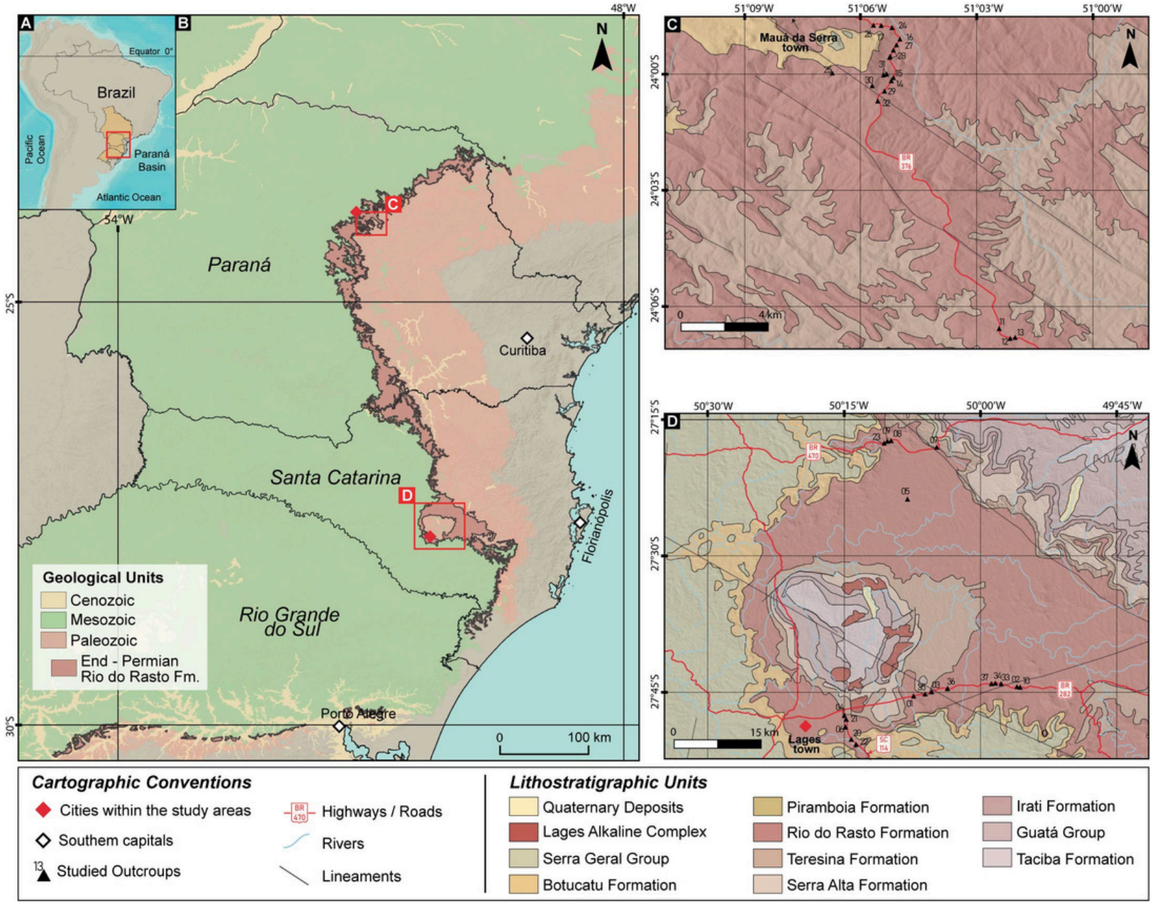
Paleoclimate-driven depositional dynamics of Western Gondwana Endorheic Basins during the Middle to Late Permian

Monica Manna[1]*, Manoela Bállico[1], Claiton Scherer[2], Christopher Scotese[3], Amanda Feitosa[4], and Ana Victória Franqueira[4]

