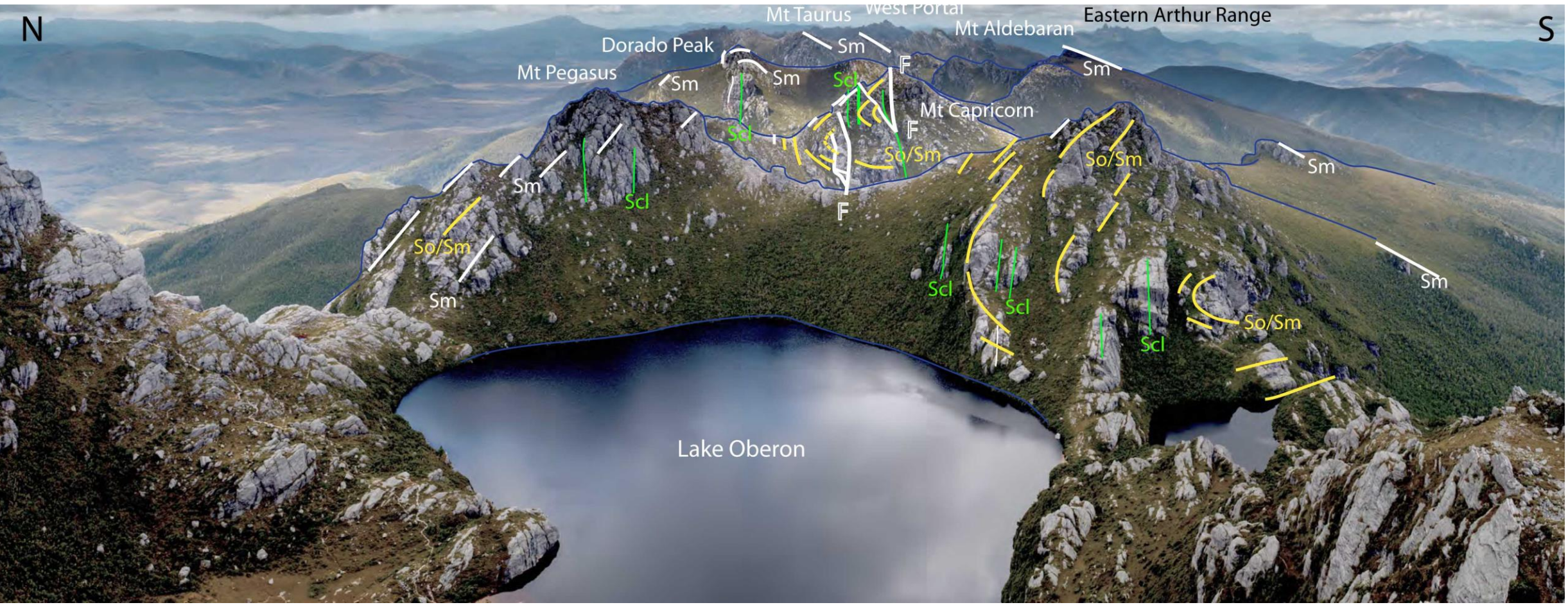


Cambrian Recumbent macro-folds and Devonian thrusts, The Arthur Ranges, Southwest Tasmania

