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Paleomagnetism and magnetic fabric of the Comanja Granite, central Mexico: Emplacement mechanism and tectonic implications

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We report anisotropy of magnetic susceptibility (AMS), anisotropy of anhysteric remanence (AAR), and paleomagnetic data obtained from the ∼51.0 Ma Comanja Granite in central Mexico. The intrusion is elongated in the NW-SE direction, and is about 60 by 8 km, with two lobules about 25 km long connected by a narrow dike-like structure. Its emplacement mechanism is of regional tectonic importance because it records a change in tectonic regime from the compressional Laramide event to extension or gravitational collapse. It was apparently emplaced in a rapid pulse. It is held that emplacement was controlled by the regional Bajío fault. AMS results for 34 sites present dominantly weak oblate fabrics; the degree of anisotropy is low (average 1.028). Isothermal acquisition experiments indicate that a cubic phase such as magnetite is the principal magnetic phase, although occasionally hematite is present in very small amount. The mean susceptibility is of about 27 E-6 SI units. This result combined with low temperature (77 K) susceptibility measurements and AAR analysis suggests that the fabric resides in a paramagnetic component, identified as biotite. The northern lobule present magnetic lineation and steep foliation crudely developed, but with directions parallel to the regional Bajío fault (NW-SE). Whilst for the southern lobule there is a group of sites with shallow foliations in the east and a group of steep foliations and NW-SE lineations in the east. This supports the hypothesis that preexisting regional structures controlled emplacement. Paleomagnetic analysis of the 34 sites yields mostly unstable behaviour during AF and thermal demagnetization, but a group of 10 sites contains a characteristic magnetization of near uniform polarity that is northwest directed and of moderate positive inclination (Dec=314,1, Inc=49,1; α95=8,6, k=37,7). The magnetization is of moderate coercivity and moderate unblocking temperate; the mean direction is thus interpreted as a thermoremanence residing in magnetite. The mean is discordant when compared to the Eocene expected direction. The discordance may be explained by NE tilt of about 30º along an horizontal axis parallel to the Bajío fault (N45W) Inclined Eocene redbeds suggest that tilt occurred in two stages and it is related to an extensional regime, but emplacement is consistent with NE directed compression.