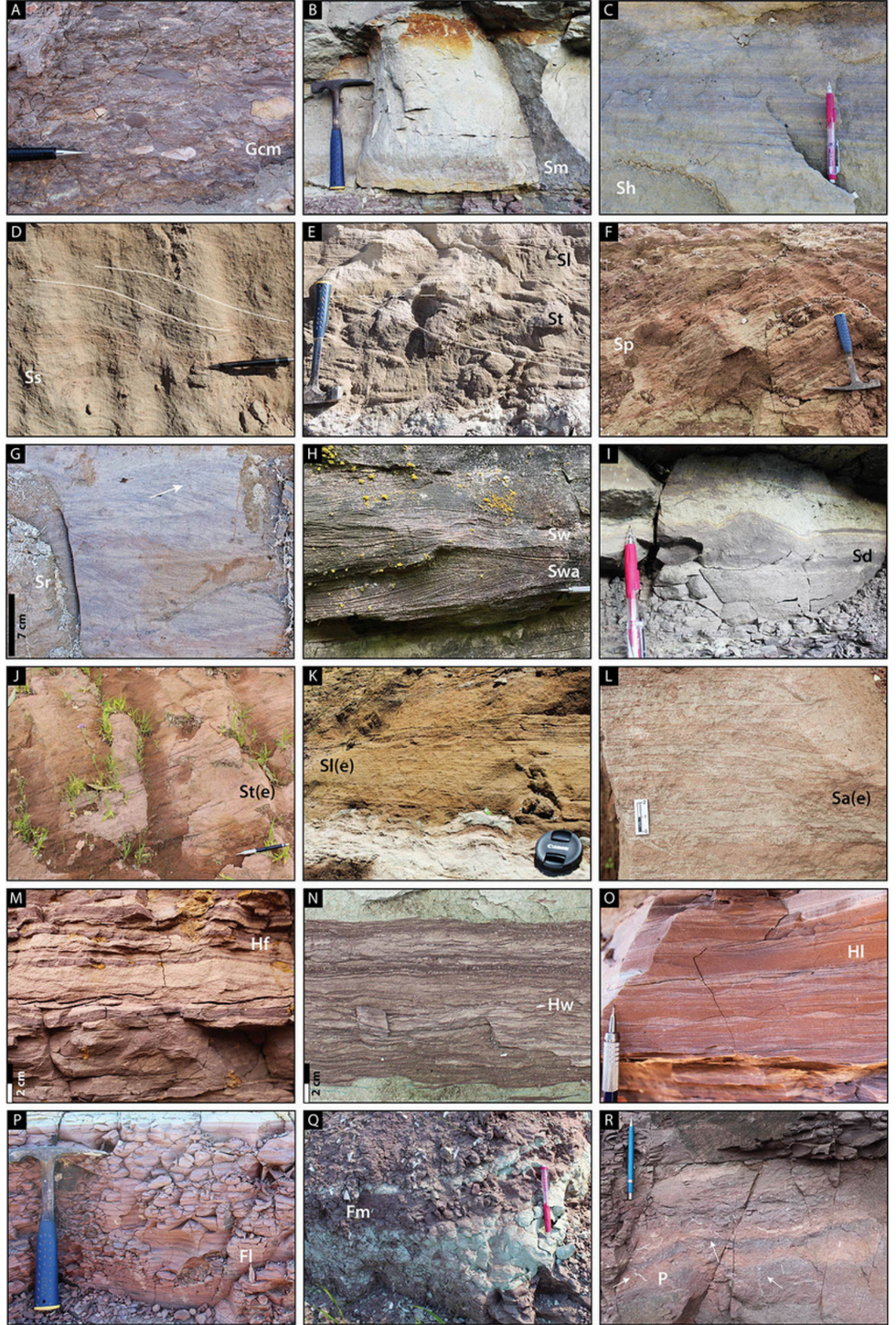
**Contact author* | momannageo@gmail.com
[1]Department of Geology, Federal University of Santa Catarina, Brazil
[2]Institute of Geosciences, Federal University of Rio Grande do Sul, Brazil
[3]Department of Earth & Planetary Sciences, Northwestern University, USA
[4]Postgraduate Program in Geology, Federal University of Santa Catarina, Brazil

- In endorheic basins, the climate directly influences sedimentation because atmospheric circulation patterns control the distribution of humid and dry air masses.
- The study area is located in the southern Brazilian states of Paraná and Santa Catarina.
- The study is field-based and consists of sedimentological, stratigraphic, and paleocurrent data analysis.

