ALPINE STRUCTURE OF THE EASTERN PYRENEES: FACTS, PROBLEMS AND A WORKABLE SOLUTION?

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For discussing the Alpine structure of the Pyrenees, and especially the relations of the Axial Zone (AZ) with the large Allochtons (Pedraforca, South Pyrenean Central Unit SPCU) of the South Pyrenean Zone (SPZ), it is crucial to point the absence of Alpine thrusts in a 100 km wide central part of the AZ (here named the Axial Central Unit, ACU), between the western (Gavarnie, Senet and Bono) and eastern (Canigou, Vallespir) thrusts. Contrary to what is generally admitted, the ACU is not an anticlinal stack and is not made of steepened Alpine thrusts (as clearly stated by McCaig, 1986), but only displays N-dipping high-angle reverse faults, possibly inverted pre-Alpine normal faults (e.g. the Mérens, Hospitalet or Vall d'Aran faults).

A key aera is the Pedraforca klippe, classically thought to be, before Alpine shortening and S-directed thrusting, a wide Mesozoic cover domain located to the North on the AZ basement (the Hospitalet fault could be the Cretaceous normal fault which separated the future Upper and Lower Pedraforca Units). It is then problematic that no Alpine thrust can be found in the ACU, north of the Pedraforca klippe. If gravitational emplacement is discarded, the inevitable explanation is that the Pedraforca thrust must be rooted north of the AZ. This line of reasoning can be applied, more or less, to the SPCU (western prolongation of the Pedraforca) and the Ampurdan nappe (eastern Pyrenees). It is probably to avoid this difficulty that, nowadays, the Pedraforca and CSPU are supposed to have evolved from a small Cretaceous basin unrelated of the North-Pyrenean basins, south of the present AZ basement (e.g. Muñoz, 1992; Vergés *et al*., 2002); this interpretation, highly debatable for the the CSPU, is considered impossible for the Pedraforca klippe.

On the other hand, the relations between the AZ and the North Pyrenean Zone (NPZ), on both sides of the North Pyrenean Fault (NPF), are also problematic. For example, the high-grade metamorphism affecting the southern-eastern NPZ is lacking in the AZ and then seems to be suppressed by the NPF; in the same way, the major NW-SE Aspres thrust, in the eastern AZ, seems to be cut by the NPF.

In order to solve these problems, a new model is presented for the beginning of the Eocene Alpine tectonics. The model implies an early S-directed major thrust which transported the whole north Pyrenean domain (including the metamorphic zone) over the (future) AZ, much like what can be seen at the western termination of the AZ, where the Chaînons béarnais are transported to the S by the St-Engrace thrust; over the AZ, the south Pyrenean thusts such as the Pedraforca thrust are linked this early thrust. Later, the NPF developed as a late reverse fault coeval with the deepest and youngest thrusts of the AZ (e.g. the St-Laurent-de-Cerdans thrust in the eastern Pyrenees); the NPF and to the south the frontal ramp fold linked to these late thrusts upthrowed the AZ relative to both the SPZ and NPZ, which resulted in the erosion of, notably, the southern part of the metamorphic zone. In this model, the entire AZ is a late tectonic window. The model will be discussed in more details for the eastern Pyrenees, especially for the relation between the Agly North-Pyrenean massif and the AZ.