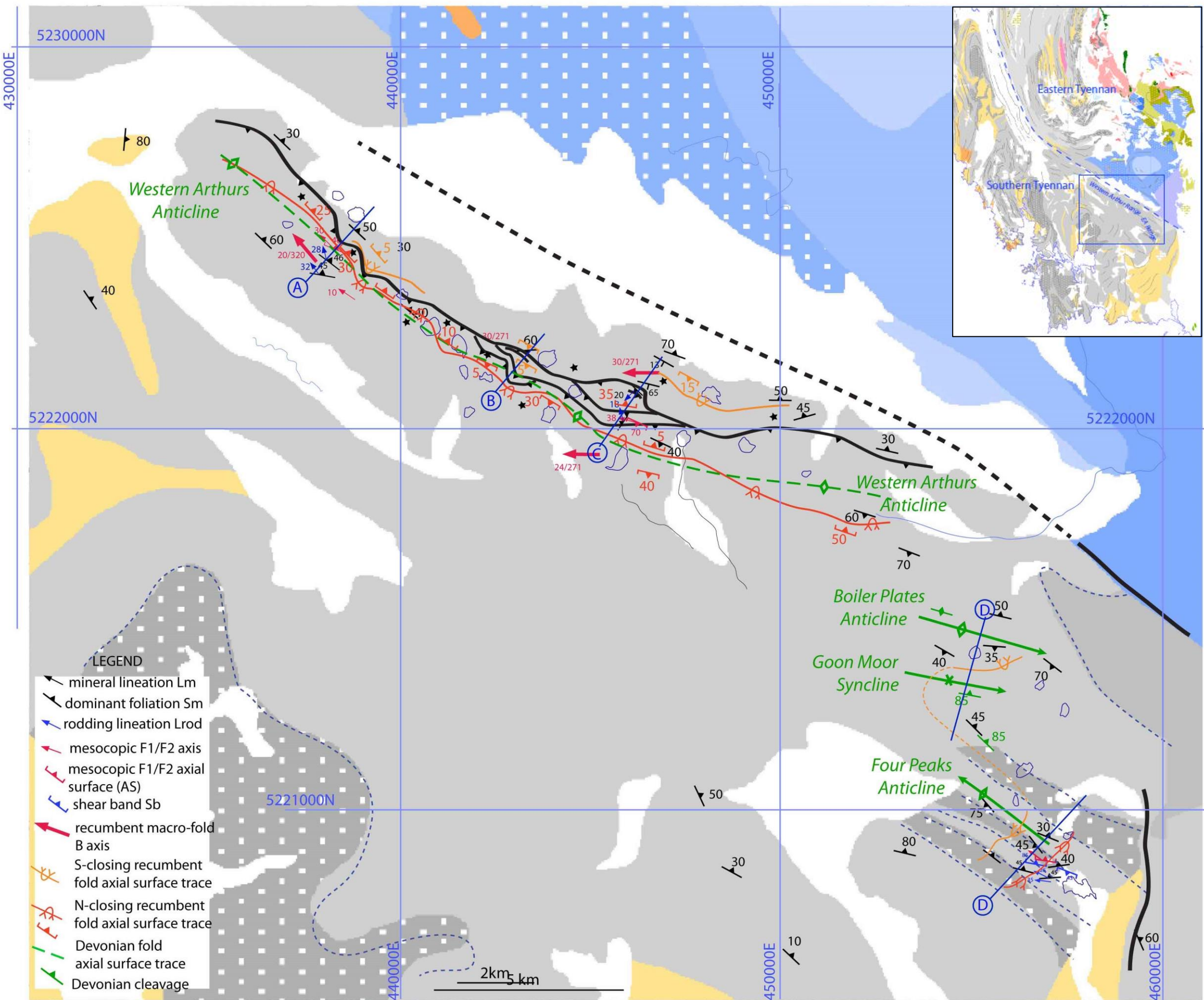
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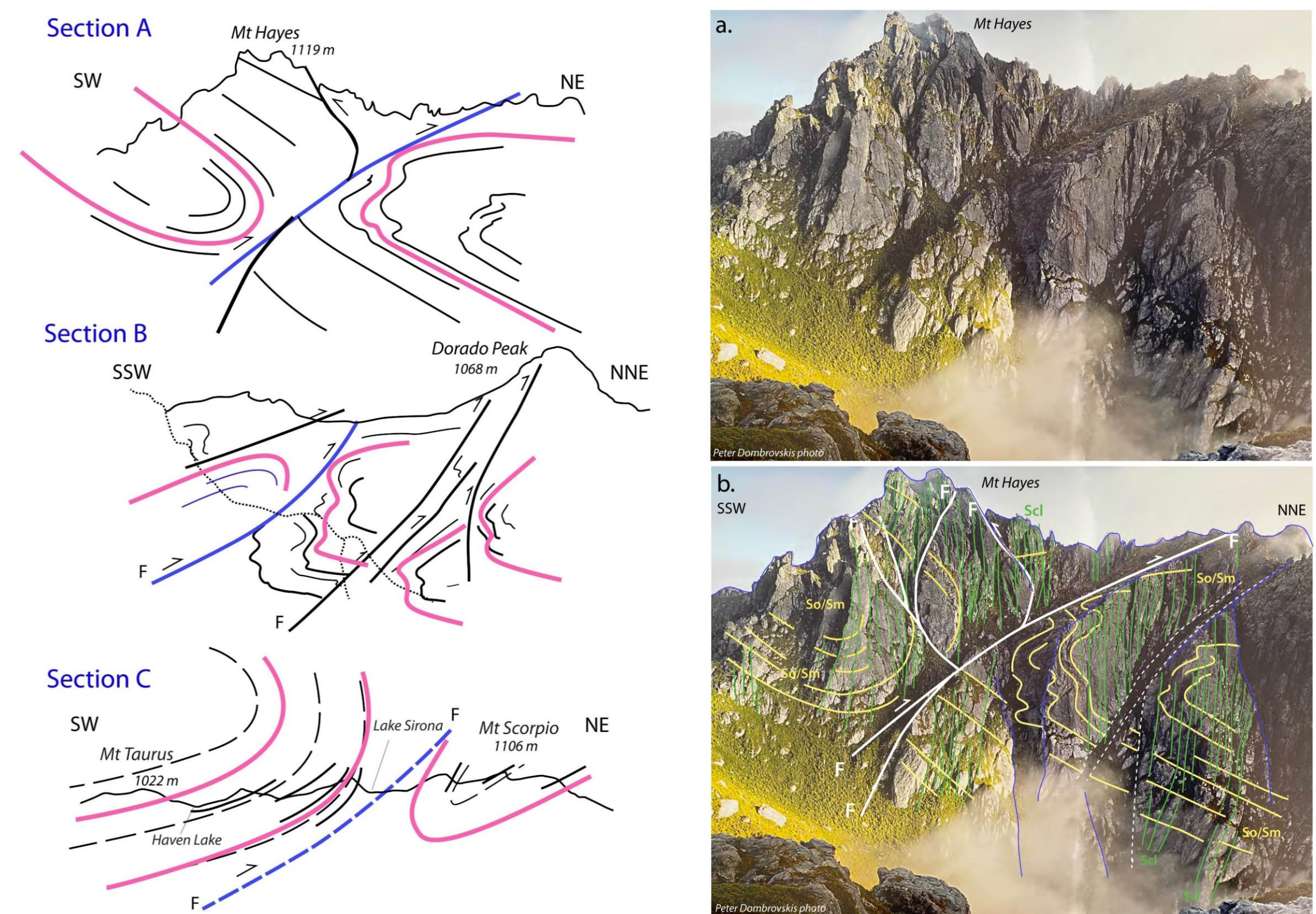
Form line interpretation from Mt Sirius at 1151m of the ragged and jagged peaks of the Western Arthur Range sculptured by glacial action with numerous glacial cirque lakes. (photo credit: David Noble).