STUDY AREA



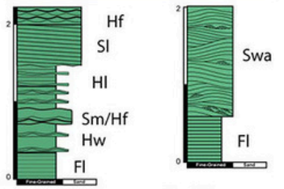
LITHOFACIES

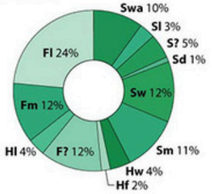


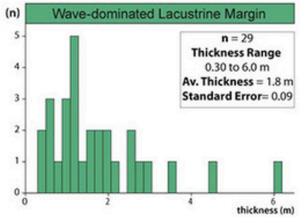
RIO DO RASTO FORMATION SUBSYSTEMS AND FACIES ASSOCIATIONS

LAKE DEPOSITS

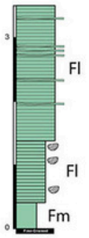
Wave-dominated Lacustrine Margin

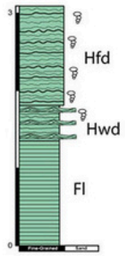


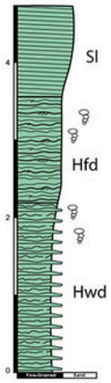


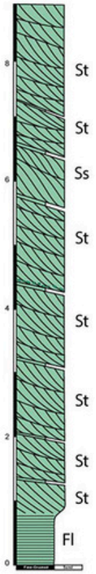


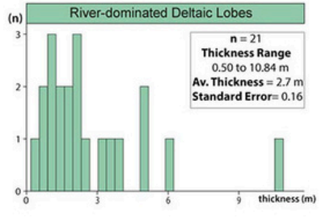
River-dominated Deltaic Lobes

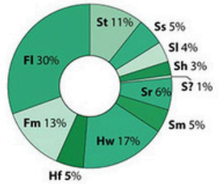






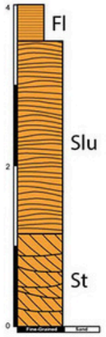


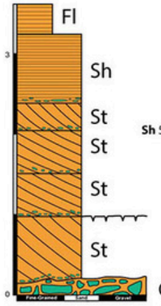


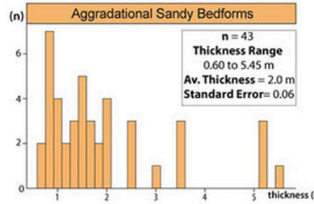


FLUVIAL CHANNELS

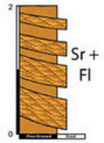
Aggradational Sandy Bedforms

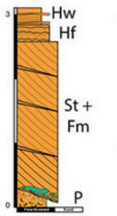


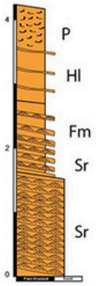


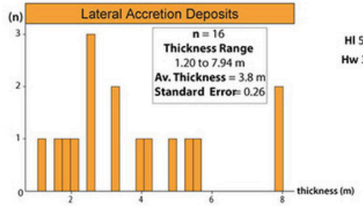


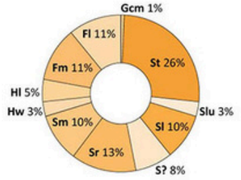
Lateral Accretion Deposits





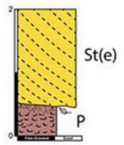




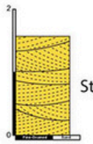


EOLIAN DEPOSITS

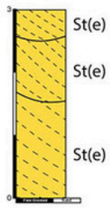
Eolian Dunes



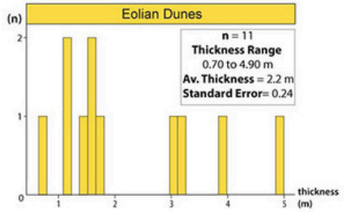
Isolated dunes



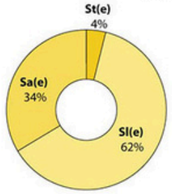
Superimposed small-scale eolian dunes

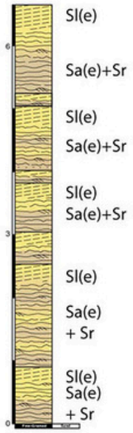


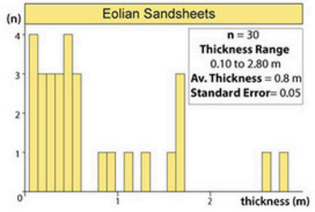
Superimposed medium- to large-scale eolian dunes



