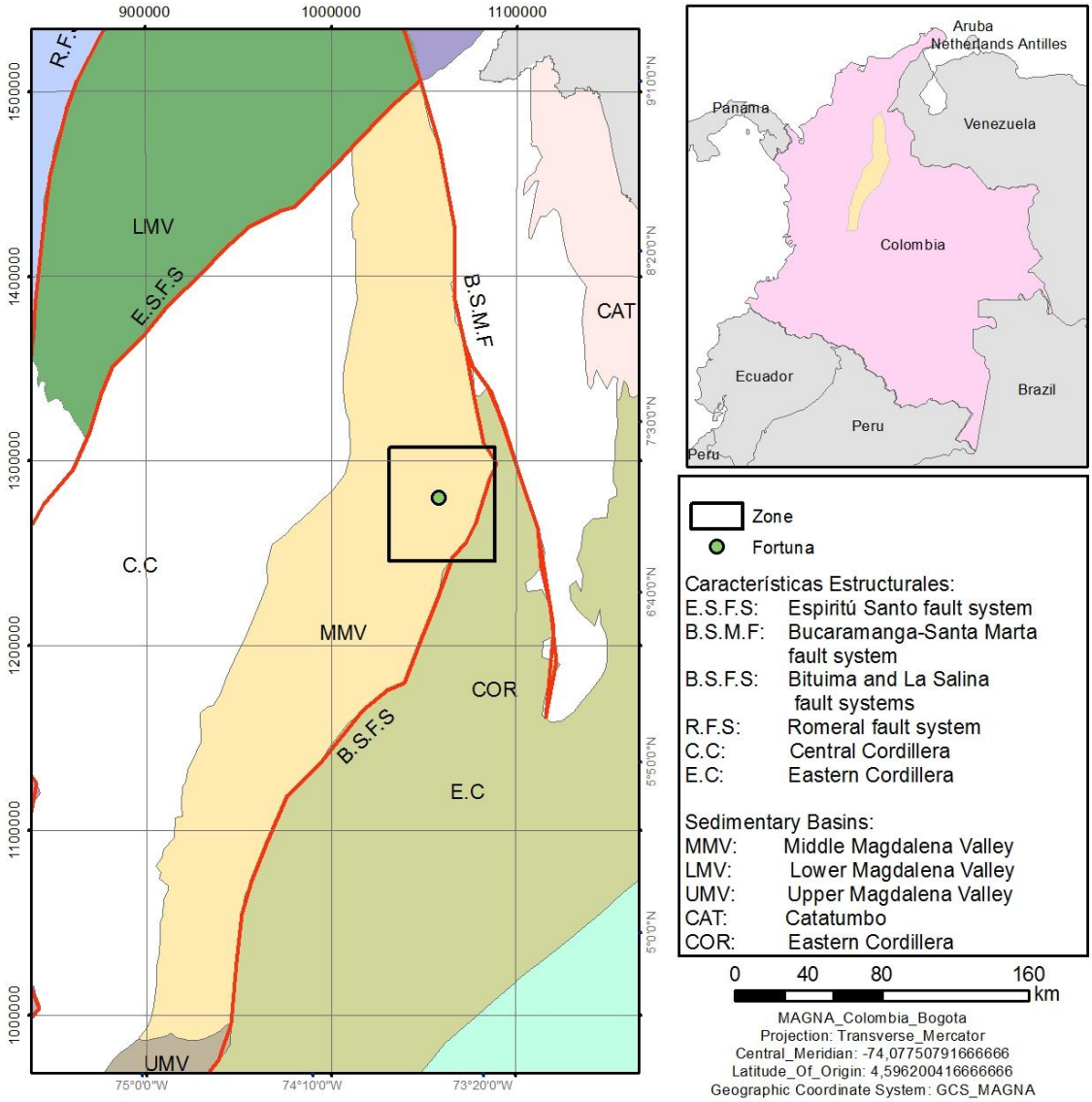

Figure 1. Location map of VMM showing its faulted limits and the adjacent basins. The map also shows the study zone.

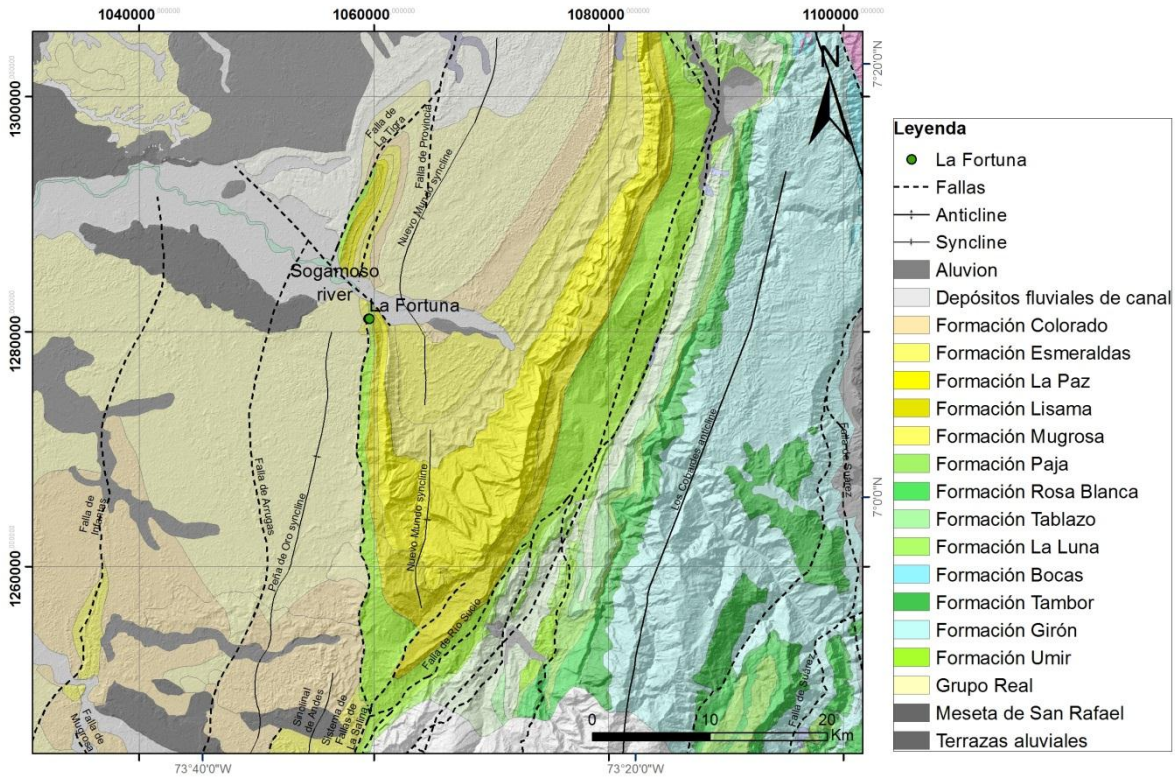

Figure 2. Geological map of the study zone and its stratigraphic section showing the most representative structures, such as the Nuevo Mundo syncline.

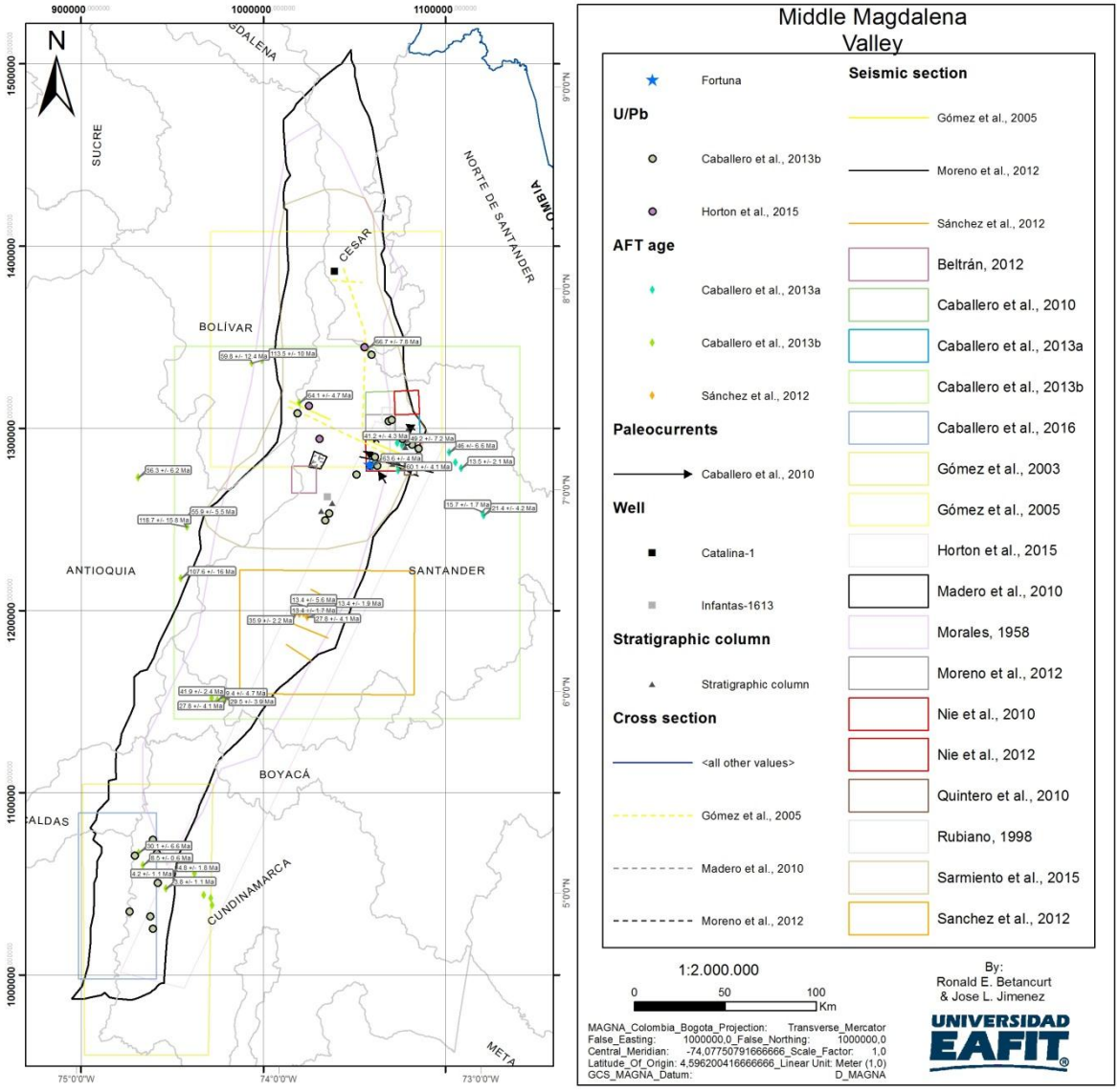

Figure 3. Database with information used in this study. The map shows the different papers

