Deformation geometries and strain patterns of a refolded sheath-nappe fold: the M. Altissimo-M. Corchia Syncline, Alpi Apuane, Italy

Marco Meccheri (1*), G. Molli (2,3), P. Conti (4), E. Beretta (1), L. Vaselli (4)

(1) Dipartimento di Scienze della Terra, Università di Siena, Via Laterina 8, I-53100 Siena
(2) Dipartimento di Scienze della Terra, Università di Pisa, Via S.Maria 53, I-56126 Pisa
(3) CNR Istituto di Geoscienze e Georisorse,Via G. Moruzzi, I-56124 Pisa
(4) Centro di Geotecnologie, Università di Siena, Via Vetri Vecchi 34, I-52027 San Giovanni Valdarno (Arezzo)

meccheri@unisi.it

Fold interference patterns (Ramsay, 1967, Thiessen & Means, 1980) can provide relevant insight on the large scale shortening history and the kinematic control on deformation in polydeformed regions. However, natural examples and analogue models (e.g. Ramsay, 1967, Watkinson, 1981, Ghosh et al. 1992, Grujic, 1993, Grujic & Mancktelow, 1995, Forbes et al., 2004, Alsop & Holdsworth, 2004) have recognized the importance of the pre-existing planar and linear anisotropies and the earlier fold generations, suggesting caution in using local fold-interference patterns to constrain the regional scale deformation.

In this contribution we present a case study from the central Alpi Apuane (M. Altissimo-M. Corchia Syncline), Italy, where a complex interference pattern developed at intermediate crustal levels (450 to 350 °C, 0.6 to 0,3 GPa) during underthrusting and earliest exhumation stages of the Northern Apennine orogenic building.

The stratigraphic units involved in deformation (phyllites, dolomites and marbles) show evidence of a strong competence contrast resulting in cartographic-scale modified dome and basin interference patterns (Ramsay, 1967, Thiessen, 1986) with cuspate and lobate fold geometries. Throughout the studied area, however, vertical cross-sections show coaxial refolding and type-3 interference patterns, between D1 isoclines with predominantly steep-dipping axial plane foliation and open to tight sub-horizontal D2 folds

The overall deformation geometries detected in the M. Altissimo-M. Corchia region are interpreted as resulting from the superposition of exhumation-related dome-shaped refolding (earliest D2 deformation) on a kilometre-scale culmination in the hinge zone of a composite, recumbent, sheath-shaped D1 megasyncline, with fold-axes rotated parallel to the trend of regional extension lineation (L1), the whole setting being further vertically shortened during D2 development.

D1 finite strain is strongly constrictional (X/Z ratios up to 8:1 with K value higher than 3) in the rotated culmination, whereas it is oblate to near plane far from this domain (Kligfield et al., 1981, and our new data). The pre-existing D1 deformation features appear to be the main factors controlling the geometries of D2 folding and the variabilities of the D2 strain patterns and fold interference observed.

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