Eolian Sandsheets

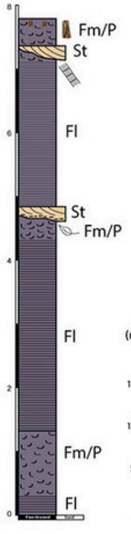


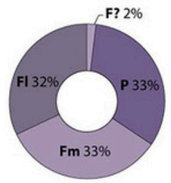


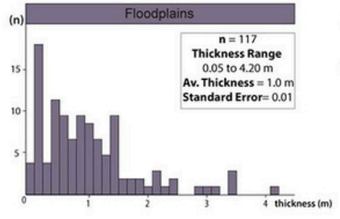


OVERBANK DEPOSITS

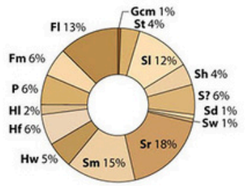
Floodplains

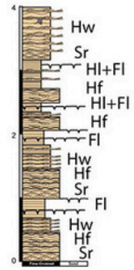


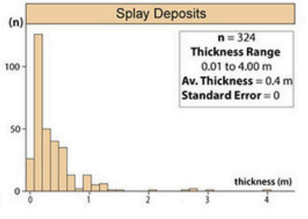


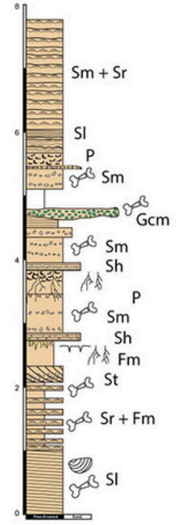


Splay Deposits





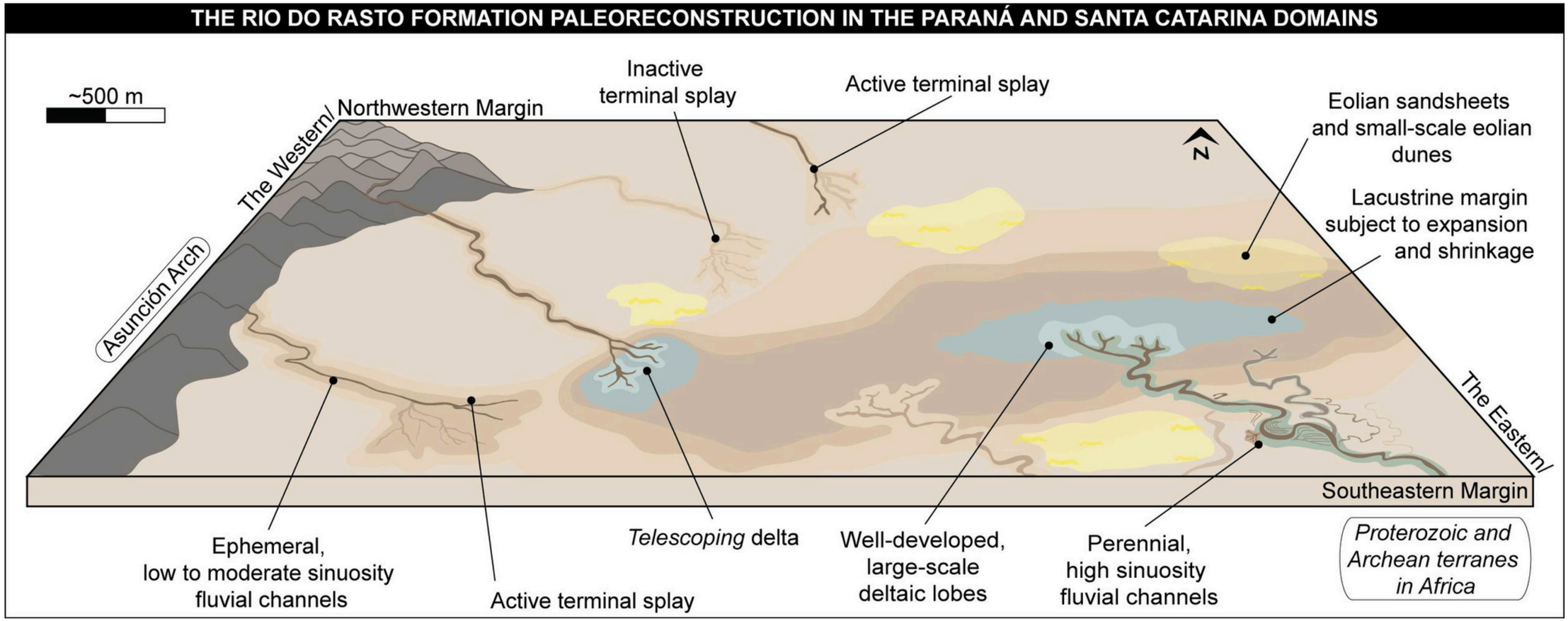




FACIES ASSOCIATION