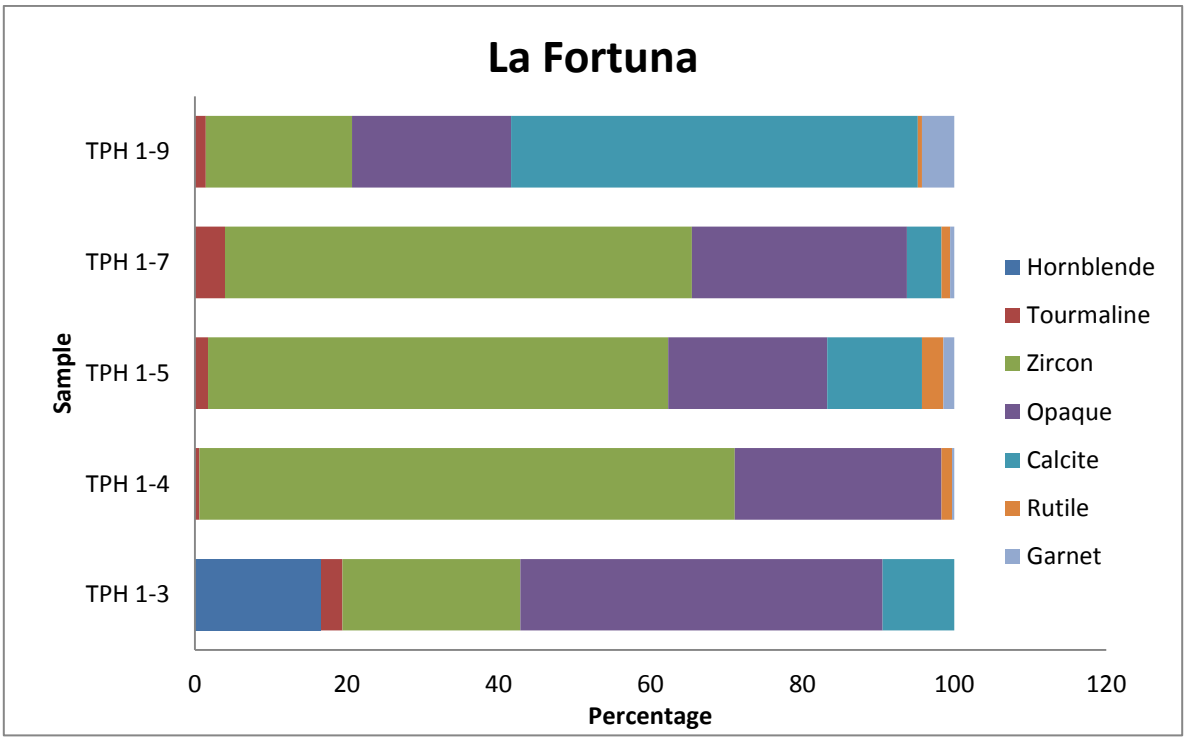

Figure 4. Percentage distribution of dense mineral samples from the La Fortuna stratigraphic section.

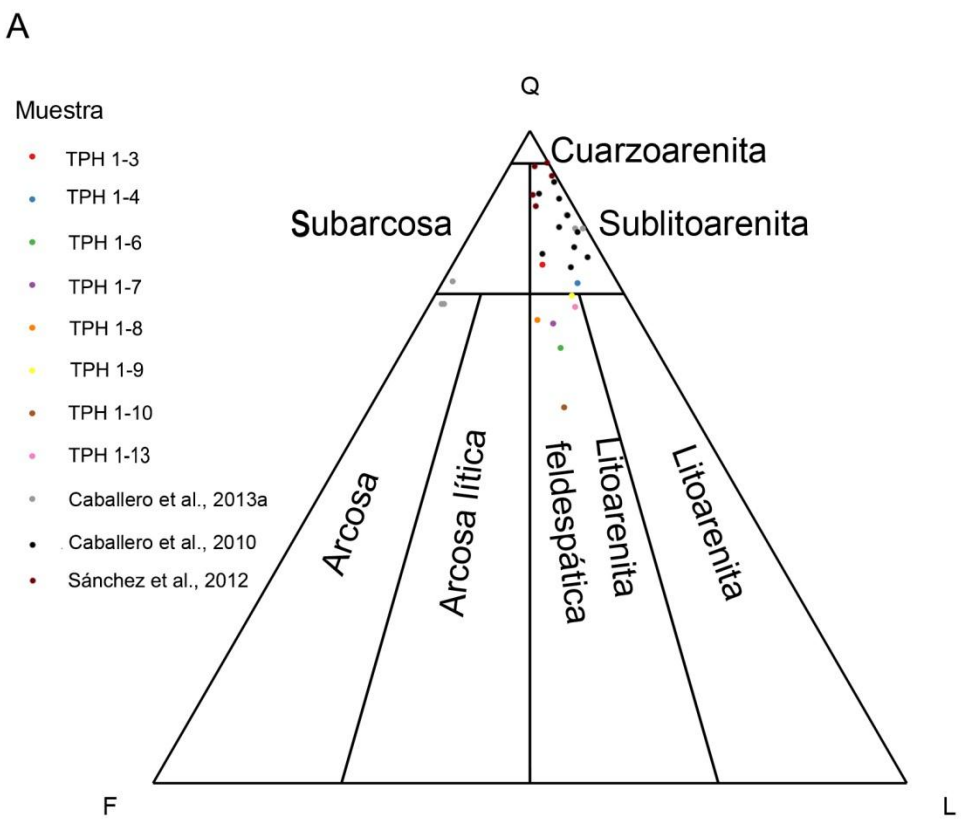

Figure 5a. Compositional diagram of the La Fortuna section (Folk, 1974).

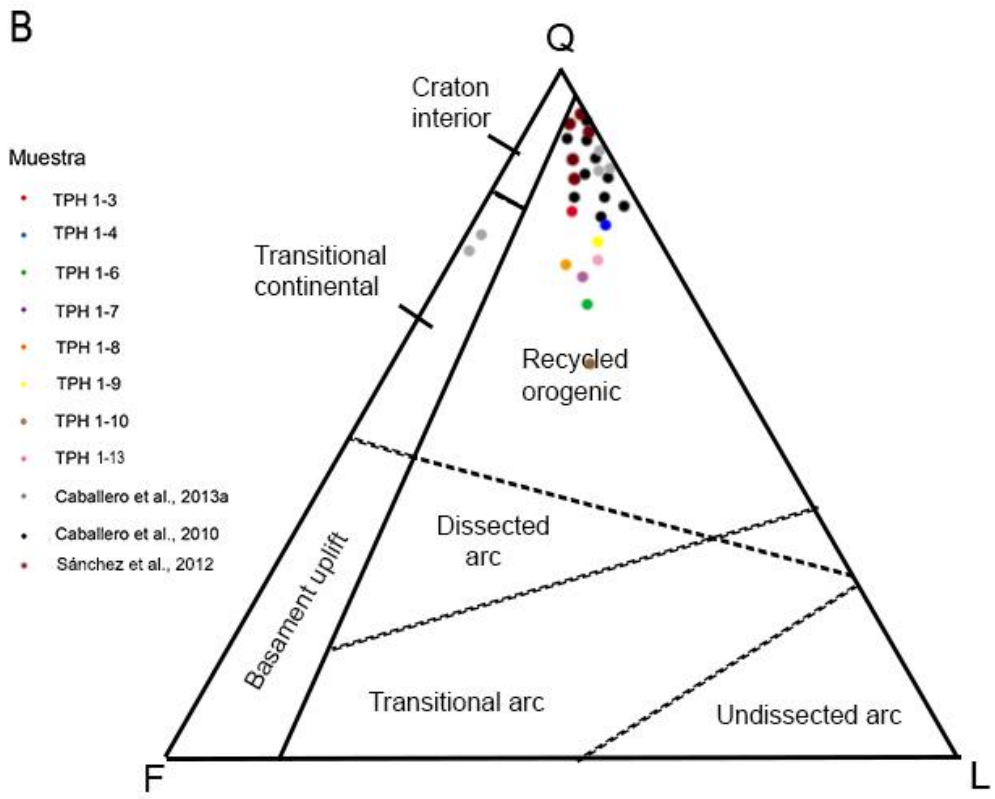

Figure 5b. Provenance and tectonic environment for the sandstones of La Fortuna section (Dickinson, 1979).

