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SPO fabric ellipsoids in granodiorites of the Gredos Massif (Variscan Iberian Massif): A clue to understand the kinematics of granitoid emplacement

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The most salient feature of the Central System batholith (CSB), located in the Central Iberian Zone (Variscan Iberian massif), is the presence of large homogeneous volumes of coarse grained, porphyritic granodiorites and monzogranites. Here, large volumes of granitoids (mostly granodiorites) of calk-alkaline affinity intruded into partially molten, anatectic domains at the middle to upper crust where peraluminous leucogranites are developed. The intrusion took place in a previously structured host in which D2 large extensional detachment put into contact low-grade metasediments and anatectic complexes. Far from being massive and homogeneous, the granitoids of the CSB are well structured in parallel, sub-horizontal layers of variable thickness, commonly approaching 1 km. The emplacement of these tabular magma bodies profited the main mechanical heterogeneities (foliation, lithological contacts) of country rocks. This process was broadly syn-tectonic with the late stages (D3) of the Variscan Orogeny. A detailed cartographic and structural study has been performed at a selected area of the Gredos massif, located at the centre of the CSB. In this region, alternating layers of migmatites and granitoids were affected by at least two generations of folds, which originated a complex fold interference pattern. This superposed folding pattern is depicted by the contacts between migmatites, granitoids and hornfels septa, as well as by the foliation inside each layer, which is mostly sub-parallel to the external contacts. The granitoid layers show a variably developed magmatic foliation, mostly defined by the preferred orientation of K-feldspar megacrysts, and also by the parallel arrangement of enclave corridors, schlieren, xenolith septa and igneous leucocratic veins. Scarce structures indicative of solid-state deformation can be seen in the granitoid layers, although ductile shear zones have been occasionally observed in some contacts between granitoids and migmatites. A precise study of the magmatic fabric described by the K-feldspar megacrysts has allowed us to obtain the SPO ellipsoids at 24 measurement sites located at three distinct granodiorite layers, separated by large septa of migmatites and hornfelses. Flattening-type ellipsoids are invariably observed at the top and bottom of each granitic body, defining thin (< 200 m) sheets near the contacts with the metasedimentary country rocks. On the other side, constriction dominates at the centre of each granite layer. The intensity of the SPO fabric (measured with the Nadai parameter) increases from bottom to top. Tiling of K-megacrysts has been used to determine the shear sense of flow at selected sites. This spatial distribution of the K-megacrysts SPO fabric is interpreted as a result of the complex interplay between the magma (internal) flow and the kinematics of the structures controlling the granitoid emplacement (external flow). The influence on the measured SPO fabrics of the late folding stages is also discussed.