DISCUSSION

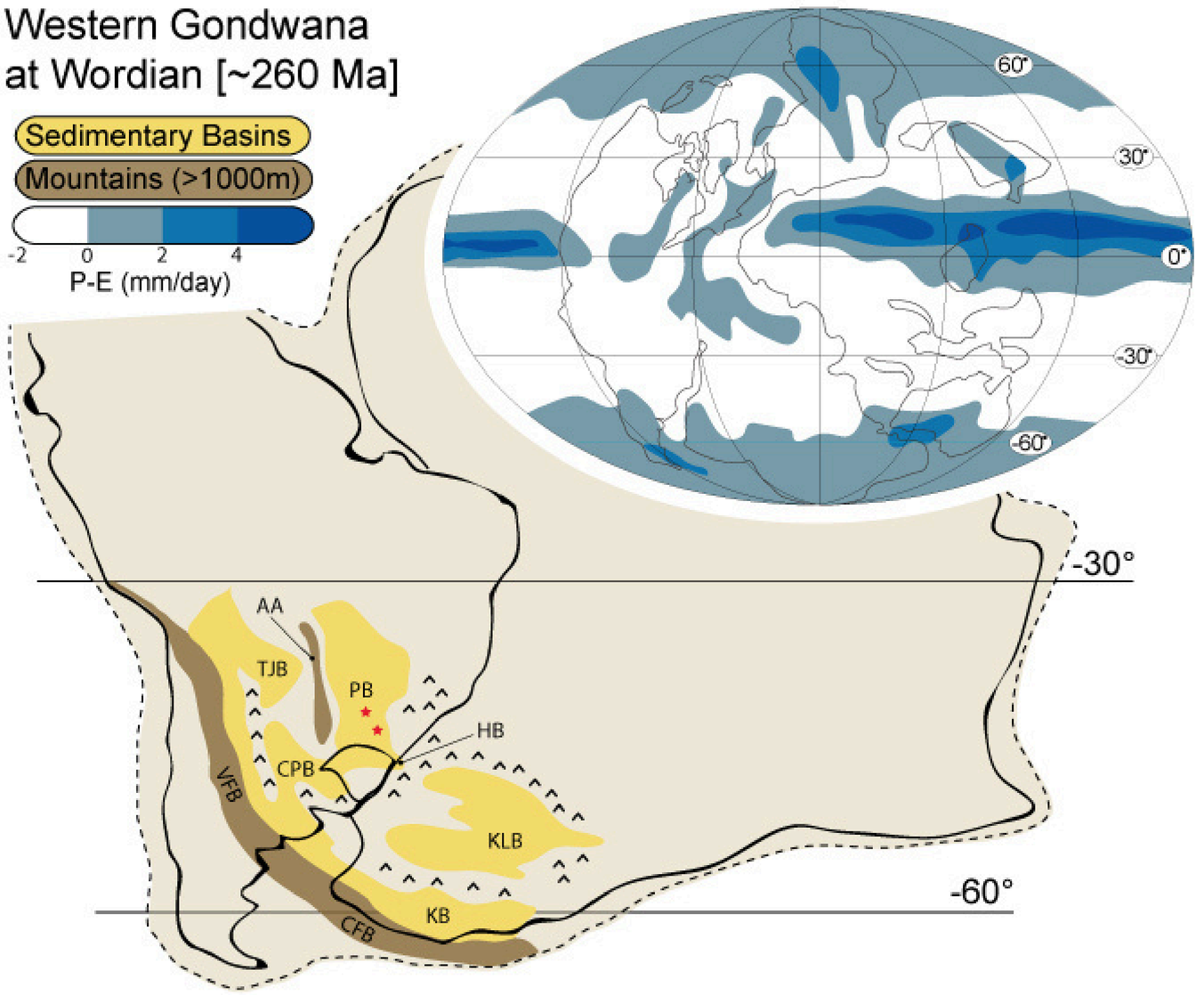
- Two main source areas influenced sedimentation in the Paraná and Santa Catarina states, each associated with a distinct discharge regime.
  - **Ephemeral fluvial channels** flow toward the **east-southeast (ESE)** → Asunción Arch (western margin).
  - **Perennial fluvial channels** flow toward the **north-northwest (NNW)** → mountainous areas of Africa to the southeast.



