Magnetostratigraphy and carbon isotopes of the Ediacaran Avellaneda Formation, Rio de La Plata Craton, Argentina

Jhon Afonso[1]; Ricardo Trindade[1]; Pablo Franceschinis[2,3], Augusto Rapalini[2,3], M. J. Arrouy[3,4], D. Poiré [3,4]

1 - Institute of Astronomy, Geophysics and Atmospheric Sciences, Departament of Geophysics, University of São Paulo, Brazil (jhon.afonso@iag.usp.br)
2 - Instituto de Geociencias Básicas, Aplicadas y Ambientales de Buenos Aires (IGEBA), Departamento de Ciencias Geológicas, Facultad de Ciencias Exactas y Naturales, Buenos Aires, Argentina
3 - Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Argentina
4 - Centro de Investigaciones Geológicas, Facultad de Ciencias Naturales y Museo, La Plata, Argentina

1 - INTRODUCTION

Paleomagnetic data from the Ediacaran (635-542 Ma) indicate rapid flips in polarity of the Earth magnetic field (Meert et al., 2016). This unusual behavior provides a powerful tool for high resolution markers. Correlation of these reversals to a geomagnetic polarity time scale yeld an important geochronological methods that facilitates precise stratigraphic correlation and arrange global geological events. Here, we present a magnetostratigraphy study combined with carbon isotopes curves from the Avellenada Formation (580-560 Ma).

2 - GEOLOGICAL BACKGROUND

The Avellaneda Formation is exposed in the the Tandilia System, located on Rio de La Plata Craton, Argentina (Fig. 1A). This is unit can reach up to 20 meters of thick including massive to laminated marls and very fine-grained siliciclastic rocks likely formed in shallow marine subtidal environments (Arrouy et al., 2015). Geochemical data from the Loma Negra Formation (Fig. 1B) and soft-bodied taxon Aspidella remains founded in Cerro Negro Formation (Fig. 1B), settle the Avellaneda Formation likely age between 580 and 560 Ma (Arrouy et al., 2016).