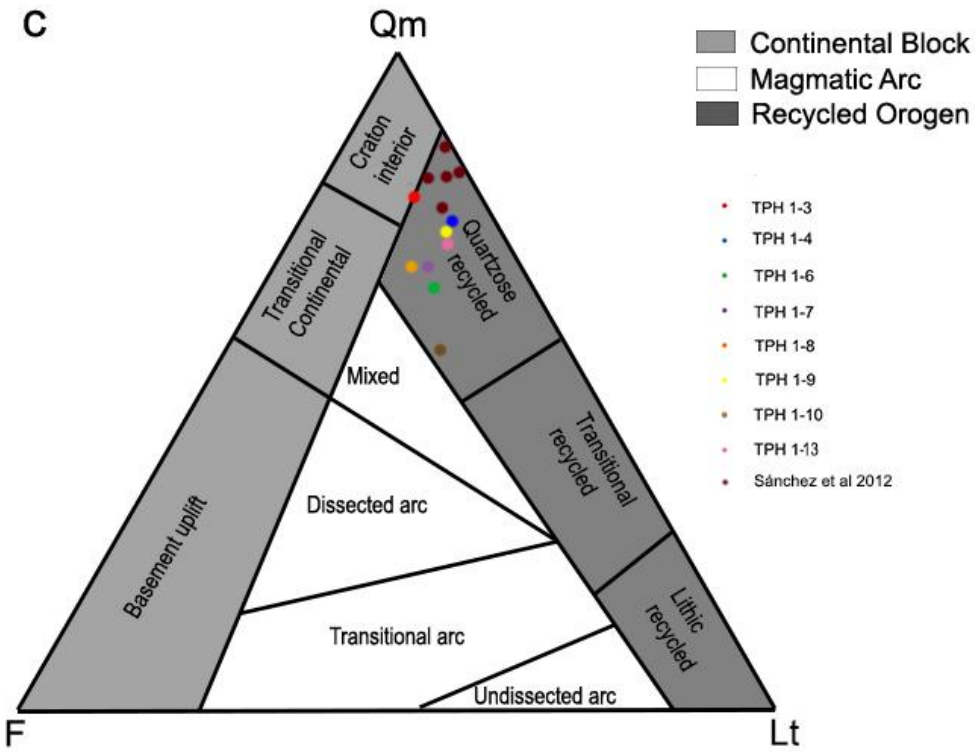

Figure 5c. Sandstone classification diagram showing provenance related to tectonic settings (Dickinson, 1985).

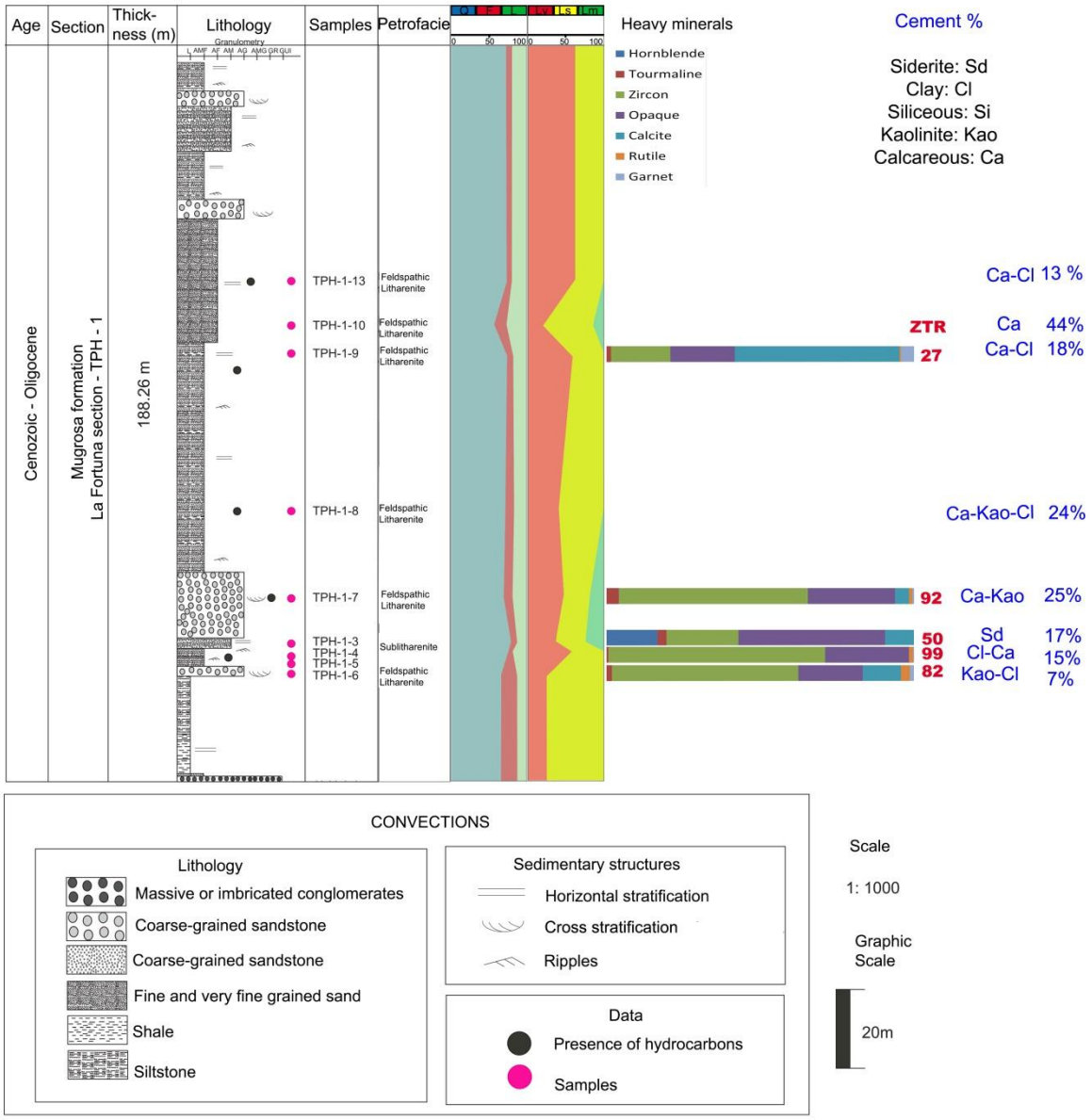

Figure 6a. La Fortuna stratigraphic section, the compositional variation is shown along 188 m of the Mugrosa formation; petrographic and dense mineral samples; the variation of petrofacies along the section; the variation of Q (Quartz), F (Feldspar), L (Lithic Fragments), Lv (Volcanic Lithic), Ls (Sedimentary Lithic) and Lm (Metamorphic Lithic). Dense mineral variation is also shown along the section

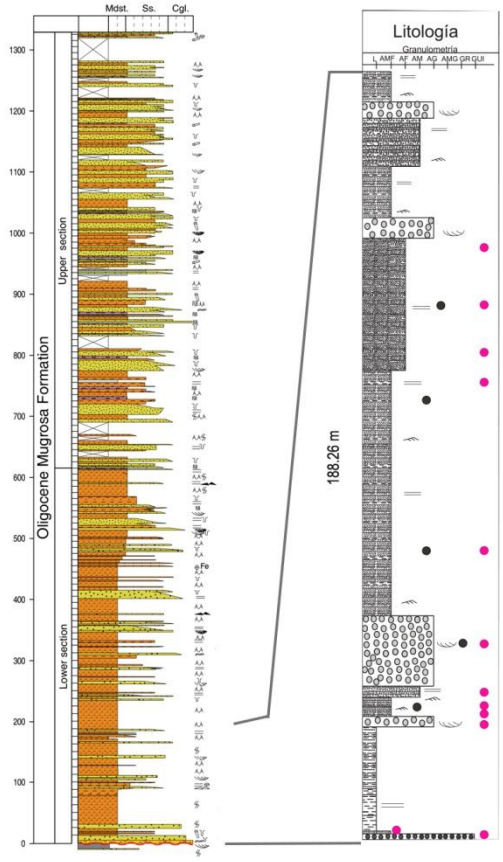

Figure 6b. Generalized stratigraphic column of the Mugrosa formation correlated with the La Fortuna stratigraphic section (Caballero et al., 2020).

