Geophysical Research Abstracts, Vol. 7, 00609, 2005
SRef-ID: 1607-7962/gra/EGU05-A-00609

New thermomecanic relationships between lower and upper crust during doming: example from the southern edge of the Velay dome (Cévennes, French Massif Central).

P. Bouilhol (1), A.F. Leyreloup (1), C. Delor (2)

(1) Laboratoire Dynamique de la Lithosphère, Université Montpellier 2, France, (2) B.R.G.M., Orléans, France (bouilhol@dstu.univ-montp2.fr)

The Velay dome, huge anatectic core complex of approximately 100 km diameter emplaced during the Hercynian period, in the inner zone of the Variscan belt (e.g. Ledru, 2001). This core complex is well known from petrological (Montel et al., 1992) and structural (Lagarde et al., 1993) point of view, especially on its northern edge where a northward normal detachment fault (i.e. the Pilat fault: Malavieille et al., 1990) has been described. On the contrary its southern edge is less known. In this zone, the vertical ascension of the anatectic dome, has been stopped by the L.A.G. (thrusted Variscan suture) leading to its overturn to the south onto the Cévennes's schist country rocks units (Burg and Vanderhaeghe 1993).

We performed petrological, structural, and thermochronological analyses focused on the Mylonitic Metamorphic Vellave Zone (M.M.V.Z.), a new Variscan object which figures out this overturn. The MMVZ consists on a 700 m thick mylonite running EW, wrapping the southern edge of the dome on at least 25 km long with a south plunging foliation, and results in the juxtaposition of Cévennes's greenschist facies rocks against the anatectic dome. The characterisation of phenomena leading to the formation of the MMVZ will give us new key in understanding dome dynamics, and its relationships with the embedding rocks.

The HT/LP regional metamorphism created by the dome emplacement (vellave event) is entirely located in the MMVZ. At the roof, quartz, muscovite, andalousite, cordierite

and biotite in metapelites define the Zand-crd-bi isometamorphic zone, whereas the wall is characterised by sillimanite and biotite (i.e. Zsil-bi).

Mineral lineations in the Zsil-bi is always perpendicular to the dome edge, and within the strong mylonitic (sometimes blastomylonitic) foliation there is few shear sense criteria, which always indicate a top to the south normal sense of shear. Quartz texture shows high temperature deformation and the crystallographic preference orientation (obtained with E.B.S.D. apparatus) reveals perfect prismatic <a> patterns, with a single quartz crystal distribution of axes. Those aspects lead to a non negligible pure shear component in the deformation regime dominated by normal southward sense of shear. So, the Zsil-bi reflects the own dynamic of the dome during its uplift.

Above the Zsil-bi, in the Zand-crd-bi, we can distinguish two different structural levels. The South-eastern part shows a deeper structural level where the Zand-crd-bi coalesces with the contact metamorphism aureole of the Rocles granite (320 Ma; Be, submitted). This aureole is contemporaneous of doming and show syn-metamorphic top to the E sense of shear. Post tectonic blastesis has been also observed locally. A greenschist terranes pile occurs in the western higher structural level area between the Borne monzogranite's contact aureole (same mineralogy as the regional metamorphism) and the Zand-crd-bi of the MMVZ. Those terranes, as well as the roof of the MMVZ and Borne's aureole, are characterised by a syn-metamorphic top to the north east sense of shear. This tectonic event acting since 320 Ma (Ar/Ar on white micas) is very well recorded in the roof of the western part of the MMVZ, where many of syn-metamorphic top to the north east shear sense criteria (shear fold, shear plane…) are present.

At St-Laurent-les-Bains (Western part of the MMVZ) the mylonitic texture began to appear in the greenschist facies, and "a" type folds increase toward the dome, through the Zand-crd-bi until a new foliation formed in the Zsil-bi by the entire transposition of the folded Zand-crd-bi foliation. This indicates a wide spread flattening.

As the Zand-crd-bi (characterised by a top to the NE) and the Zsil-bi (top to the South) are formed during the same metamorphic event well dated by Ar/Ar on biotite at 310 Ma, those two opposite sense of shear are contemporaneous of the dome emplacement. The top to the NE tectonic event well recorded in the highest structural level reveals tectonic affecting the upper crust during doming. This event is well known, and characterise the tectonic framework of the late evolution stage of the Variscan belt in the French Massif Central.

Consequently, the MMVZ is an atypical mylonite which represents the interaction of dome dynamics and the tectonic environment of the upper crust. In fact, in the same tectono-metamorphic event, a top to the N flat detachment (Pilat's faults system?) act-

ing since 320 Ma, has been intruded and tilted to the south by the dome emplacement at 310 Ma. We have an original example of how a dome structure interacts with the upper crust during uplift.

This study reveals that emplacement of a metamorphic core complex does not have to be only studied by its detachment, but also by the fact that they emplaced in force in the embedding rocks and create atypical structure characterised by flattening leading to mylonite with pure shear component effect.