



Hydrocarbon-induced magnetic authigenesis in Guafita and El Furrial oil fields, (Venezuela)

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We have combined rock magnetic experiments with Electronic Paramagnetic Resonance (EPR) to study drill cuttings from two Venezuelan oil fields (i.e. El Furrial and Guafita). In order to correlate shallow micromagnetic anomalies in oil wells, with the underlying reservoir, we compared logs of Magnetic Susceptibility (MS), Organic Matter Concentration (OMS) and Organic Matter Free Radical Concentration (OM-FRC). Additionally, rock magnetic and EPR experiments were carried out to identify the magnetic phases responsible for these anomalies. In the southwestern Guafita oil field MS and OMC anomalies coincide at the same depth levels, and are associated to framboids of authigenic magnetite. In northeastern El Furrial, MS anomalies seem to be caused by the presence of Fe sulphides (i.e. greigite). OMC peaks do not coincide at the same depth levels of their MS counterparts. These results lead us to the conclusion that two different authigenic processes operate in each field. In Guafita, secondary magnetic minerals could be produced by the proper thermochemical conditions, reached at shallow depth levels, and combined with the presence of organic matter (both processes induced by the underlying reservoir). In El Furrial, high concentrations of H₂S (related to the reservoir), at shallow depth levels, might allow the formation of secondary Fe-sulphides without the presence of organic matter. Different results for these two oil fields are clearly linked to their inherent distinct structural complexities and chemical properties of their hydrocarbons.