The Arthur Ranges lie in the northeast corner of the Southern Tyennan domain. They consist of a Proterozoic low-grade quartzite-pelite sequence dominated by a series of Cambrian regional-scale, recumbent-isoclinal folds. The northeast flank of the Arthur Ranges is defined by a Devonian reverse fault system that truncates and offsets these Cambrian recumbent folds. The faults are associated with a sub-parallel series of open, upright northwest-trending Devonian folds that swing to a more east-west trend towards the eastern end of the Western Arthur Range. Spacing of the Devonian axial surface traces is on the order of ~1.5km. This younger folding refolds the older Cambrian large-scale recumbent folds that are also northwest-trending.

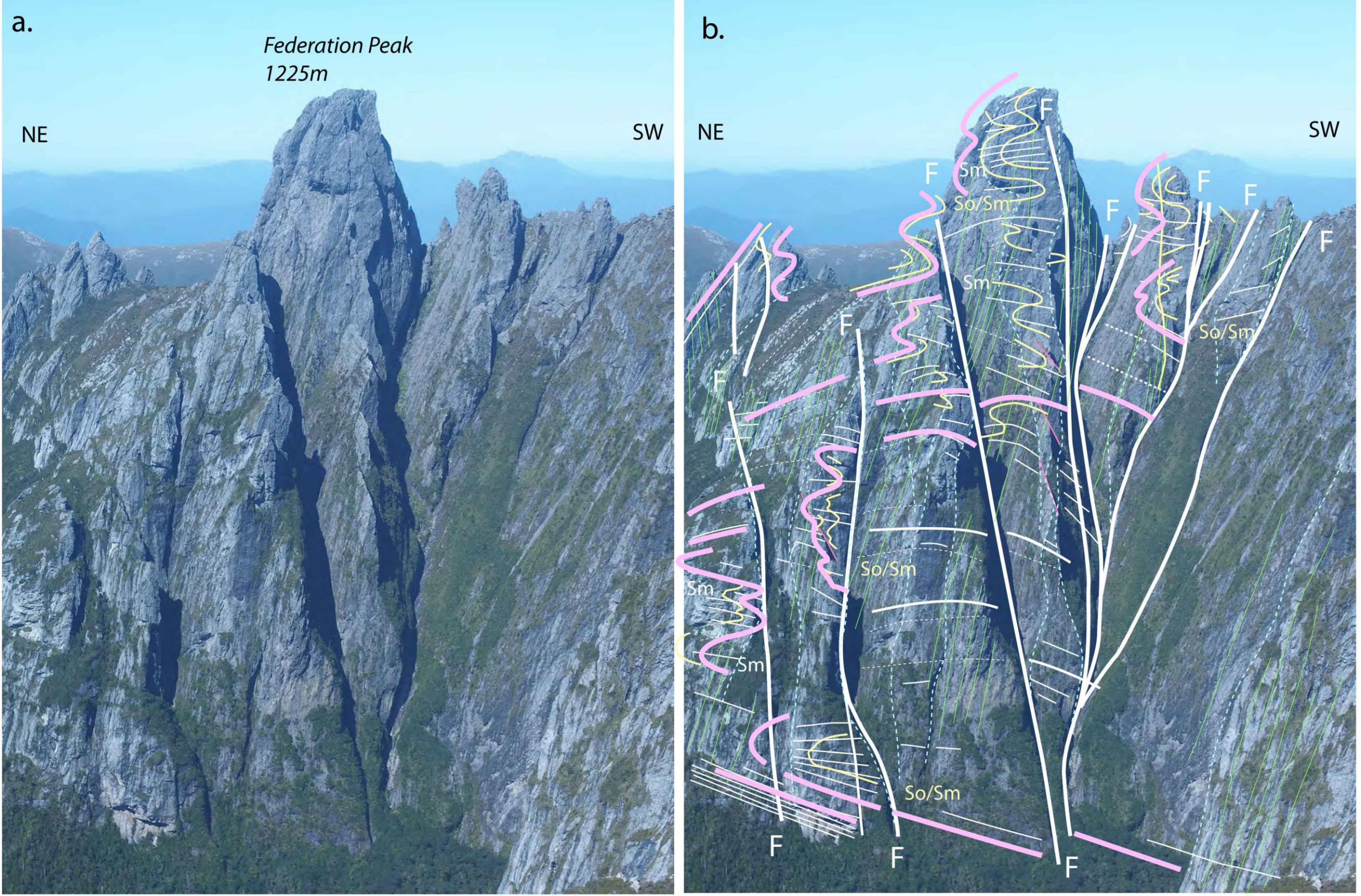


Structural map of the Arthur Ranges. (light grey: un-differentiated low-grade Proterozoic quartzite sequence; dark grey: undifferentiated Proterozoic sequence; dark grey with white stipple: pelite or schistose quartzite)

The spine of the Western Arthur Range consists of a major northeast-closing recumbent macro-fold that extends the length of the range (~21km) and is folded by the younger open Western Arthur Anticline. An oppositely, southwest-closing recumbent fold sits in the footwall to the Devonian reverse fault system, but to current knowledge this is only preserved at Mt Hayes, Dorado Peak and Mt Scorpio along the north flank of the range.