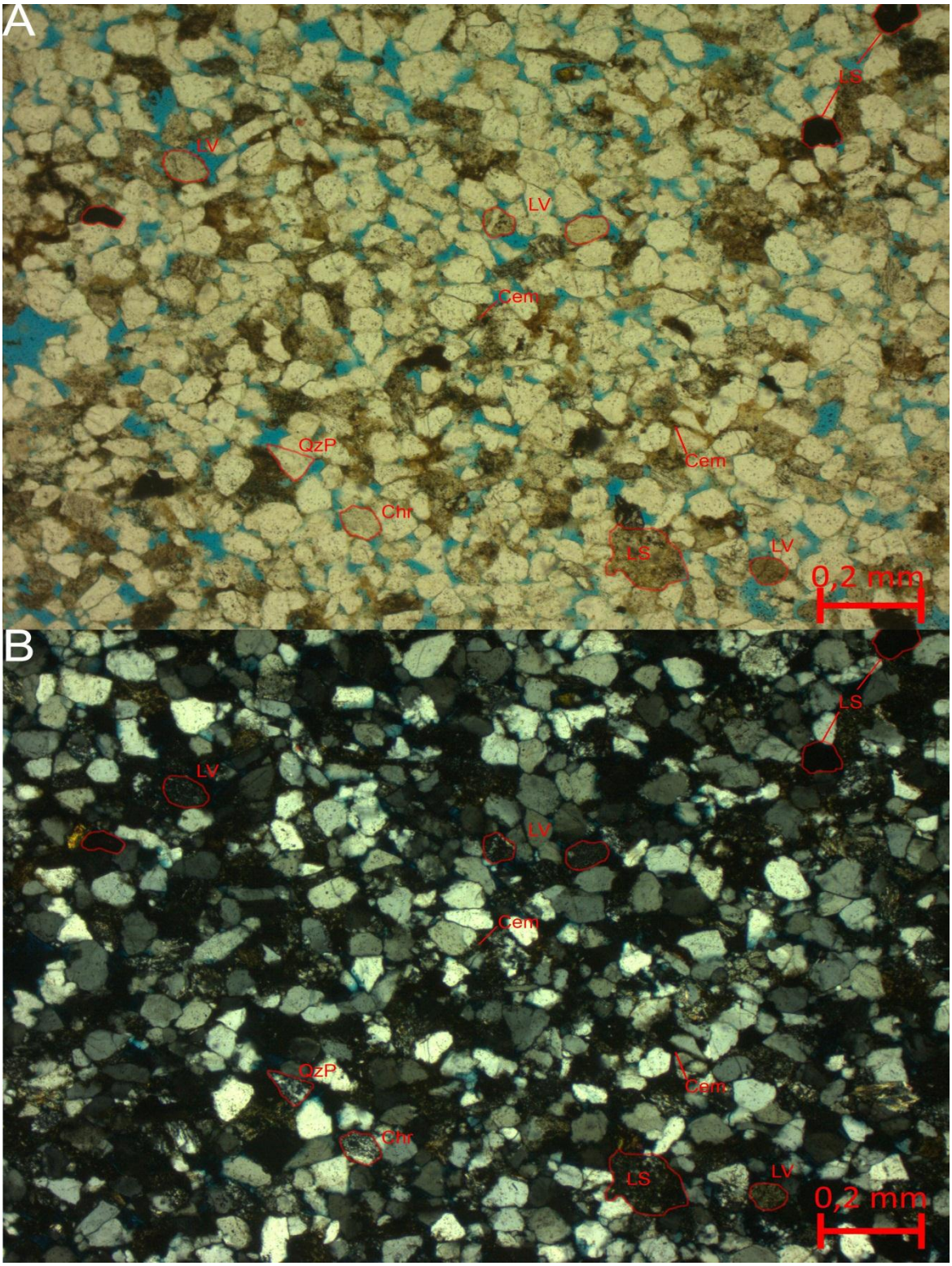

Figure 7. Sample TPH 1-4 with parallel (a) and crossed (b) nicols. Qz = Quartz; QzP = Polycrystalline Quartz; Fd = Feldspar; Lv = Volcanic Lithic Ls = Sedimentary Lithic; Lm = Metamorphic Lithic; Chrt = Chert; Ms = Muscovite; Hc = Hydrocarbon; Cal = Calcite; Cem = Cement.

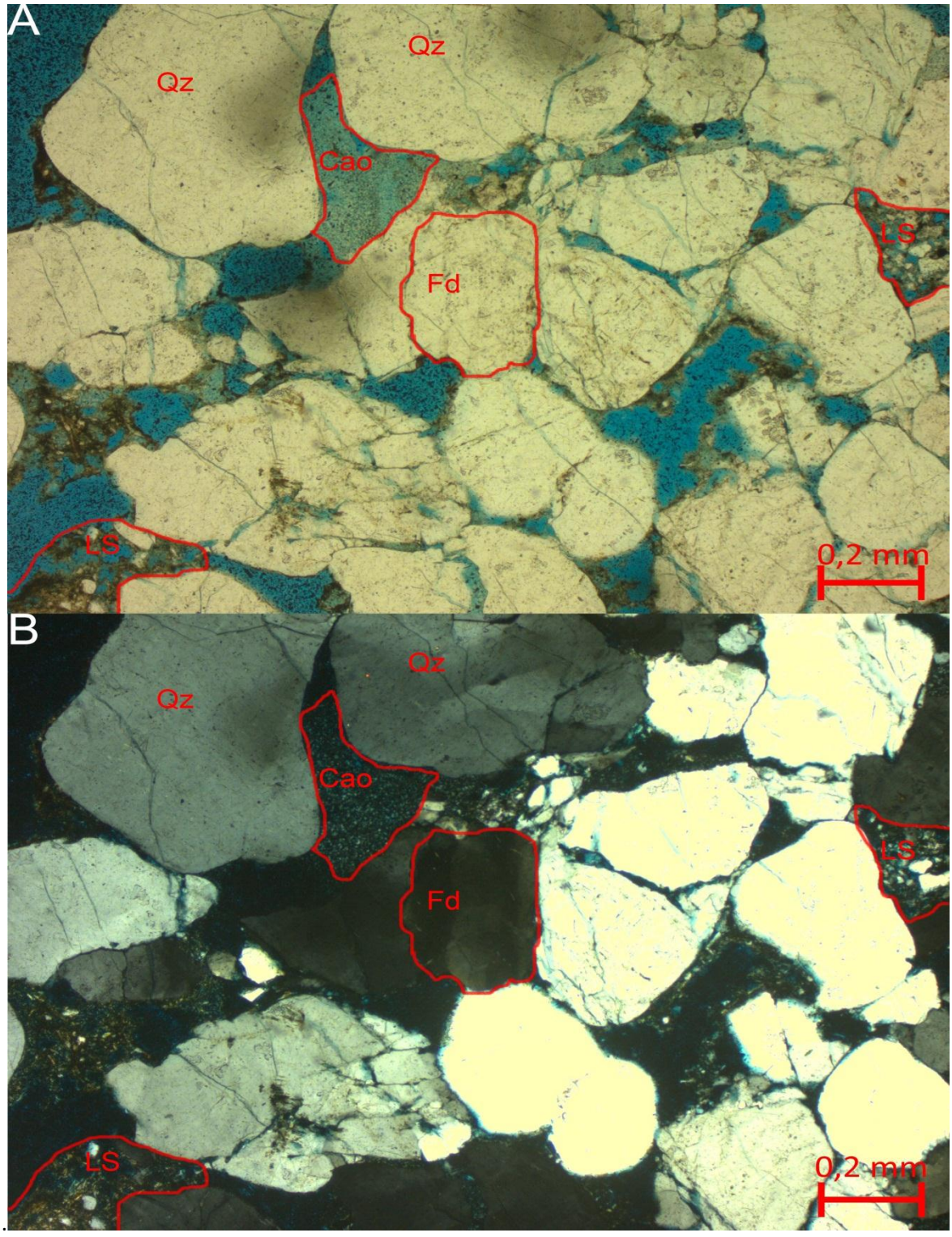

Figure 8. Sample TPH 1-6 with parallel (a) and crossed (b) nicols. Rounded clasts with concave point contacts and high secondary porosity is observed. Cao = Caolinite; Qz = Quartz; Fd = Feldspar; Ls = Sedimentary Lithic.

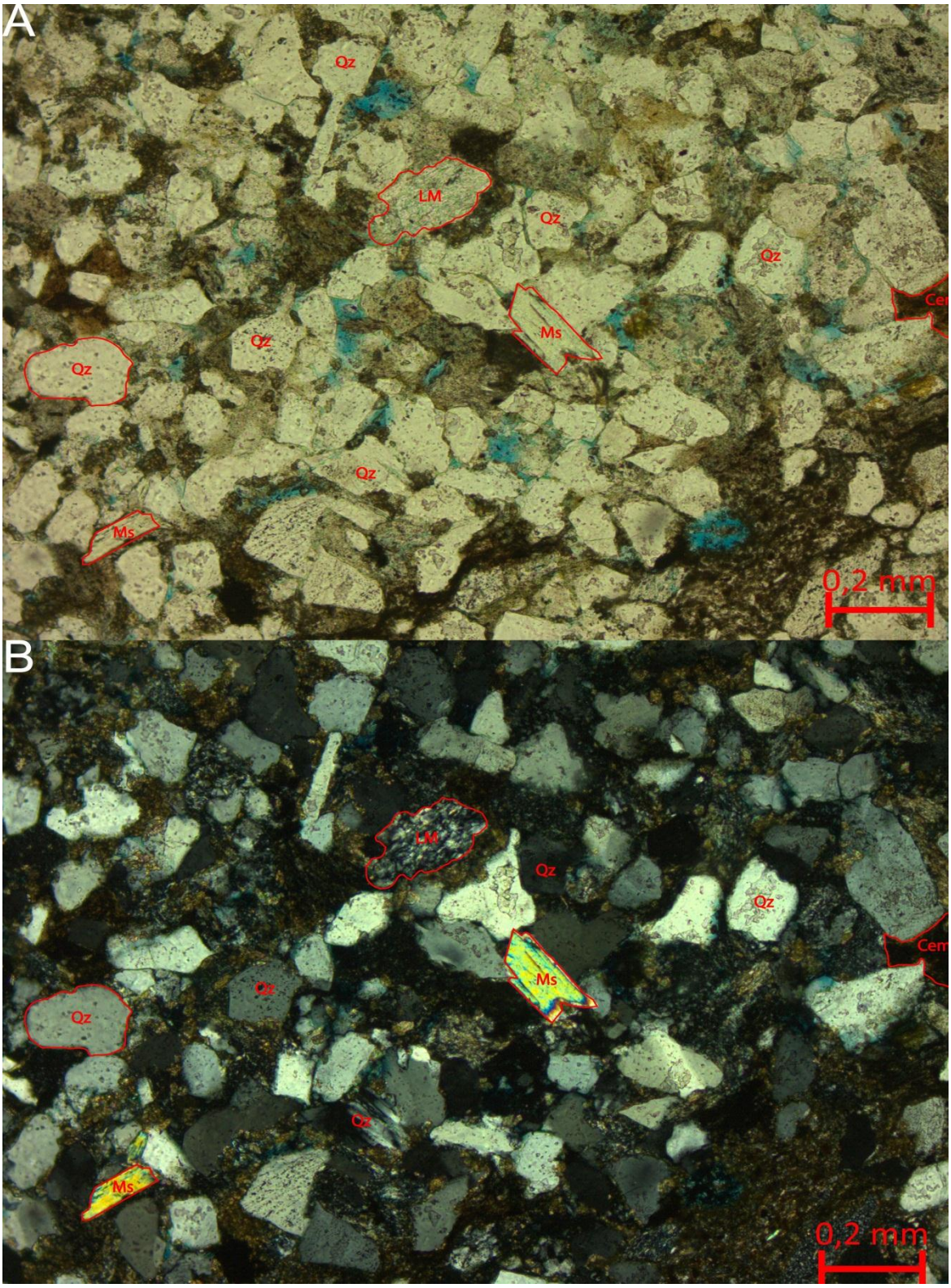

Figure 9. Sample TPH 1-7 with parallel (a) and crossed (b) nicols. High presence of mainly calcareous cements, clasts with medium sphericity and sub-angular shape. Undeformed muscovite appears (Ms). Qz = Quartz; Lm = Metamorphic Lithic.

