PALEOENVIRONMENTAL AND PALEOECOLOGICAL CHANGES DURING THE EARLY GABI IN THE ARGENTINE PAMPAS: A STABLE ISOTOPE APPROACH

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INTRODUCTION & AIMS

- **The Late Miocene–Early Pliocene mammalian fossil record from Argentine Pampas** is profuse and diverse and constitutes **an exclusive natural laboratory** for testing the effects of some of the most important events occurred in the late Cenozoic in America, such as the expansion of C_4 grasses or the Great American Biotic Interchange (GABI).
- **Few studies** have focused on paleoenvironmental context by means of **stable isotope analysis** ($\delta^{13}C$ and $\delta^{18}O$) in Argentina, and generally they lack a precise chronological framework.
- **Our aim is double:** i) to establish a paleoenvironmental and paleoecological framework through the isotopic analysis of a high diversity of mammals during the early stages of GABI, and ii) to provide radioisotopic ages (U-Pb on detrital zircons) for some classic fossiliferous localities (Fig. 1).

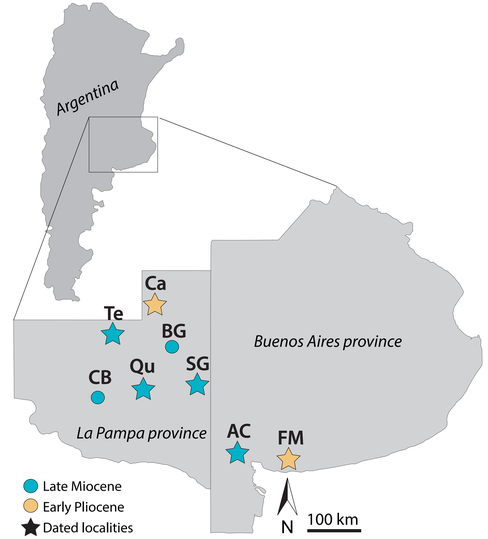

Fig. 1: Fossil localities of the Argentine Pampas selected in this study. AC: Arroyo Chasicó, BG: Bajo Giuliani, Ca: Caleufú, CB: Cerro La Bota, FM: Farola Monte Hermoso, Qu: Quehué, SG: Salinas Grandes de Hidalgo, Te: Telén

STABLE ISOTOPES

270 tooth samples [1] → Chemical treatment [2] → **Standard**

$\delta^{13}C_{CO3}$ ‰ VDPB

$\delta^{18}O_{CO3}$ ‰ VSMOW

Tooth enamel: litopterns, notoungulates, rodents
Orthodentine: pilosans and cingulates

$\delta^{13}C$ provides information on paleoecological and paleoenvironmental parameters, allowing the characterization of paleodiets and the reconstruction of ancient habitats.

$\delta^{18}O$ of obligate drinkers, reflects changes in values of meteoric water controlled, in turn, by shifts in temperature and evaporation rate.

SUMMARY & CONCLUSIONS

- **This study is one of the few isotopic works that cover such a wide time span in South America.**
- **The new ages** (U-Pb on detrital zircons) provide a more solid chronological framework.
- **The expansion of C_4 plants** is recorded in the study region at the **Early Pliocene**:
  - **Chasicoan Stage/Age**: $\delta^{13}C$ herbivore data point to **mixed C_3–C_4 diets**, implying the existence of favorable habitats for C_4 plants before their full expansion (Fig.2A-D).
  - **Huayquerian Stage/Age**: taxa showed a **preference for C_3 plants** (Fig. 2A-D), except for some rodents that continued to include C_4 plants in their diets (maybe related to an early specialization of this group).
  - **Latest Huayquerian–Montehermosan stages/ages**: there is a significant change in diets with taxa incorporating a **higher percentage of C_4 plants, except litopterns** (Fig. 2A-D), supported by the statistical analyses.
- Regarding $\delta^{18}O$ values, litopterns, notoungulates and rodents showed different results. **This difference may be because they recorded different geographical scales** (global, regional and local, respectively).
  - Litopterna values showed no trend (Fig. 2E), while notoungulates showed an increase in $\delta^{18}O$ values during the Early Pliocene (Fig. 2F), possibly related to an increase in aridity and/or temperature. Rodents showed a slight decrease in $\delta^{18}O$ values during the Early Pliocene (Fig. 2G).