DISCUSSION

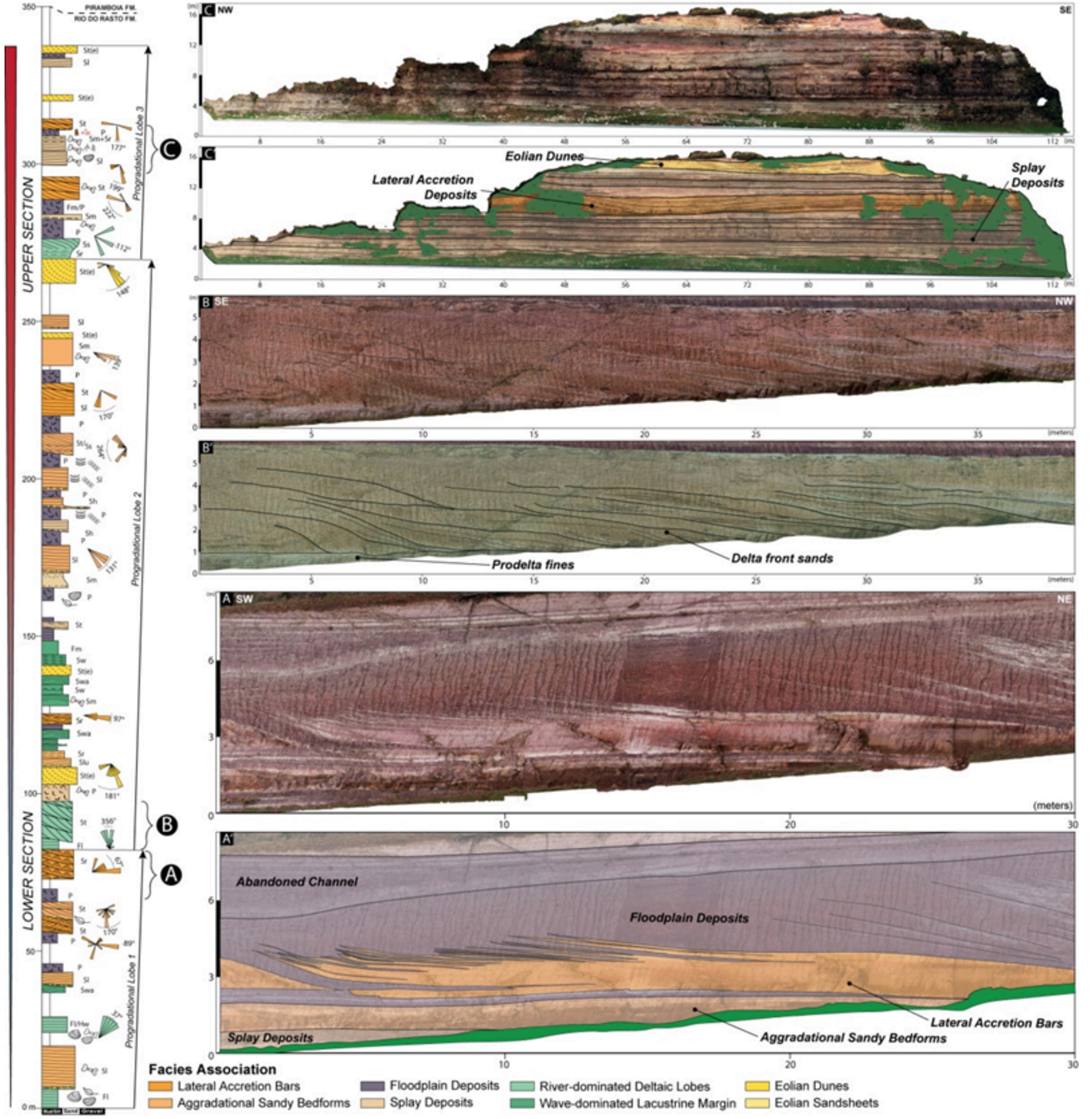
- Ephemeral fluvial channels originated from the Asunción Arch. Moisture carried by westerly winds did not reach the interior of Western Gondwana due to orographic barriers to the west, such as the volcanic chain, the Pampean Sierras, and the Asunción Arch.