Fig. 1A Fig. 1B

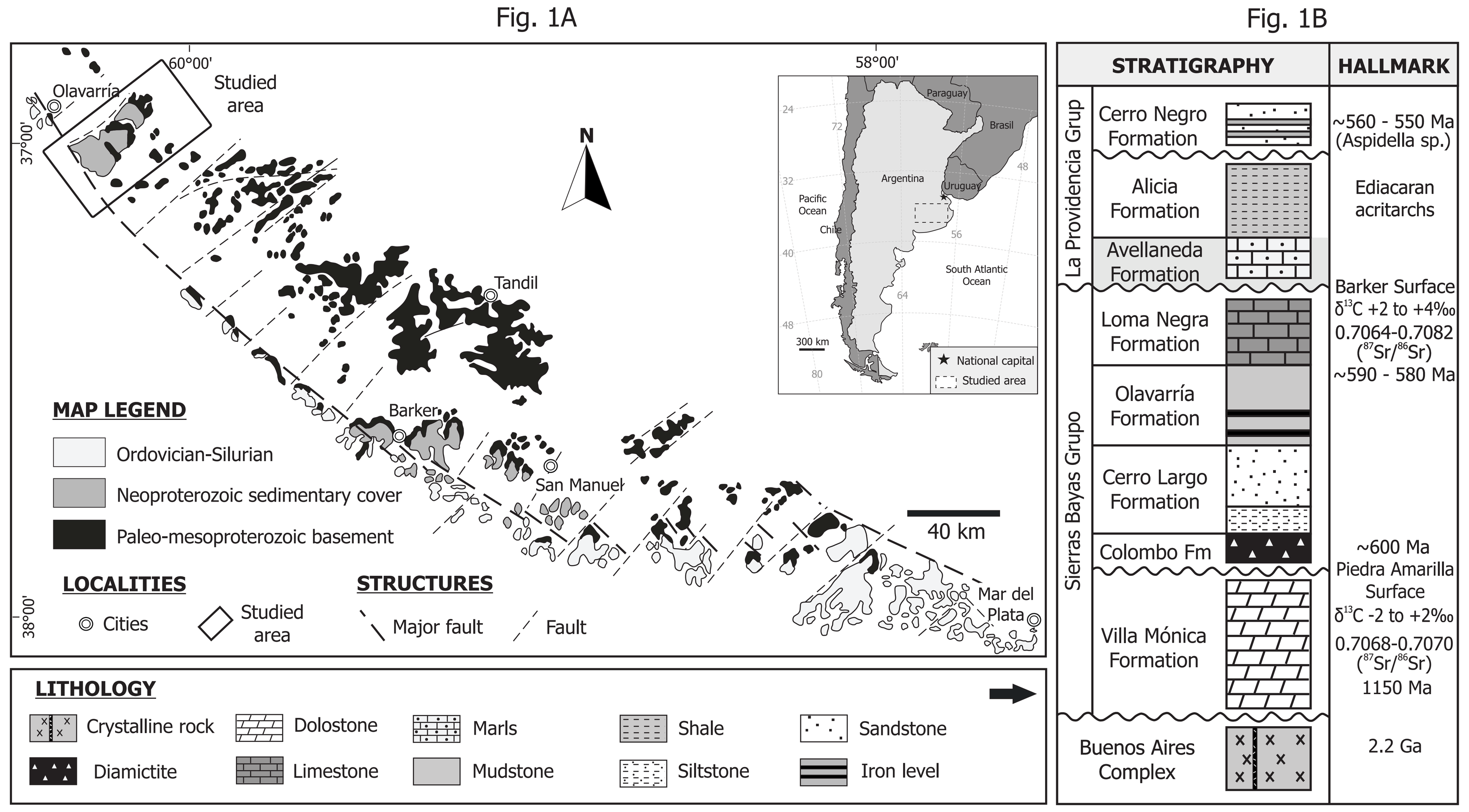

Fig. 1 - Geological context. (A) Schematic map of the Tandilla System. (B) Stratigraphic column for the area. Fig. 2B column were compiled of previous studies of Arrouy et al., (2016) and Gómez-Peral et al., (2019).

3 - MATERIALS AND METHODS

Two drill cores (TSE-34 and TSE-07) recovered from Avellaneda Formation near the city of Olavarria were sampled and described. Oriented samples for paleomagnetic measurements were collected every 0.3–0.5 meters. At least two cylindrical cores measuring 2.2 cm^3 were extracted from each sample. The two drill cores provided 178 cylindrical specimens. All individual specimens were subjected to thermal demagnetization treatments. Measurements of the natural remanent magnetization (NRM) were made using a three-axis 2G cryogenic magnetometer, housed in a magnetically shielded room in the Laboratório de Paleomagnetismo at the Universidade de São Paulo (USPmag). Measurements were processed using the Remasoft 3.0 software. Carbon isotope analyses were prepared using a powders drill and analysed in Laboratório de Isótopos Estáveis (LES) at the Universidade de São Paulo.

