

Biostratigraphy, cyclostratigraphy and radio-isotopic geochronology of the Agrio Formation (Argentine Andes): towards an intercalibration with the Tethys during the Valanginian–Hauterivian

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The global ‘standard’ Early Cretaceous stages that are based on sections in the Mediterranean Tethys were defined by ammonite biostratigraphy and calcareous nannofossil bioevents calibrated with the M sequence of magnetic polarity chrons. Because of the scarcity of tuffs in the Tethys, the lack of precise radiometric ages has hindered the construction of an accurate geological time scale. In particular, the durations of the Valanginian and the Hauterivian stages are presently under much debate, with large discrepancies between the numerical ages of the Geological Time Scale 2016 (OGG et al., 2016) and biostratigraphic and radio-astrochronological studies performed recently, both in the Andes (AGUIRRE-URRETA et al., 2015) and in the Tethys (MARTINEZ et al., 2015). To deal with these issues we analyzed the Agrio Formation in the Neuquén Basin, a retro-arc basin developed at the foothills of the Andes. We have studied this unit for more than 20 years with bed-by-bed collection of fossils in many localities, recently sampling several tuff layers. We have selected a stratigraphic section at El Portón where this formation is composed of marl-limestone alternations, and have performed magnetic susceptibility measurements obtaining the first orbital time scale. Besides, there are two Chemical Abrasion-Isotope Dilution-Thermal Ionization Mass Spectrometry (CA-ID TIMS) U-Pb radio-isotopic ages in El Portón; the first one is 130.39 ± 0.16 Ma (early Hauterivian) and the second is 126.97 ± 0.15 Ma (latest Hauterivian–?early Barremian). Both are well constrained biostratigraphically by ammonites and calcareous nannofossils which correlate with the ‘standard’ sequence of the Tethys. Thus, we have obtained a robust combination of cyclostratigraphy, biostratigraphy and radio-isotopic ages for the Agrio Formation. This new data, together with two former U-Pb radio-isotopic ages from other localities have been used to correlate the results in the Neuquén Basin with those of the Tethys, including the candidates for the base of the Hauterivian (La Charce) and the base of the Barremian (Río Argos). Thus, a new geological time scale for the Valanginian–Hauterivian stages integrating astro-chronological, biostratigraphic and radiochronological data differs with the present official geological time scale which still maintains poorly constraint absolute ages for the Valanginian–Hauterivian interval.

AGUIRRE-URRETA, B. et al., 2015. *Geol. Magazine*, **152**/3, 557–564.

MARTÍNEZ, M. et al., 2015. *Global Planet. Change*, **131**, 158–173.

OGG, J.G. et al., 2016. *The Concise Geologic Time Scale*. Elsevier.