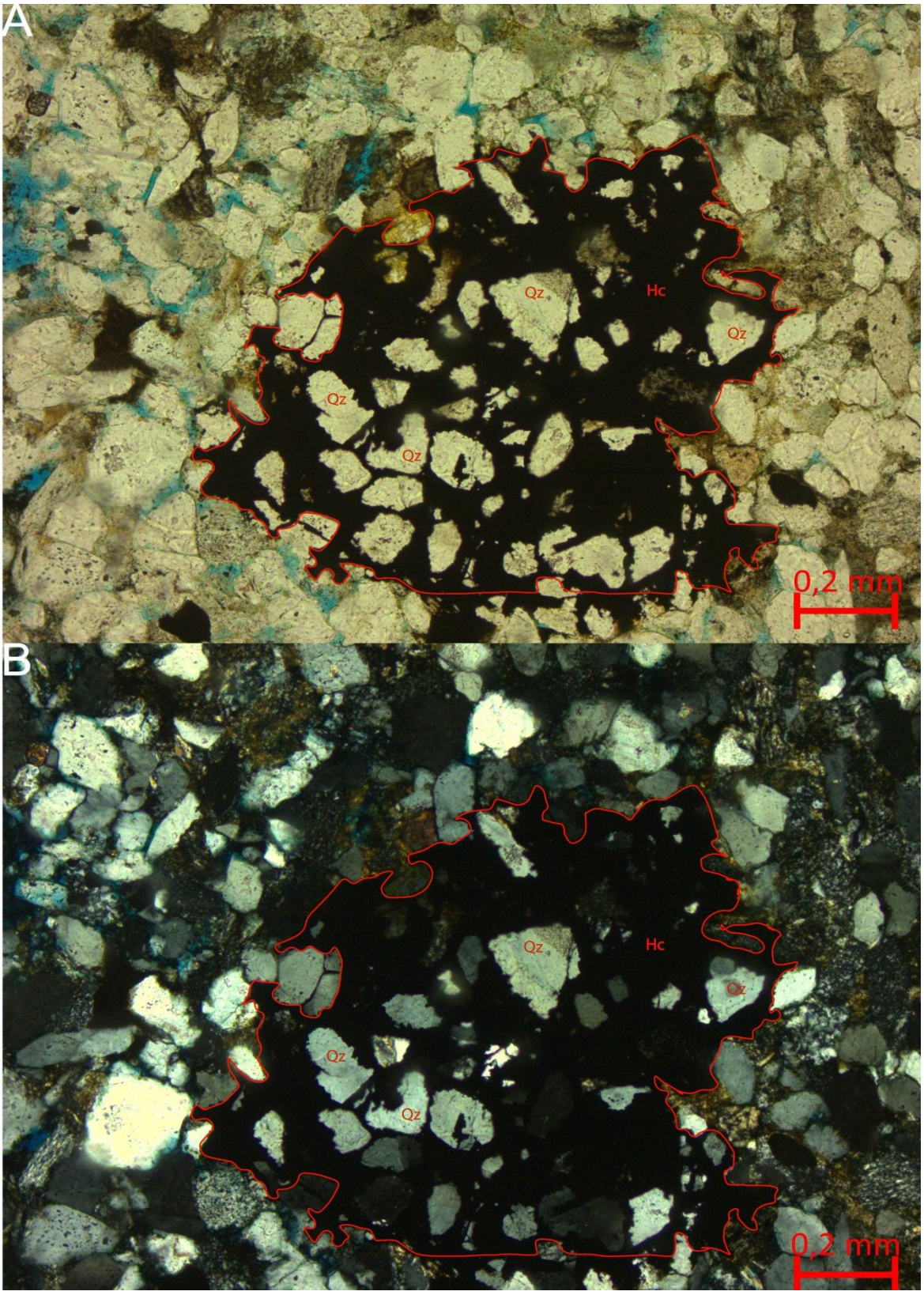

Figure 10. Sample TPH 1-7 with parallel (a) and crossed (b) nicols. A high presence of organic matter-hydrocarbons (Hc) is observed.

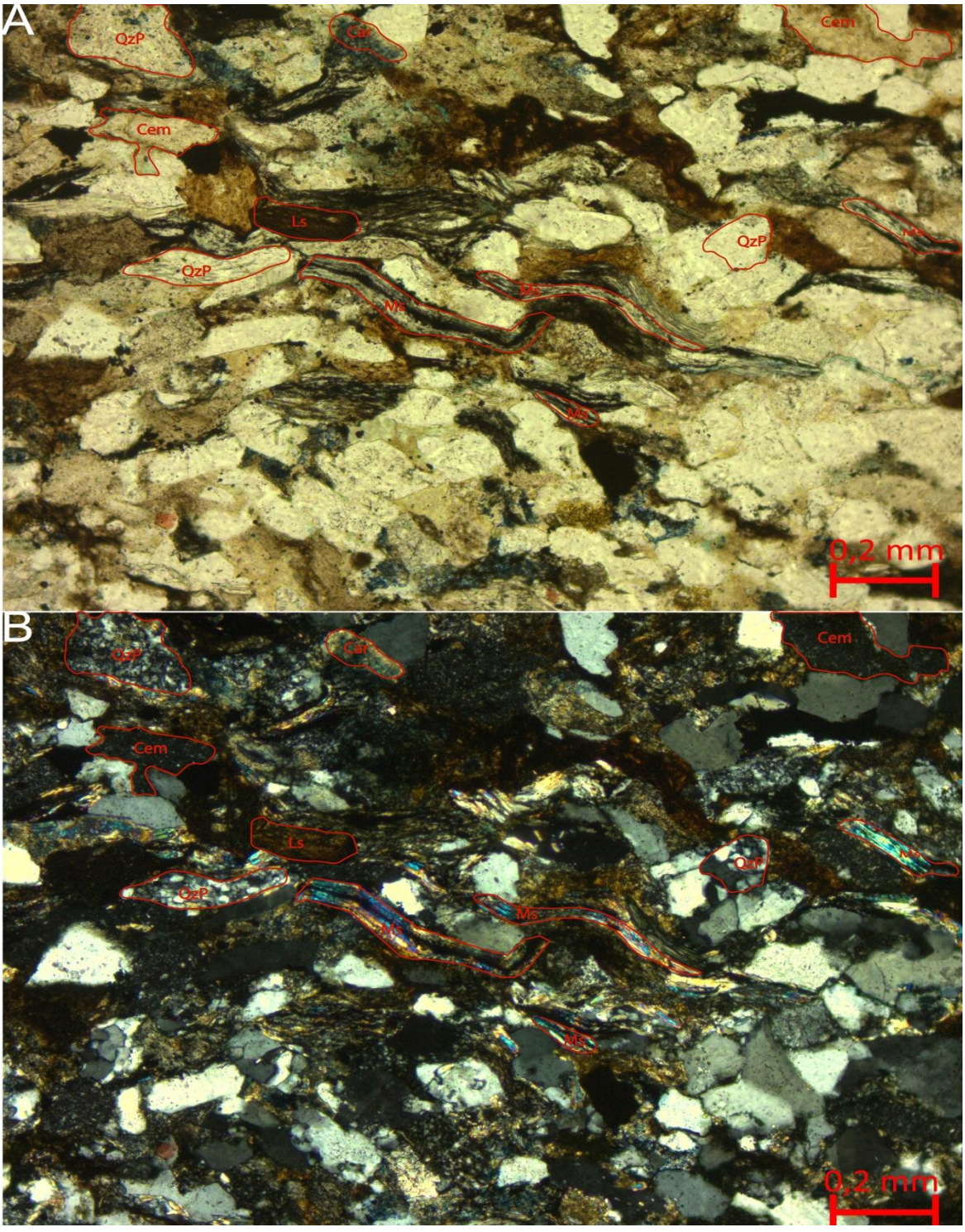

Figure 11. Sample TPH 1-8 with parallel (a) and crossed (b) nicols. Some grain orientation is observed in minerals, mainly in deformed muscovite (Ms). Qz = Quartz; QzP = Polycrystalline Quartz; Fd = Feldspar; Ls = Sedimentary Lithic; Cem = Cement.