4 - RESULTS

Fig. 2A Fig. 2B

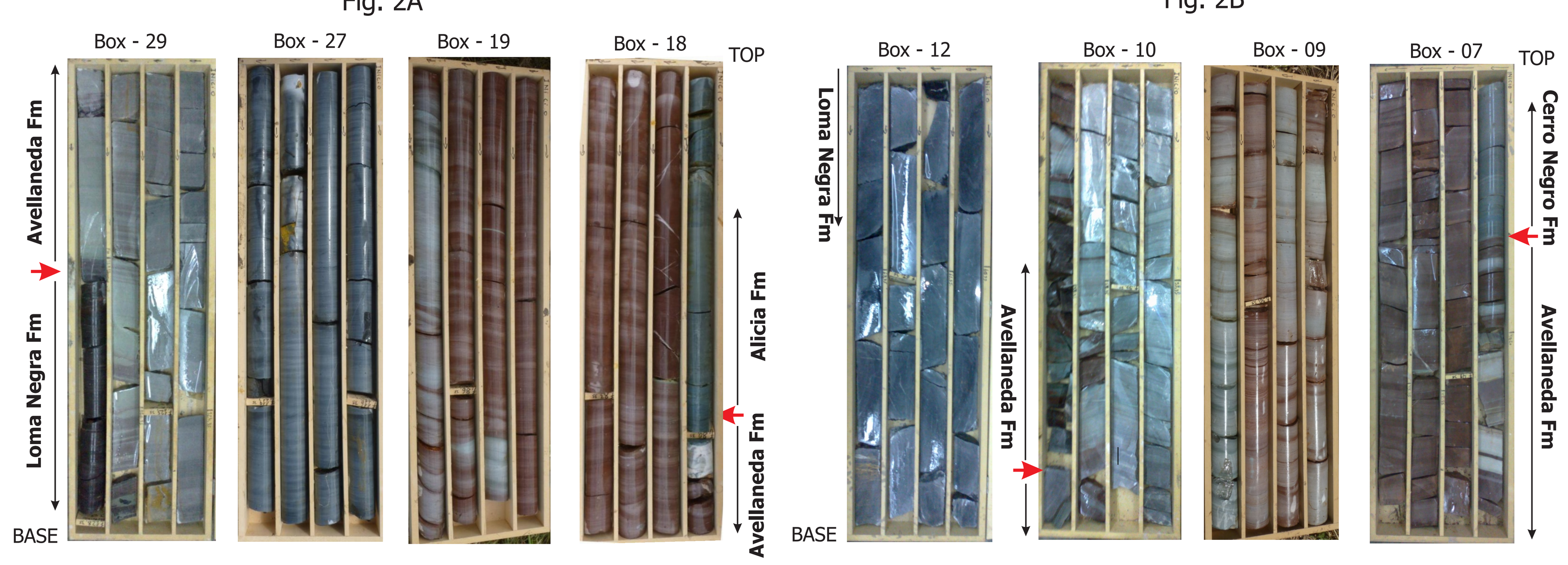

Fig. 2 - Photography of drill cores samples from Avelleneda Formation. In the left site samples from core TSE-34. Samples obtained from core TSE-07 appear on the right. Red arrow indicate the lower and upper boundaries of the Avellenda Formation.