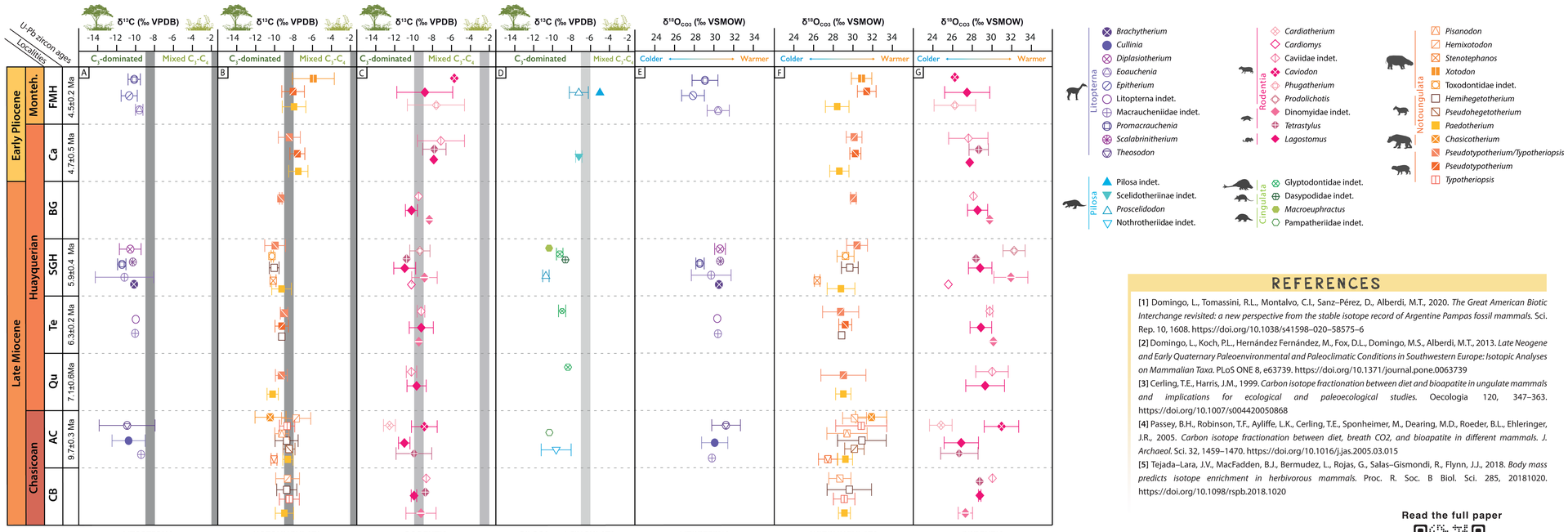

Fig. 2: Temporal evolution of mammal isotopic data according to the new chronological framework proposed in this work. A–D) $\delta^{13}C$ (‰ VPDB) mean ± 1 standard deviation values and E–G) $\delta^{18}O_{CO3}$ (‰ VSMOW) mean ± 1 standard deviation values. The gray vertical bars depict the vegetation $\delta^{13}C$ cut–off values between a C_3–dominated diet and an intermediate C_3–C_4 diet: notoungulates and litopterns ε^*diet–enamel = +14.1‰ [3]; rodents ε^*diet–enamel = +12.8‰ [4]; xenarthrans ε^*diet–bioapatite = +15.6‰ [5]. See figure 1 for fossil localities abbreviations.

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