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The temporal evolution of the Mitu group, south-east Peru – first U-Pb age data.

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The Eastern Cordillera of southern Peru formed along a crustal zone that has been active as part of the western Gondwana margin since the middle Paleozoic. The present study investigates the Mitu Group of south-east Peru in the area of Abancay-Cusco-Sicuani-Titicaca. This unit comprises continental clastic sediments deposited in syn-sedimentary basins during an extensional period in Permo-Triassic times and has not benefitted from a thorough geochemical-geochronological investigation so far. One of the main reasons for this lack of data is a complex structure of the graben system, tectonically complicated by compressional inversion of the extensional basins during Andean orogeny. Due to dominating coarse-grained clastics, the Mitu Group is devoid of fossils and its age is only poorly bracketed to be Permo-Triassic based on its stratigraphic relation to the underlying Copacabana and overlying Pucara groups. The upper levels of the Copacabana have been constrained by palynology to the Artinskian (Doubinger and Marocco, 1981). However, a hiatus may be observed between the Copacabana and the Mitu groups in most places, rendering the age estimate of the basal Mitu imprecise. The Pucara Group, regarded by Rosas et al. (2007) as thermal sag after Mitu extension, is attributed to the late Triassic - early Jurassic on the basis of ammonite fossils and U-Pb zircon ages from ash beds (Schaltegger et al., 2008). The aim of this study is to provide more accurate and precise age constraints for the age and duration of the Mitu Group by using U-Pb geochronology of volcanic zircon in rhyolitic lavas, and of detrital zircon in clastic sediments. For andesitic volcanic lithologies, age approximations will be obtained by Ar-Ar techniques applied to amphibole and groundmass samples. Field data were obtained from a long and apparently complete section through the Mitu, situated 120km SE of Cusco near the city of Sicuani. This section consists of typical Mitu deposits; continental red beds, breccias and andesitic lavas. However, a zircon-bearing rhyolitic lava at the bottom gives us the opportunity to date the start of Mitu sedimentation by U-Pb ID-TIMS; this analysis will provide a precise age for the base of the Mitu group for the first time. In the Sicuani area the Mitu unconformably overlies the Ambo group, suggesting that the entire Copacabana is missing. Laser-ablation ICP-MS U-Pb data of detrital zircons from a sandstone just below the unconformity indicate a maximum age of latest Carboniferous (303Ma) for the underlying Ambo group. This maximum age overlaps with the palynological age of the lower Copacabana (Azcuy et al., 2002), raising the question whether the Ambo and Copacabana are truly diachronous or just coeval units of different sedimentary facies associations.

In another section, 100km W of Cusco, near the city of Abancay, we found Mitu sediments overlying the Copacabana Group. Here the Copacabana contains well preserved plant fossils of the lycopsids family also found elsewhere in Peru and Bolivia. Lack of acidic volcanism during Mitu extension in this region prevents from dating of lavas using the U-Pb method. The detrital zircon population in a sandstone in the lowermost part of the Mitu was analysed for U-Pb ages, using LA-ICP-MS techniques. The youngest zircons in the population are around 235 Ma hence providing a maximum age for the onset of Mitu group sedimentation. The Artinskian age for the upper Copacabana from Doubinger and Marocco (1981) has also been obtained from the Abancay region, establishing a hiatus of some 50 Myrs between the two units. The Mitu Group is intruded by a 220 Ma granite body (Lipa and Saraiva, 2008) indicating significant burial of the sediments at this time. 500km SE of Cusco, on the Bolivian shores of lake Titicaca, the Ambo Group features plant fossils of the Lycopsids family like those found in the Copacabana near Abancay. Our detrital zircon LA-ICPMS study on a quartz arenite just below the fossils indicates a maximum U-Pb age of 343Ma. However a zircon-bearing ash bed will allow for more precise calibration of the fossil age by ID-TIMS techniques. The zircon U-Pb data will provide a test whether the Copacabana and the Ambo group are indeed diachronous or just lateral variations of a sedimentary system.

REFERENCES