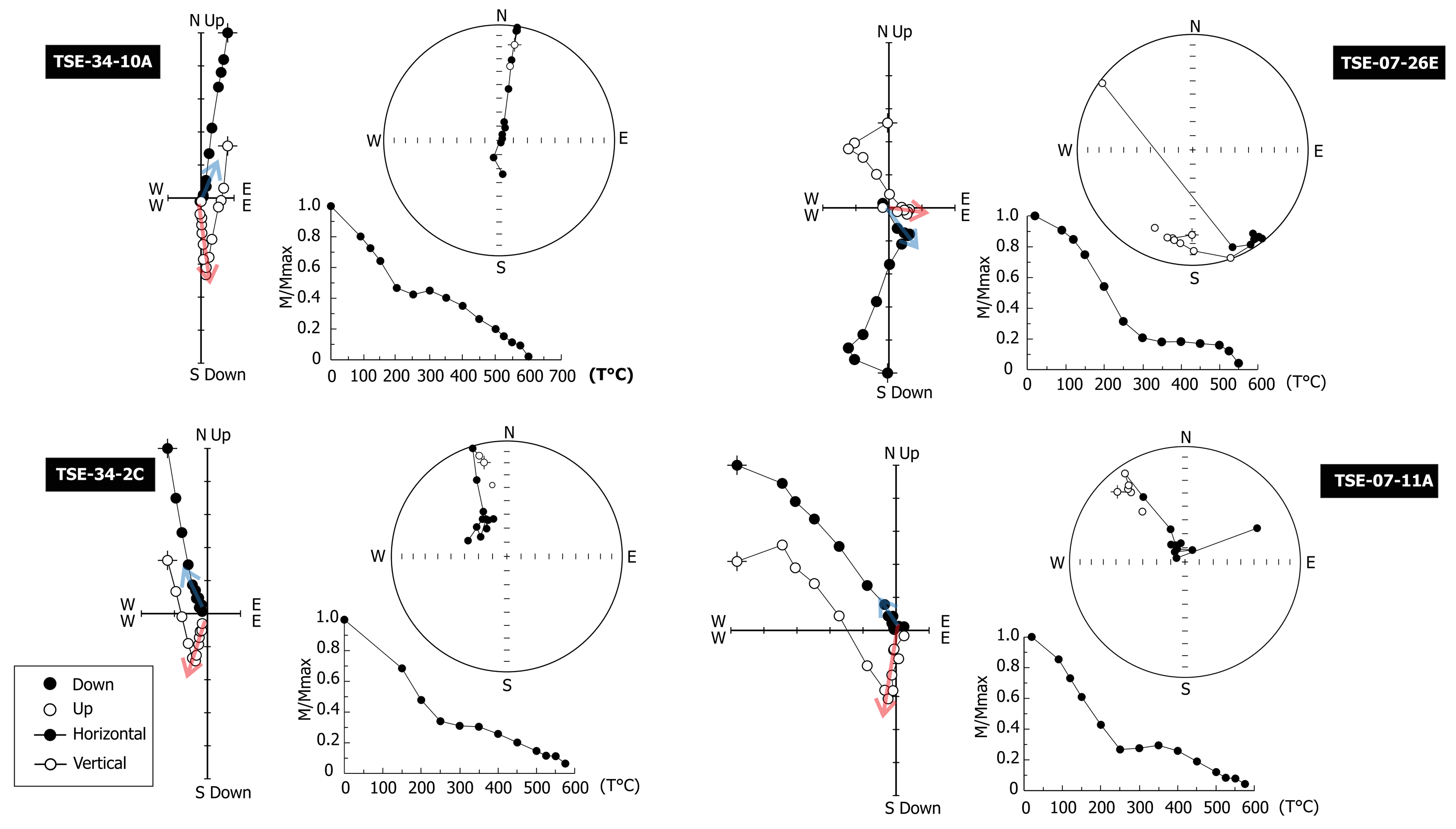

Fig. 3 - Representative thermal demagnetization data. Data are in stratigraphic coordinates and are plotted in vector-endpoint diagrams (Zijderveld, 1967), equal-area stereographic projection and magnetization intensity versus temperature curves. The characteristic remanent magnetizations were determined by principal component analysis (Kirschvink, 1980). Blue and red arrows showing horizontal and vertical components, respectively.

5 - DISCUSSION

Sedimentary rocks described in both drill cores are similar (Fig. 2). Grey to redish marls and very-fine grained siliciclastic sediments are main constituents of drill cores (Fig. 2A and 2B). Thermal desmagnetization treatment revealed a stable high-temperature component (HTC) above ~300-575°C or 620°C depending on samples (Fig. 3). HTC show positive and negative inclination. Plot the inclination versus stratigraphic position allow the recognition of correlatable magnetozones (Fig. 4A). Stable carbon isotope ratio (δ^{13}Ccarb) provide an independent tool and support for magnetostratigraphic correlations. δ^{13}Ccarb against δ^{18}Ocarb suggest a primary C isotope curve (Fig. 4B).

