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Magnetic measurements as indicators of soil development in a late Quaternary river terrace chronosequence in SE Spain.

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Palaeosols developed on late Quaternary river terraces in SE Spain, have been investigated to assess whether magnetic properties are sensitive to relative age over the chronosequence. Magnetic measurements of relict soils show evidence for the pedogenic development of secondary magnetic minerals in association with the modification of the detrital signal from fluvial gravel parent material. The magnetic signature is deconstructed by IRM unmixing into components indicative of the detrital magnetic mineral signature from soil parent material and its pedogenic alteration. A threshold in the maximum concentration of neoformed superparamagnetic minerals is highlighted, likely to be determined by the longevity of soil development and climate regime. The threshold may represent the long timescale necessary for the transformation of maghemite to hematite (at ambient temperatures), thereby decreasing bulk magnetic parameters such as susceptibility. This is supported by greater rubification in older terrace soils. Climatic shifts over the period may also influence the competitive pathways for the formation of ferrimagnetic and non-ferrimagnetic Fe oxides in the terrace soils. Magnetic measurements facilitate the development of a conceptual model of soil development within the terrace sequence spanning ca 500,000 years and improve upon previous field-based age associations estimated by soil carbonate and colour.