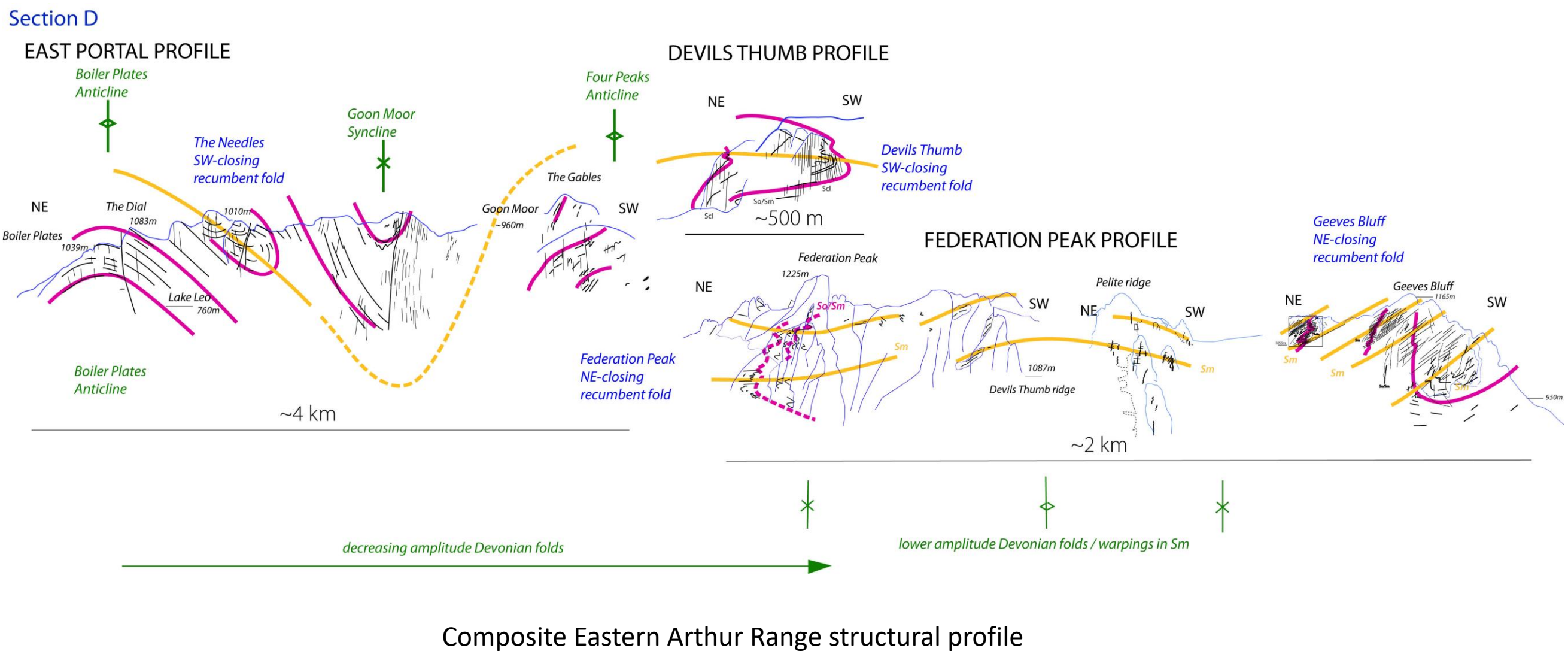


(Left) Structural profiles along the northeast margin of the Western Arthur Range showing the northeast closing recumbent isoclinal fold in fault-juxtaposition with a major southwest-closing recumbent isoclinal fold in the footwall. Heavy pink lines highlight recumbent fold closures in bedding foliation So/Sm. Heavy blue lines highlight the major thrust fault that separates the northeast- and southwest closing recumbent fold hinges. Thin black lines are bedding foliation (So/Sm) traces and heavy black lines are faults (F). (Right) Structural Interpretation in the Mt Hayes area (photo credit: Peter Dombrovskis)



Federation Peak structural interpretation.

The Eastern Arthur Range consists of a fold-pair of regional-scale, Cambrian recumbent-isoclinal macro-folds, with a structurally higher southwest-closing closure overlying a structurally lower northeast-closing closure. Hinge zones of these folds can be seen at "The Needles" and Devils Thumb (southwest-closing hinge zones) and at Geeves Bluff and Federation Peak (northeast-closing hinge zones).



Composite Eastern Arthur Range structural profile

Lithofacies of the Arthur Ranges include quartzite (both thick and thin bedded), banded quartzite-pelite (interlayered quartzite, quartz schist and schist) and pelite (carbonaceous schist/phylite). These lithologies dictate the geometry and character of the early recumbent isoclinal folding. Most of the structural profiles show 1) a thin-bedded, chevron folded quartzite in the macro-fold core (exposed on the eastern flanks of the range), and 2) more thick-bedded quartzites within the north-closing macro-fold hinge (exposed in the central to northern part of the range). Chevron folding is dominant in thinner-bedded quartzites whereas the transposition layering is more associated with the intercalated black carbonaceous siliceous pelite/phylite.



Cliff with chevron-folded thinly bedded quartzite below the Dragon and above Lake Ganymede (photo credit: Grant Dixon).

In the Western Arthur Range cross-bedding was observed in quartzites above Alpha Moraine and on ridgeline south of Lake Cygnus. Both indicate right-way-up, bedding-parallel foliation (So/Sm) on the upper limb of the northeast-closing recumbent fold.

Shear sense indicators in the low-grade metamorphic sheet indicate recumbent macro-fold evolution and internal sheet deformation involves south-southwest-over-north-northeast transport, with shear displacement to the north (003° to 013°) in the Western Arthur Range and to the north-northeast (022° to 026°) in the Eastern Arthur Range. The Devonian fold and thrusting is also south-southwest-over-north-northeast, with transport towards ~025° in the Western Arthurs and towards ~035° in the Eastern Arthurs (assuming transport is approximately orthogonal to fault strike-traces).



For more information:
Structural Geology of the Arthur Ranges, Southern Tyennan Domain, Tasmania. Geological Survey Report 8.
Mineral Resources Tasmania

