

Advances in the Ordovician stratigraphy of Peru: the Floian to ?Hirnantian succession from the Apurímac River valley, Cordillera Oriental

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In the northern part of the Central Andean Basin, Ordovician rocks crop out extensively in the Cordillera Oriental of Peru and also occur sporadically in some parts of the Peruvian Altiplano. The Ordovician succession in the Cordillera Oriental differs from those in the Altiplano, comprising three sedimentary units, namely (in ascending order) the San José Formation (massive organic-rich shales, up to 3500 m thick), the Sandia Formation (quartzose sandstones with interbedded shales, up to 3000 m thick) and the San Gabán Formation (glaciomarine diamictites with some sandstones, ca. 160 m thick). Graptolites are abundant in the oldest formation but being restricted to a short interval in the Middle to basal Upper Ordovician (Maletz et al., 2010), and there is a single occurrence of upper Floian (Lower Ordovician) conodonts in the lower part. Biostratigraphic data from the other two formations are much more scarce, having been referred to the Sandbian and the Hirnantian through Llandovery intervals, respectively. Field work recently conducted along the northeastern margin of the Apurímac River valley, northeast of the city of Ayacucho, led to the discovery of new sections in the area mapped by Monge et al. (1998), which were measured and sampled biostratigraphically in detail. The San José Formation lies unconformably on a Neoproterozoic metamorphic complex, reaching a maximum thickness of about 700 m. This formation has yielded basal Floian graptolites in its lower –not most basal– part, and these are succeeded by a complete biostratigraphic record documenting the existence of upper Floian, Dapingian, Darriwilian and lower Sandbian strata, which include graptolites, trilobites, brachiopods, molluscs and ostracods, as well as some conodonts and other fossils. The upper part of the San José Formation is unconformably overlain by a thick sandy succession, previously assigned to the Sandia Formation, but here as the newly defined Kimbiri Formation. It consists of 80 m of massive sandstones with a basal member of glaciomarine diamictites measuring up to 90 m thick and locally resting on a basal quartzite. The diamictites also rarely occur interbedded in the main sandstone member and show some resemblance to the San Gabán Fm, that has been reinterpreted as lower Silurian turbidites and gravity flows instead of autochthonous glacial deposits contemporaneous to the end-Ordovician glaciation. Some fossiliferous pebbles in the Kimbiri Fm come from deeply eroded areas of the San José Fm.

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Maletz J., Reimann C., Spiske M., Bahlburg H. & Brussa E.D. (2010) - Darriwilian (Middle Ordovician) graptolite faunas of the Sandia Region, southern Peru. *Geological Magazine*, 45, 397–411.

Monge R., Valencia M. & Sánchez J. (1998) - Geología de los cuadrángulos de Llochegua, río Picha y San Francisco. *Boletín*, 120, 1–253.



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