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New evidence of ammonites and its sedimentary context within Upper part of Chocolate Formation (Yura, Arequipa)

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In District of Yura, Province and Department of Arequipa (southern Peru), there are several studies in petrology and stratigraphy (Jenks, 1958; Benavides, 1962; Vargas, 1970; Vicente, 1981; León, 1981; Vicente et al., 1982). In this study, we show an update on knowledge of sedimentological and paleontological elements in Chocolate Formation, in cerro Yanacoto; reporting for this area fluvial and marine sedimentary sequences, both containing fauna of ammonites in marine facies. This study relates paleontological features on the sedimentological context in which the ammonites were found.

At cerro Yanacoto, up to 170 m. in the stratigraphic column (at the top of the Sequence 1) at Chocolate Formation, there are layers containing carbonated silty sediments, that contain two fossiliferous levels, separated each other by 50 cm. in thickness by fine grained sandstone, collected at total about ten internal molds of ammonites found in normal position and regular state conserved. These are ammonites, which paleontological features consists of small size, umbilical diameter about 2 to 5 cm., first whorl height range between 1.5 to 2 cm., evolute to slightly involute, some samples, can be observed at least 4 whorls, venter is slightly rounded and very narrow, and the ornamentation consists of simple and straight ribs on the flanks; and on its ventro-lateral shoulders, bending are observed toward growth direction of the shell. These characteristics correspond to *Arietitidos*. Regarding *Uptonia* sp., they are compressed, with coarse ribs and coarse to slightly regular folds relatively next to ventral zone, they are not tuberculated.

These ammonites were found in a siltstone-shales intercalation, some of them with thin sandstone layers and calcareous components within a ~2 meter strata, which there are two fine grained levels. In the first level, there are the ammonites *Megarietites* sp., *Eparietites* sp. and *Uptonia* sp., followed by a chaotic sedimentation

represented by convoluted laminations, accompanied by syndimentary normal microfaults cutting unconsolidated layers; above these levels, the second level is located, containing *Megarietites meridionalis* (REYNES), *Eparietites* cf. *undaries* (QUENSTEDT) and *Arnioceras* sp.

The presence of ammonites Arietítidos, is characteristic of Sinemurian times, Arietítidos ammonites reported in this study are present in Lower Sinemurian beds in northern Siberia and in the Mediterranean Sinclinal Belt in Russia (Krymholts et al., 1988), these environments are relatively deep, and also, there are reported I relatively shallow marine water. Moreover, sedimentary evidences suggest a deltaic sedimentary environment, in a slope with strong deformed strata. According to those evidences, is very possible that these ammonites have undergone short post-mortem transport.

In conclusion, ammonites reported at the top part of the Sequence 1 of Chocolate Formation, correspond to *Megarietites meridionalis* REYNES, *Eparietites* cf. *undaries* (QUENSTEDT), *Megarietites* sp., *Eparietites* sp. and *Uptonia* sp.; these are Sinemurian and Lower Pliensbachian ammonites, and lived in relatively deep marine water. These ammonites were found next to post-mortem transport evidences that correspond to a slope facies.

Stratigraphic column in cerro Yanacoto shows a sequence of sedimentary rocks, involving conglomerates, sandstone and siltstone from continental environments, with occasional deposits of siltstone-shales, which correspond to marine sea level rise in thin thicknesses.

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Sedimentary facies and ammonites relations between Arequipa and Tacna during Lower to Middle Jurassic

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Arequipa basin has been studied by different authors, such as Jenks (1848), Wells (1953), Benavides (1962), Vargas (1970), Leon (1981) and Vicente (1981). These authors refer to the layers of the Chocolate Formation (Lower Jurassic) in Arequipa, as a succession of andesitic and sedimentary rocks, containing Sinemurian ammonites. There are geological investigations in localities of Tacna made by Wilson & Garcia (1962), Jaen & Ortiz (1963), Salinas (1987), among others; whose produce the first geological maps of the zone.

Currently, data showed in this report (stratigraphic columns, ammonites paleontology) (Fi. 2), corresponds to a set of information not yet published, obtained from INGEMMET field jobs. Data sets were taken from outcrops along coastal strip of southern Peru, in localities of Yura (Department of Arequipa) and cerros Palquilla and Pelado (Department of Tacna) (Fig. 1), within the Arequipa Mesozoic basin, southern Peru. Lower and Middle Jurassic sediments have been analyzed in Arequipa (Yura) and Tacna (cerros Palquilla and Pelado) in terms of stratigraphy, sedimentology and paleontology. A taphonomic study of ammonites and its paleoenvironmental and chronological implications and has been related one to another.

In Cerro Yanacoto, Yura, Arequipa, there is a stratigraphic section, containing to Chocolate Formation as a succession of sedimentary rocks (Acosta et al., 2008), which is correlated with Junerata and Pelado formations (Fig. 2). This succession involves conglomerates, sandstones, and calcareous siltstones, from marine incursion of few thicknesses; in its respective sedimentary facies variations.

Here, the Chocolate Formation contains ammonite fauna, and they are positioned in calcareous siltstone interstratified with very fine grained sandstone; showing us the presence of relatively shallow marine waters. Sedimentation in this fossiliferous levels, presents evidences of submarine turbulence in a prodelta sub-environment, contained in talud facies; being these fossils possibly re-transported post-mortem (Alván et al., 2008). These are the ammonites *Uptonia* sp., *Megarietites* sp. and *Eparieti-*