RT-AMS AND LT-AMS OF APTIAN BLACK MARLS IN THE NORTH-PYRENEAN BASIN, FRANCE. REINFORCEMENT OF THE EXTENSIONAL FABRIC DURING COMPRESSION?

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The study at room temperature of the anisotropy of magnetic susceptibility (RT-AMS) has been used traditionally as a powerful technique in structural analyses, since a direct relationship between magnetic fabric and strain ellipsoid was found (Hrouda, 1982, Borradaile, 1988). However, the superposition of different tectonic events and complex magnetic mineralogy hamper the interpretation of the magnetic fabric regarding the structural setting. In the Aptian-Albian black marls and limestones of the North-pyrenean basin, a RT-AMS study was carried out in 40 sites in order to control the strain ellipsoid. Due to the lack of structural markers analysis of deformation was not possible. The Aptian-Albian sedimentation, reaching thickness of about 1.5 km in the basin depocenters in this area, is linked to the strike-slip or transtensional movement of WNW-ESE faults. The compressional deformation (Late Cretaceous-Eocene in age) resulted in folds and development of a pervasive foliation in pelitic sediments during the inversion of the basin. The studied sites show: (i) subparallel bedding and foliation planes (19 sites), (ii) very different attitudes of bedding and foliation planes and bedding close to horizontal (9 sites), (iii) bedding and no foliation (6 sites) and (iv) in the rest only the foliation plane was determined. In spite of showing a similar magnetic mineralogy, the behavior of the magnetic ellipsoid is not homogeneous throughout the studied area. Thermomagnetic curves in argon atmosphere of selected samples indicate the same predominance of paramagnetic minerals (hyperbolic shape at lower temperatures) and the formation of magnetite with heating. The orientation of the magnetic ellipsoid in sites showing high angles between bedding and foliation planes show a grouping of the K_3 axes near the pole to foliation. The sites where either bedding or foliation planes are observed separately have different orientations of the magnetic ellipsoid, with only one site in each group showing K_3 axes clustered near the pole of the plane. Conversely, the sites where foliation and bedding are subparallel might have preserved and reinforced the orientation of the K_1 axes at the time of the transtensional deformation during Aptian-Albian times. The AMS measured in samples cooled down to 77 K (LT-AMS) help to better control the paramagnetic fabric. In the studied samples overlap of RT-AMS with LT-AMS, confirms that the paramagnetic minerals dominate the RT-AMS. Therefore, RT-AMS can be successfully applied as an indicator of the petrofabric of phyllosilicates.

RT-AMS, LT-AMS, strain ellipsoid, paramagnetic

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