

Absolute age constraints on the Upper Parautochthon sedimentary sequence of the Morais allochthonous complex (Iberian Variscan belt, NE Portugal) based on new magmatic zircon U-Pb data

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The Morais allochthonous complex (MAC) is the easternmost far-travelled tectono-metamorphic unit of the Galicia-Trás-os-Montes Zone (GTMZ) in NW Iberia. It is surrounded by a tectonically underlying allochthonous unit known as Parautochthon (or Schistose Domain), which is subdivided into Upper and Lower on the basis of structural and stratigraphic characteristics. Intense and pervasive polyphase Variscan deformation erased most of the fossil record in the Upper Parautochthon (UP) and only a few Silurian graptolites were found in its higher section. Recent field work at the eastern rim of the MAC differentiated three volcanic events in the UP, all displaying tuffaceous facies intercalated in the sedimentary sequence. U-Pb zircon ages were determined for these volcanic rocks to constrain the time span in which these sediments were deposited. The lowermost volcanic episode, known as Mora Volcanics, consists of a bimodal suite of N-MORB tholeiitic basic rocks and calc-alkaline intermediate to acid volcanic rocks which yielded an age of 494 ± 2 Ma (Furongian, late Cambrian). The intermediate unit, traditionally known as the Saldanha Gneiss, consists of rhyolitic lavas and tuffs of calc-alkaline affinity which gave an age of 485 ± 3 Ma (close to the Cambrian–Ordovician boundary). Both volcanic events are associated with a homogeneous detrital sequence of slate, greywacke, quartz-wacke and quartzite known as the Mora-Saldanha volcano-sedimentary complex. Higher in the sequence, a laterally continuous unit of white quartzites (Algozo Formation) constitutes the only reliable marker bed in the region, defining major folds of several Variscan phases. Above this unit and below the black Silurian facies topping the UP, volcanic rocks are more abundant, yielding different chemical signatures: sub-alkaline basalts (N-MORB and OIB) and rhyolites (WPG), and a peraluminous alkaline rock of trachytic composition. These volcanic rocks are enclosed in a sedimentary unit of black and purple slates with minor jasper bodies named the Peso Formation. The obtained ages range from 460 ± 5 Ma to 450 ± 7 Ma (Middle–Late Ordovician).

This group of ages (Furongian to Silurian) make it possible to correlate the UP sedimentary material and depositional environment with those of the autochthonous Central Iberian Zone (CIZ) and, consequently, to confirm a Gondwanan affinity. The Algozo Formation can be considered as equivalent to the Armorican quartzites widespread in the CIZ. The abundance of volcanic rocks in the UP in relation to the nearby autochthonous sequence (CIZ), suggests that it was formed in a more external shelf position along the northern Gondwana margin, thus suffering more intense extensional deformation and associated volcanism during the Early Palaeozoic.