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Shallow and deep burial remagnetisations in the Cotiella Massif (late Cretaceous, South Central Pyrenees): insights from rock magnetic properties

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Secondary magnetizations of opposing polarities were found in the late Cretaceous shallow marine fine-grained limestones of the Aguas Salenz Fm in the Cotiella massif (South Central Pyrenees). Sediments of the Aguas Salenz Fm. were tilted soon after deposition as a result of extension along listric faults. Fold tests indicate that both normal and reversed magnetizations were acquired after syn-sedimentary tilting, but prior to Early Eocene folding and southwards thrusting of Central Pyrenean units. The two magnetic polarities were mutually exclusive at both sample and site level. Also, none of the studied sites in the Aguas Salenz Fm. preserved signs of primary components, while overlaying Campanian to Eocene marine sediments yielded only primary magnetizations. Considering the age of the remagnetised rocks (Coniacian-Santonian), timing of remanence acquisition and burial history we consider that the two remagnetizations in the Cotiella massif best agree with a chemical diagenetic origin. Rock magnetic properties show that magnetite is the carrier of both remanences, but with different grain size distribution and mineral concentrations. We suggest a scenario with two separate remagnetisations occurring at different depth and age. First, an early (but post-tilt) normal polarity magnetisation, probably biogenic, was acquired at shallow depths soon after deposition. This early magnetite underwent disolution upon burial in a reducing organic matter rich environment. Released iron was fixed as Fe-sulfide (pyrite) and Fe-carbonates such as ankerite and ferroan dolomite. Increasing burial depth and temperature favoured conditions for inorganic precipitation of fine-grained magnetite, inducing a second, higher intensity, reversed polarity remagnetization. The boundary between normal and reversed remagnetisations would represent an ancient upper limit of the for the thermogenic redox reactions causing the late secondary magnetite precipitation. Rocks affected by this last remagnetisation

event show characteristic wasp-waisted hysteresis loops and unblocking temperatures below 500 C, as is typical in other remagnetised carbonate formations worldwide.