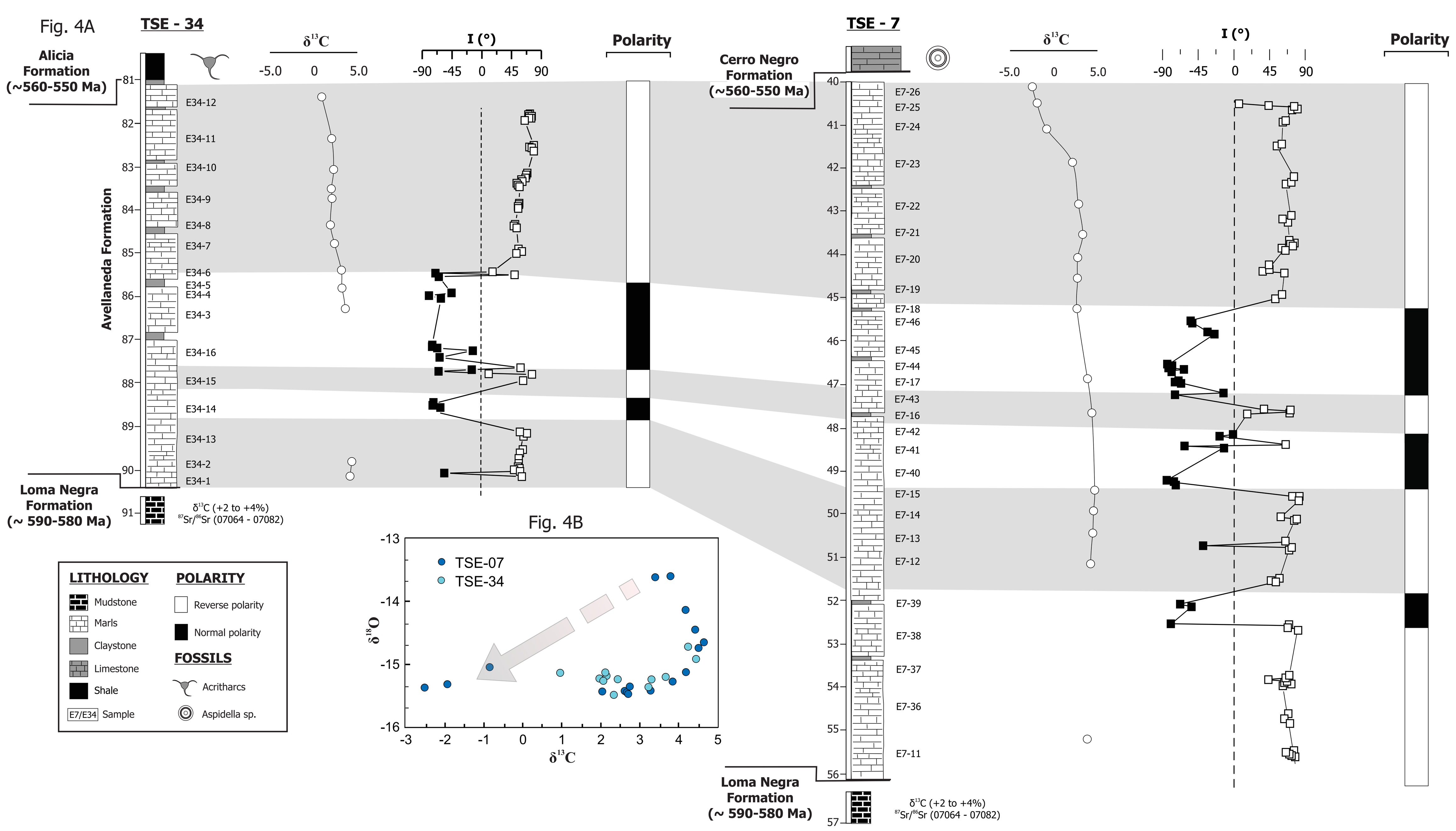

Fig. 4 - Correlation of the drill cores from Avellanade Formation. (A) Carbon isotope curves and magnetostratigraphic frames including variations of lithology, inclinations, and polarity along depths. (B) Plot δ^{13}Ccarb versus δ^{18}Ocarb (arrow indicate the diagenetic trends).

6 - CONCLUSIONS

Magnetostratigraphy coupled with carbon isotopes data from Ediacaran Avellaneda Formation provide a reliable tool to perform high precise correlations.

The detailed paleomagnetic investigations show the presence of multiple geomagnetic polarities in the Ediacaran.

In the future, we hope provide robust magnetostratigraphic data able to extend correlation with worldwide Ediacaran successions

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