

First magnetostratigraphic results of the Upper Jurassic-Cretaceous VacaMuerta Formation, Neuquén basin, Argentina

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RESUMEN

Se efectuó un estudio paleomagnético en la zona del Arroyo Loncoche (provincia de Mendoza), donde aflora una sección de c. 300 m de espesor de rocas sedimentarias portadoras de amonites correspondientes a la Formación Vaca Muerta (Tithoniano-Berriasiano). Los niveles de muestreo paleomagnético fueron ubicados de acuerdo a las Zonas de amonites de la Región Andina que comprenden desde la Zona de *Virgatosphinctes mendozanus* a la Zona de *Spiticeras damesi*. Luego de someter las muestras a desmagnetización térmica y por campos alternos, se observaron comportamientos magnéticos confiables. De este modo, fue posible aislar una zona de polaridad reversa en la base de la Formación Vaca Muerta, y otra normal en la parte superior. Estos resultados preliminares son consistentes con la escala de polaridades geomagnéticas internacional.

Palabras clave: Jurásico Superior, magnetoestratigrafía, hemisferio sur

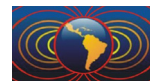
ABSTRACT

A palaeomagnetic research was carried out in the Arroyo Loncoche area (provincia de Mendoza), where a 300 m thick succession of sedimentary rocks bearing ammonites: Vaca Muerta Formation (Tithonian-Berriasian) is outcropping. Levels of paleomagnetic sampling were located according to the ammonite zoning in the Andean region, which comprises from *Virgatosphinctes mendozanus* Zone to *Spiticeras damesi* Zone. Afterwards imparting alternating field and thermal demagnetizations, reliable magnetic behaviors were observed. Then, it was possible isolate a reverse polarity zone toward the base of Vaca Muerta Formation and another normal polarity zone toward the upper part. These preliminary results are consistent with the international geomagnetic polarity scale.

Keywords: Upper Jurassic, magnetoestratigraphy, southern hemisphere

Introduction

A palaeomagnetic research has been carried out in the Jurassic succession cropping out along Arroyo Loncoche near Malargüe, province of Mendoza (fig. 1). The main goal was to obtain the first Upper Jurassic magnetostratigraphic scale in the Southern Hemisphere, although the Lower Jurassic was also sampled. In this locality, we sampled a ca. 300 m-thick section of mostly marine rocks bearing ammonites of the Andean region. The basement in the area corresponds to the El Fortin Group (= Choyoi Group) dated as Upper Permian (Llambias *et al.*, 2005), and is overlaid by continental rocks of Triassic age. The Jurassic section that we sampled starts with the conglomeratic Remoredo Formation of Upper Triassic to Lower Jurassic age, overlaid by the Bardas Blancas Formation that is made up of ammonite-bearing sedimentary rocks of Middle Jurassic age. This is followed by an unnamed unit, the Auquilco Formation and the Tordillo Formation. On the top of the section, we sampled the Upper Jurassic-Lower Cretaceous Vaca Muerta Formation which is composed by ammonite-bearing rocks.



The average distance between palaeomagnetic levels has been of approximately 20 m in the case of the continental volcanic – sedimentary basal section, and 5 m in the marine Jurassic part of the succession. This is because the main goal of this research was the sampling of the different lithologies in order to know which ones were fit for the palaeomagnetic study.

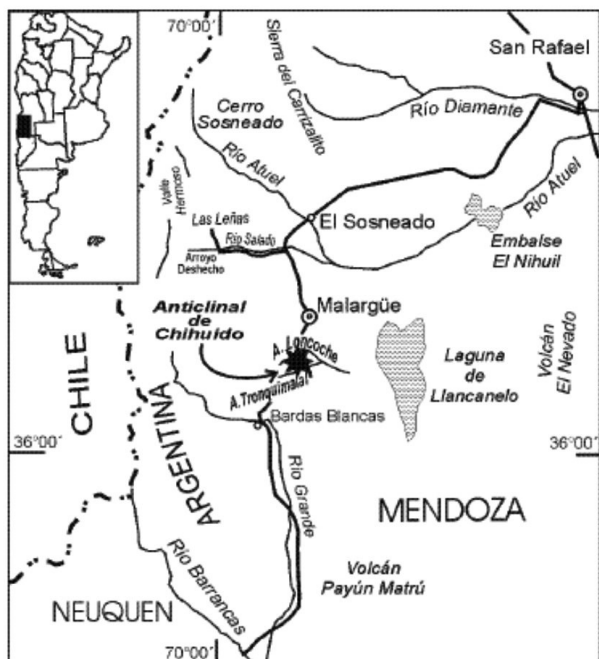


Figure 1. Location map of the study area in southern Mendoza (taken from Llambías *et al.*, 2005).

Methodology

We collected at least 4 oriented specimens per site using portable drills. Routine demagnetization procedures and analysis were performed at the Laboratorio de Paleomagnetismo “Daniel Valencio”, IGEBA, Universidad de Buenos Aires. Both alternating fields (AF) and high temperatures (TH) were carried out using a 2G AF demagnetizer and a Schoenstedt furnace. Remanent magnetizations were measured in a 2G DC SQUID magnetometer. As a rule, specimens were demagnetized in approximately ten AF steps usually up to 60 mT and occasionally 110 mT; thermal demagnetization was done up to temperatures of 550-580° C and sometimes 650° C. Susceptibility was monitored after each heating step in order to detect possible changes in the magnetic mineralogy. Preliminary results suggest that the main magnetic carrier is titanomagnetite and secondly, haematite.

Results

In the Vaca Muerta Formation, a reverse polarity zone from the *Virgatosphinctes mendozanus* to the *W. internispinosum*, followed by a normal polarity zone up to the *Spiticeras damesi* Andean Zones have been isolated. As a whole, the ammonite zones are correlatable with the Tethyan Darwini to *S. boissieri* Zones (Tithonian- Berriasian). On this basis, the polarities of the Vaca Muerta Formation have been tied with the international geomagnetic polarity time scale.

This is the first magnetostratigraphic scale of this age obtained in the Southern Hemisphere. Because palaeomagnetic sampling sites are precisely dated, it can help to refine the international geomagnetic scale which, for this time interval, shows considerable gaps (*e.g.* Ogg, 2004).

References

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