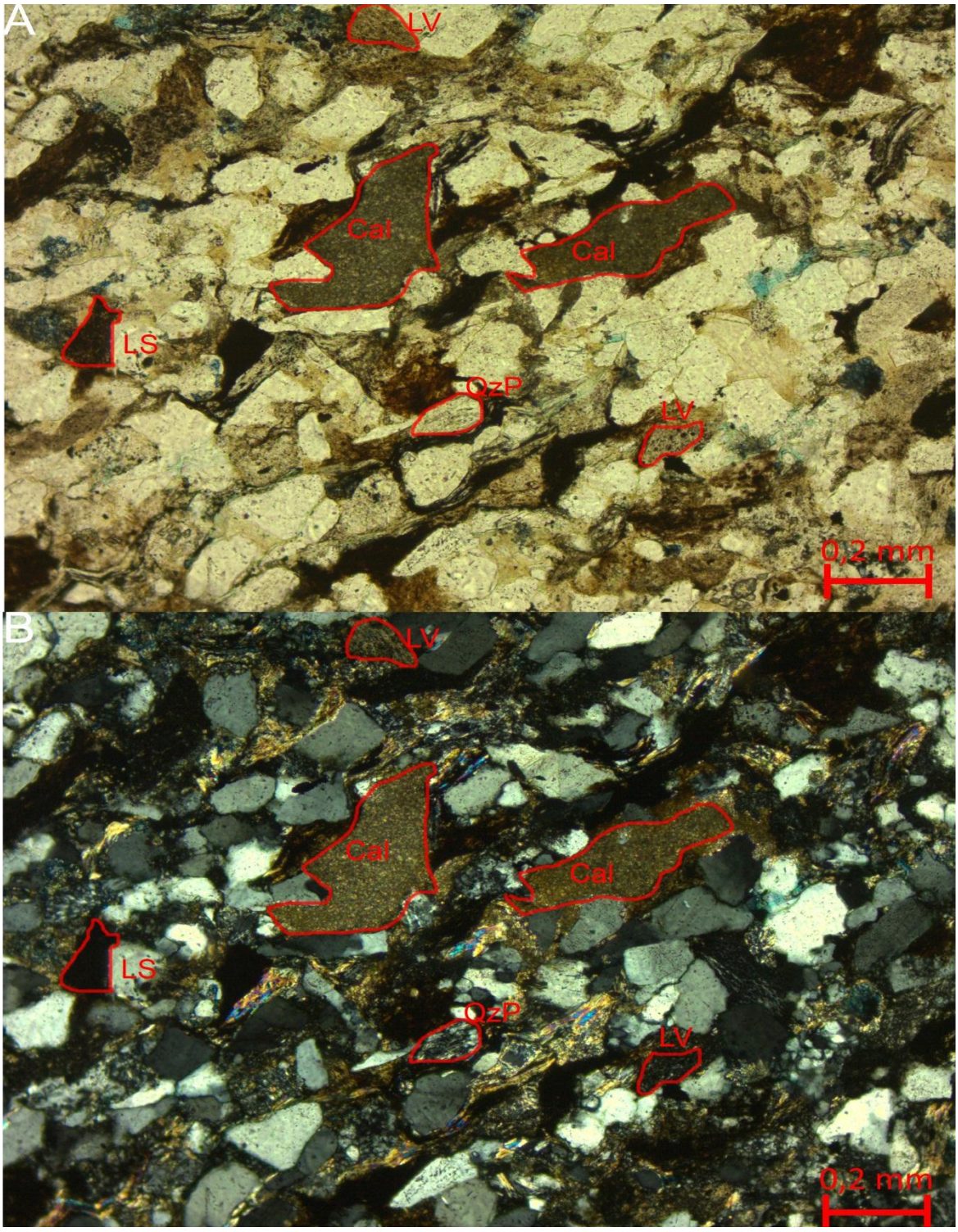

Figure 12. Sample TPH 1-9 with parallel (a) and crossed (b) nicols. The clasts are well selected, deformation of the muscovite and concave contacts are observed. Qz = Quartz; Lv = Volcanic Lithic; Ls = Sedimentary Lithic; Cal = Calcite.

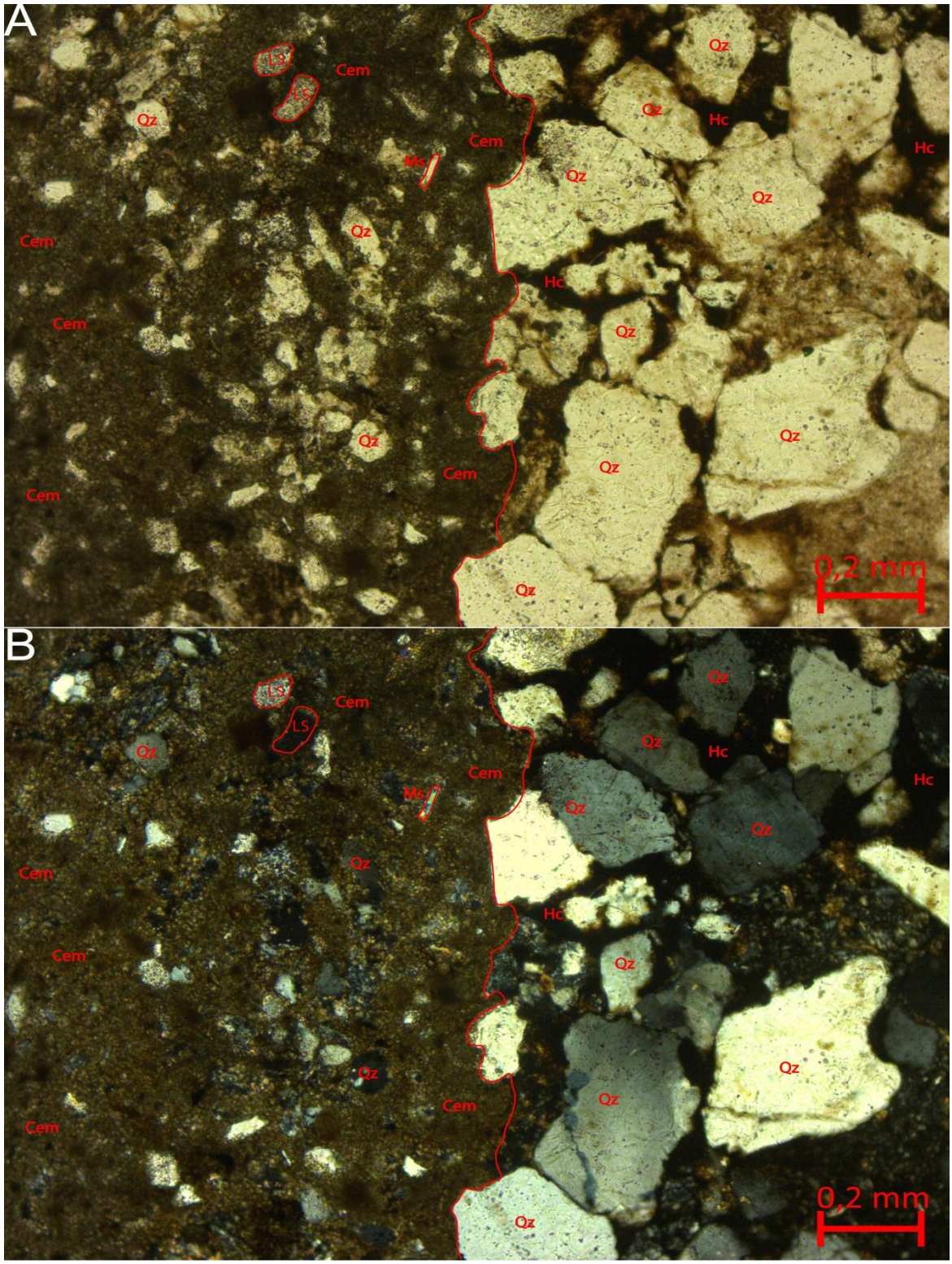

Figure 13. Sample TPH 1-10 with parallel (a) and crossed (b) nicols. sample with poorly selected clasts and calcareous cement. Qz = Quartz; Ls = Sedimentary Lithic; Hc = Hydrocarbon; Cem = Cement.

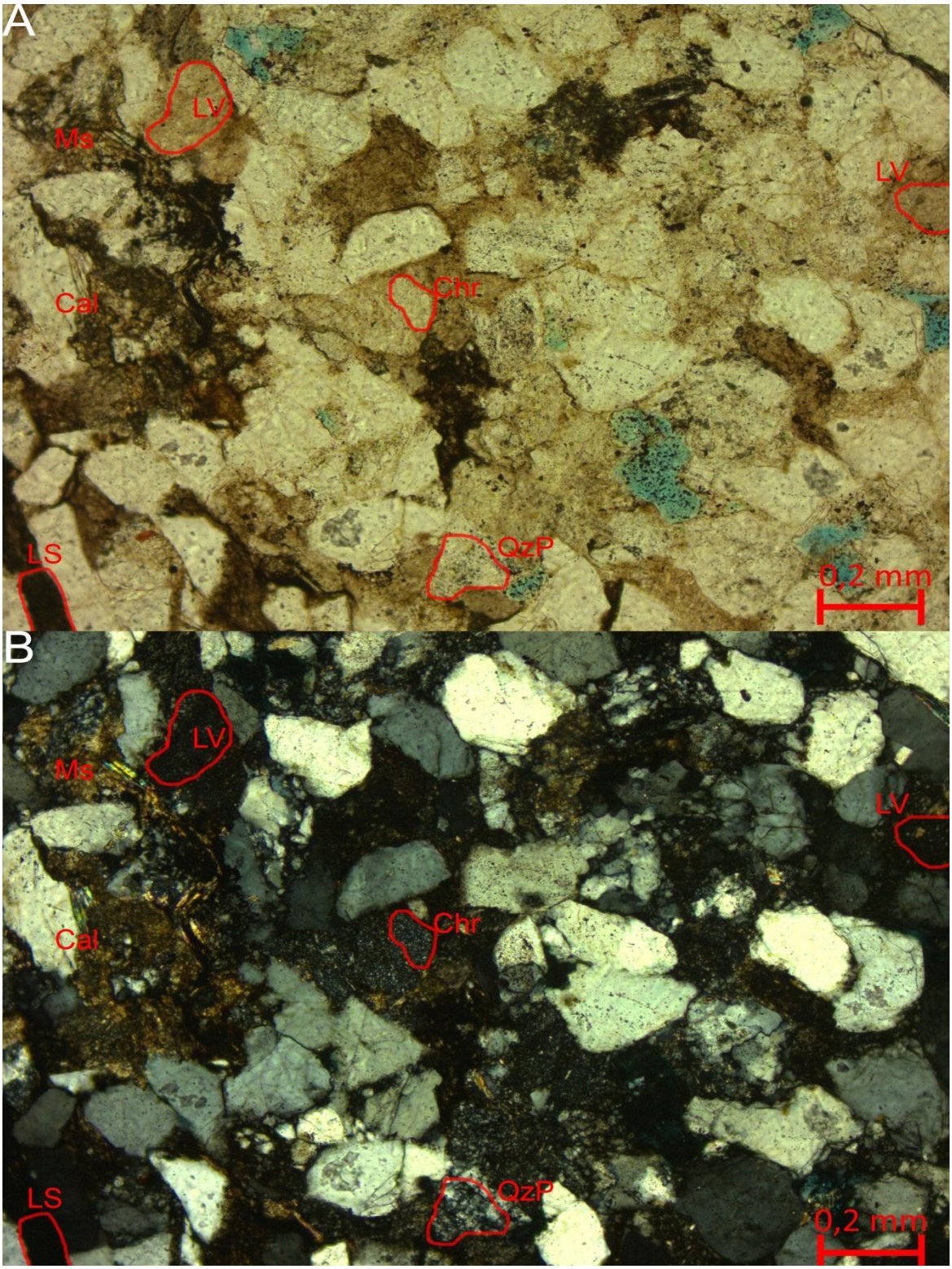

Figure 14. Sample TPH 1-13 with parallel (a) and crossed (b) nicols. A high presence of cement is observed, muscovite (Ms) appears, the clasts are sub-angular and the sphericity is medium-high. Chr = chert, QzP = polycrystalline quartz; Lv = Volcanic Lithic; Ls = Sedimentary Lithic; Cal = Calcite.

