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True metamorphic isograds or tectonically sliced metamorphic sequence? New high-spatial resolution petrological data for the New Caledonia case-study

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The metamorphic belt of northern New Caledonia represents the best-exposed example of fossil Pacific-type subduction zone and a worldwide reference for High-Pressure (HP) metamorphism and metamorphic mineral isograds, marked by a gradual evolution from very low-grade lawsonite-bearing to high-grade epidote-bearing eclogite assemblages.
Despite general agreement on the progressive increase of metamorphism, open debates hinges on the tectonic meaning of such mineral isograds, either interpreted as fossilized continuous metamorphic gradients or as major tectonic discontinuities.
We present a new and extensive metamorphic dataset acquired by means of Raman Spectroscopy of Carbonaceous Material (RSCM) and pseudosection modeling. Our dataset indicates the occurrence of two tectonometamorphic domains characterized by distinct patterns and significantly modifies the past tectonic interpretation of the HP terranes. The first domain, rich in metasediments, shows a continuous metamorphic gradient starting at $\sim$300 °C and $\sim$0.8 GPa and reaching the blueschist-eclogite transition at 500-520 °C and $\sim$1.8 GPa, and is only locally cut by minor tectonic breaks. The second one, rich in metaophiolites, shows a rather constant metamorphism at 520-550 °C and $\sim$2.4 GPa. The two terranes are separated by a conspicuous pressure gap (0.6 GPa, or $\sim$20 km), but no temperature gap exists.
We therefore interpret the metamorphic mineral isograds in the blueschist, metasediment-rich unit as a continuous prograde metamorphic gradient corresponding to $\sim$35 km of accreted material (in a cold subduction zone favoring lawsonite stability) later affected by a factor of two decompressional thinning. Only the epidote isograd, which localised strain as a result of fluid release during decompression, reflects regional reequilibrations.
Importantly, no significant tectonic break affects the regional distribution of the classical mineral isograds, and the most significant metamorphic break is best depicted by a lithological contrast (metasediment-rich vs. metaophiolite-rich domains). Comparable patterns are observed in Tethyan-type orogens like the Western Alps or Corsica. This contribution provides useful insights on the mechanisms of exhumation and stacking of HP terrains and mountain building of both Pacific and Tethyan orogenic belts.