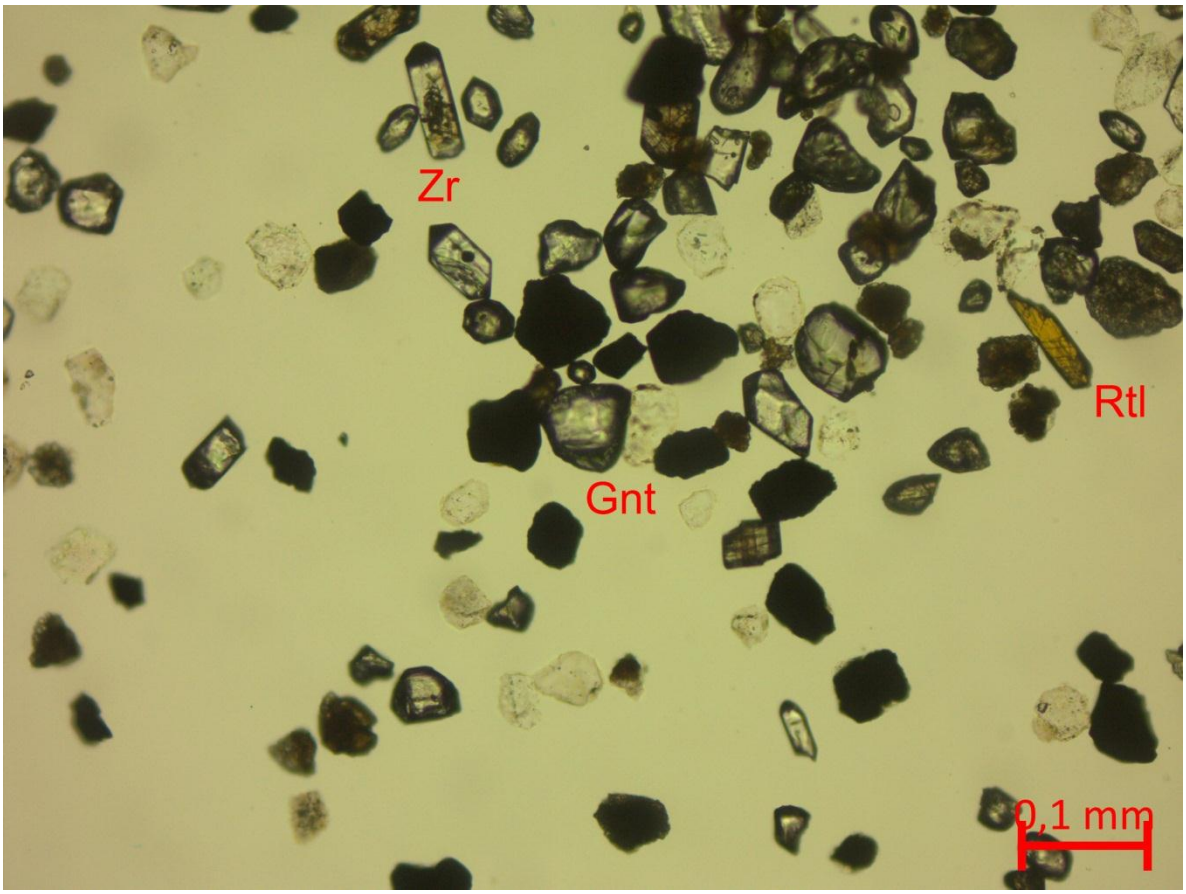

Figure 15. Sample TPH 1-5. Zircon (Zr), rutile (Rtl) and garnet (Gnt) are observed. Some zircons retain some of their original shape but are generally rounded.

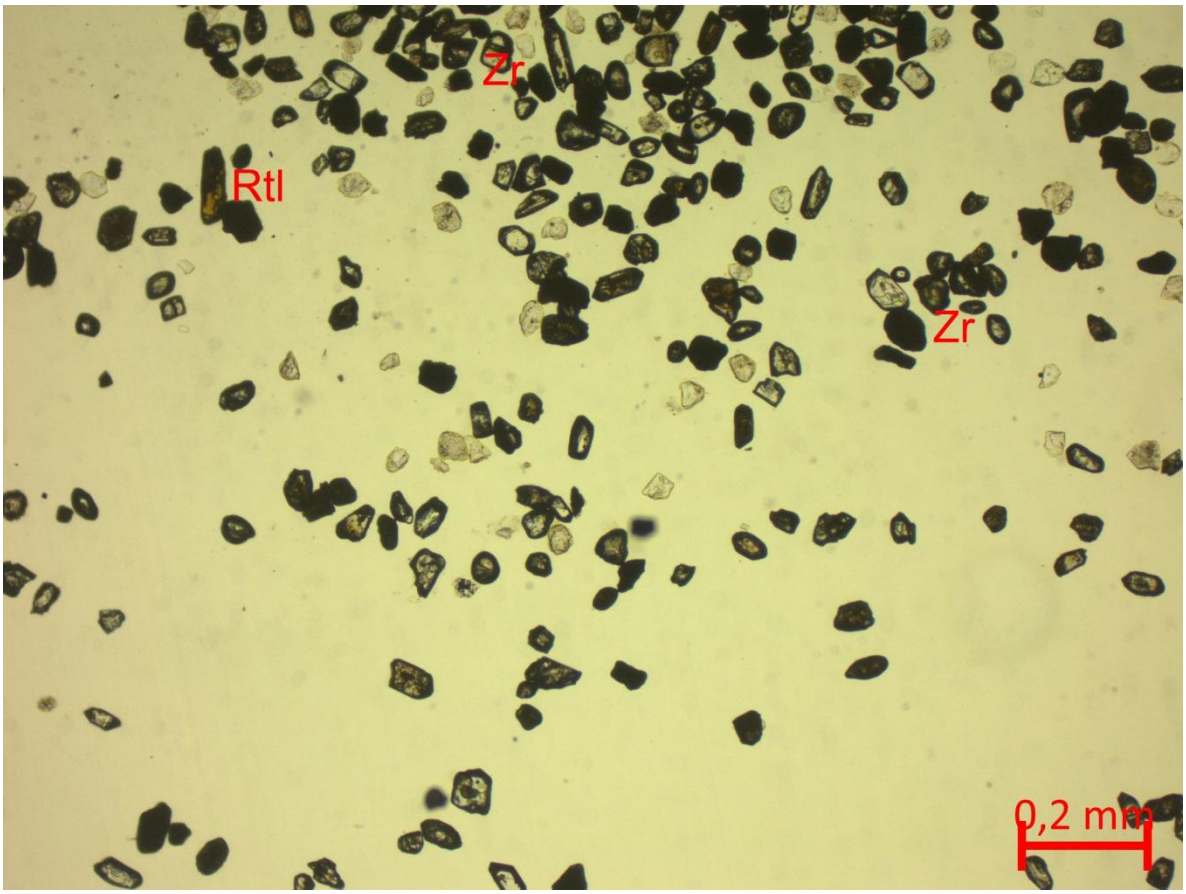

Figure 16. Sample TPH 1-4. Rutile (Rtl) and zircon (Zr) are observed; the zircons retain their shape better compared to the TPH 1-5 sample.

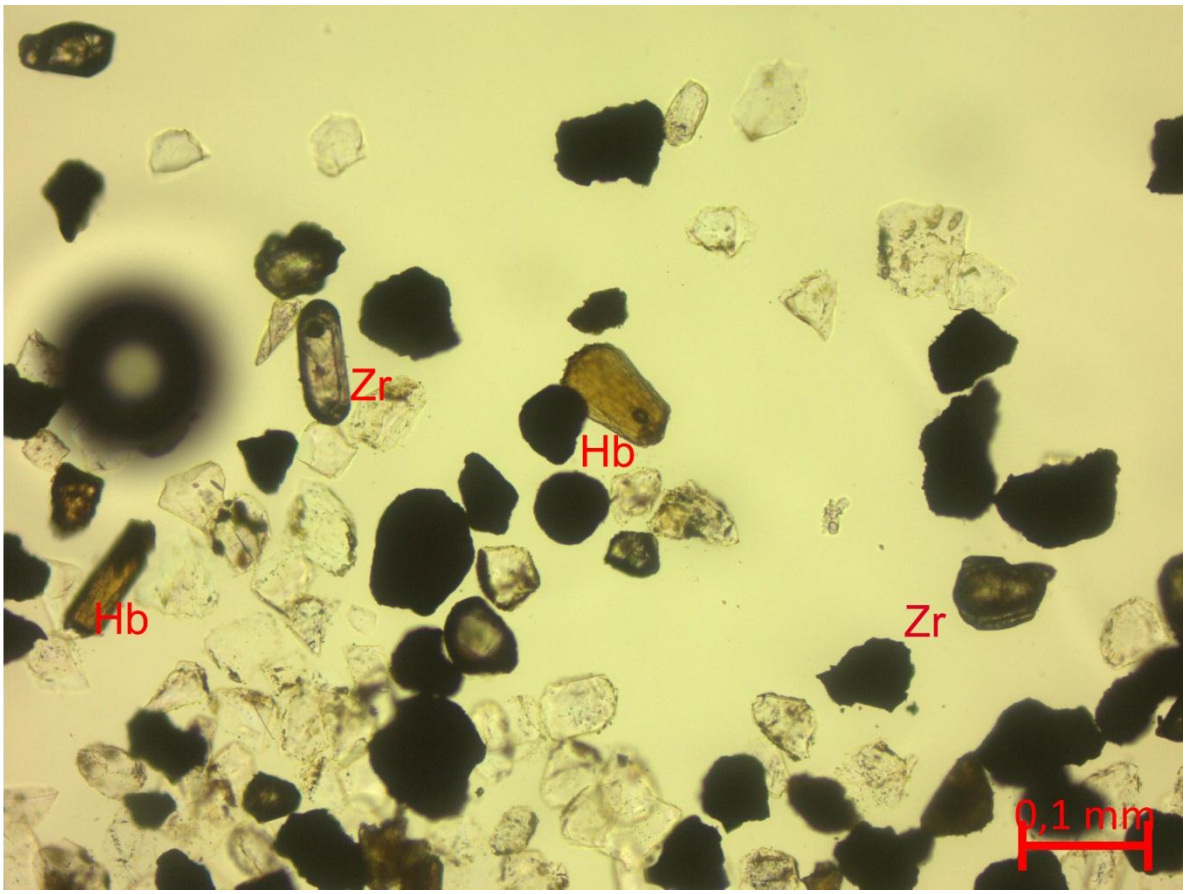

Figure 17. Sample TPH 1-3. Sample with hornblende (Hb). And Zircon (Zr).

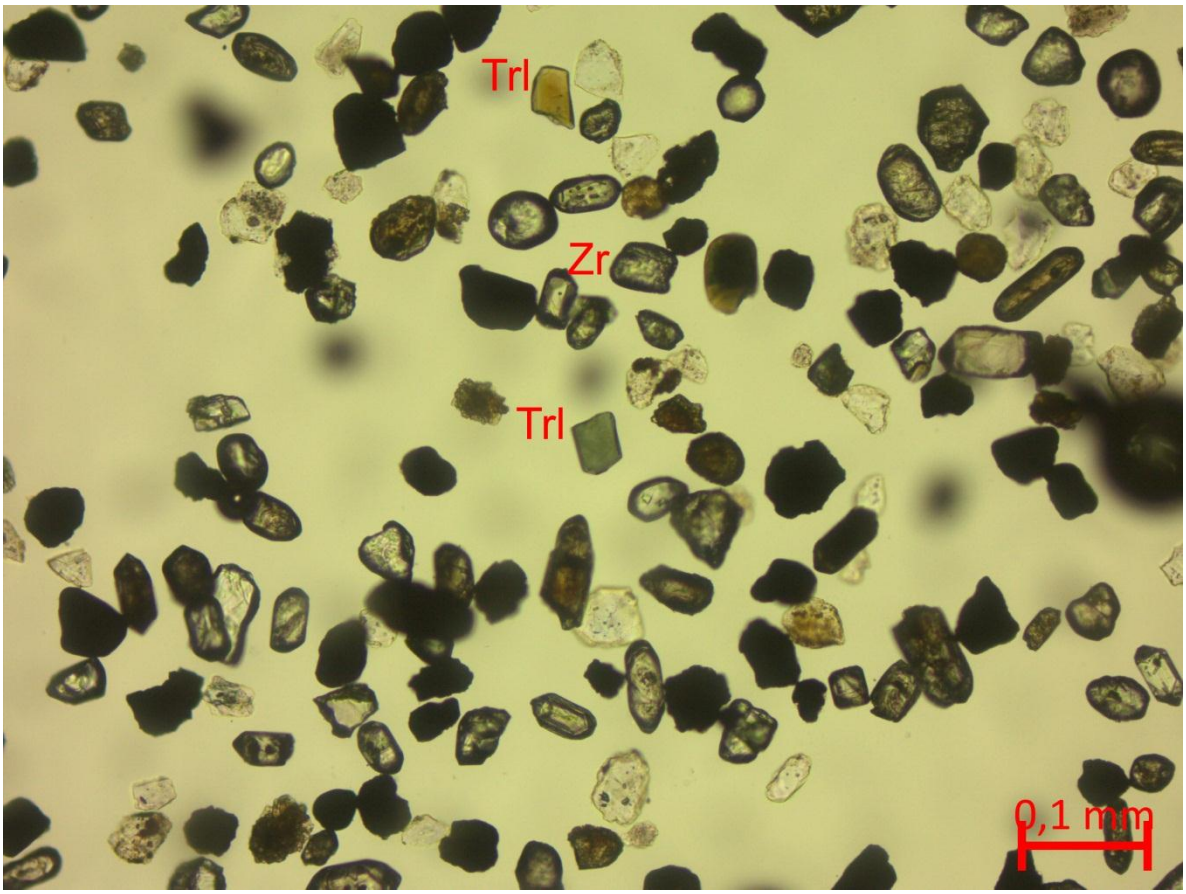

Figure 18. Sample TPH 1-7. Zircons (Zr) and tourmaline (Trl) are observed, tourmaline appears in green and brown tones, zircons in general are rounded at the edges and are colorless or with yellowish-brown tones.

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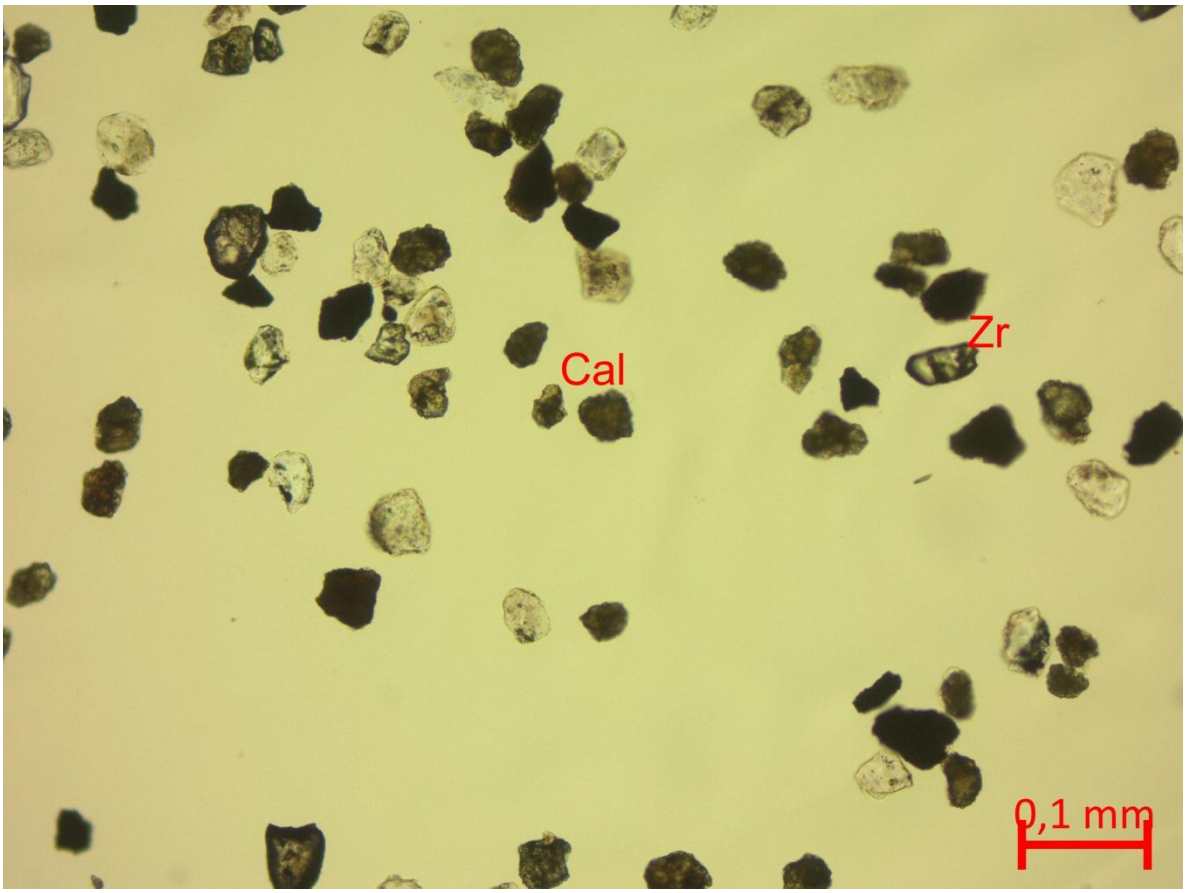

Figure 19. Sample TPH 1-9. Sample with high presence of carbonates (Cal) and Zircon (Zr).

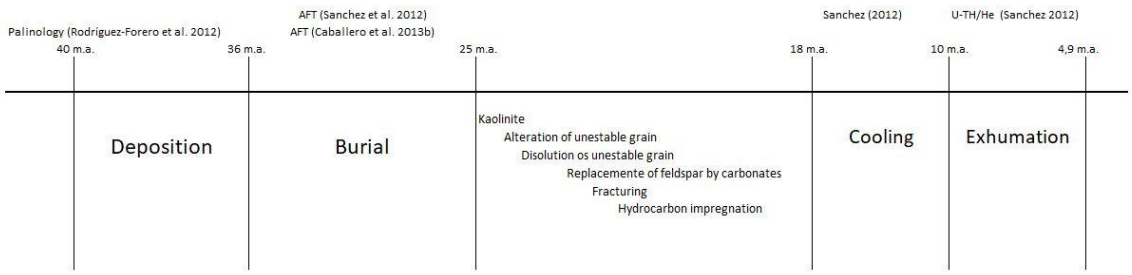

Figure 20. Proposed paragenetic sequence for the analyzed sandstones.