- Perennial fluvial channels drained the mountainous areas of southern Africa. According to paleocirculation models by Gibbs et al. (2002), this region was located within a moisture center.

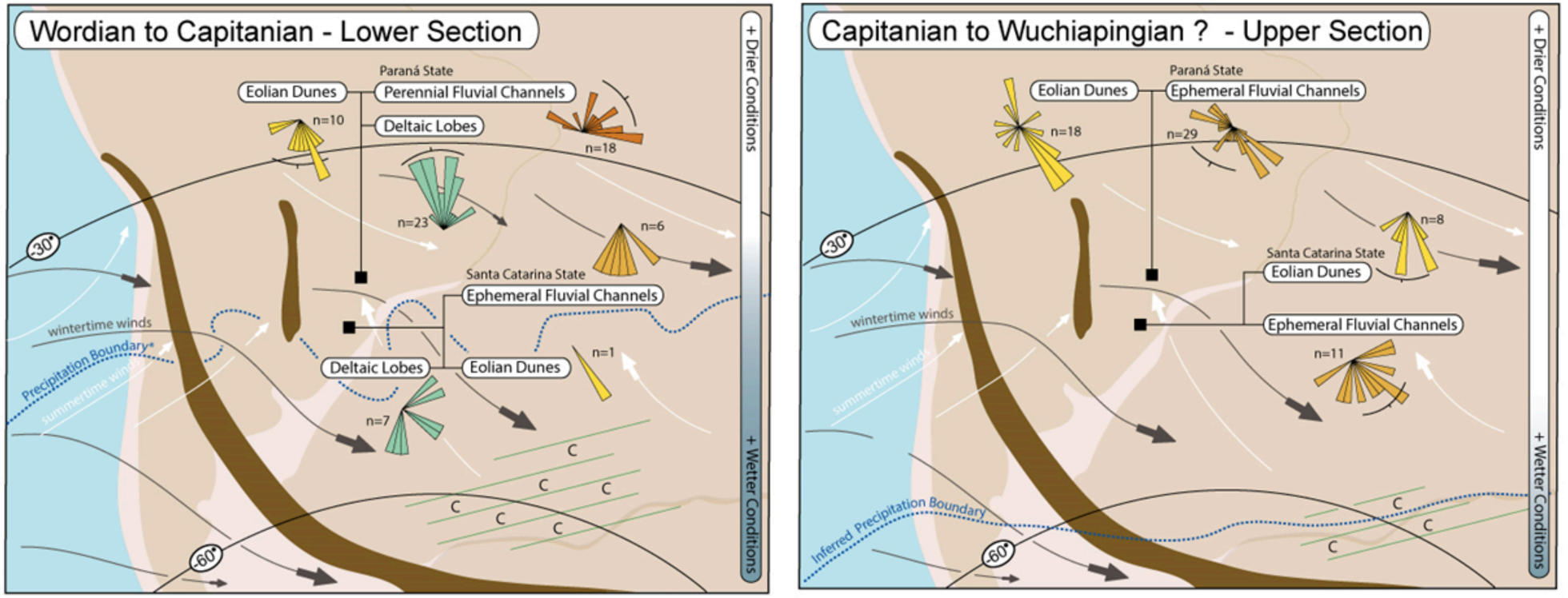


DISCUSSION

- Perennial fluvial channels, well-developed deltaic lobes, and lacustrine deposits dominate the lower part of the stratigraphic succession.
- Toward the top of the succession, these deposits are absent; instead, there is dominance of ephemeral fluvial channels, eolian deposits, pedogenetic horizons, and red beds.
- Similar architectural changes have been described in Middle to Late Permian deposits of the Karoo Basin.



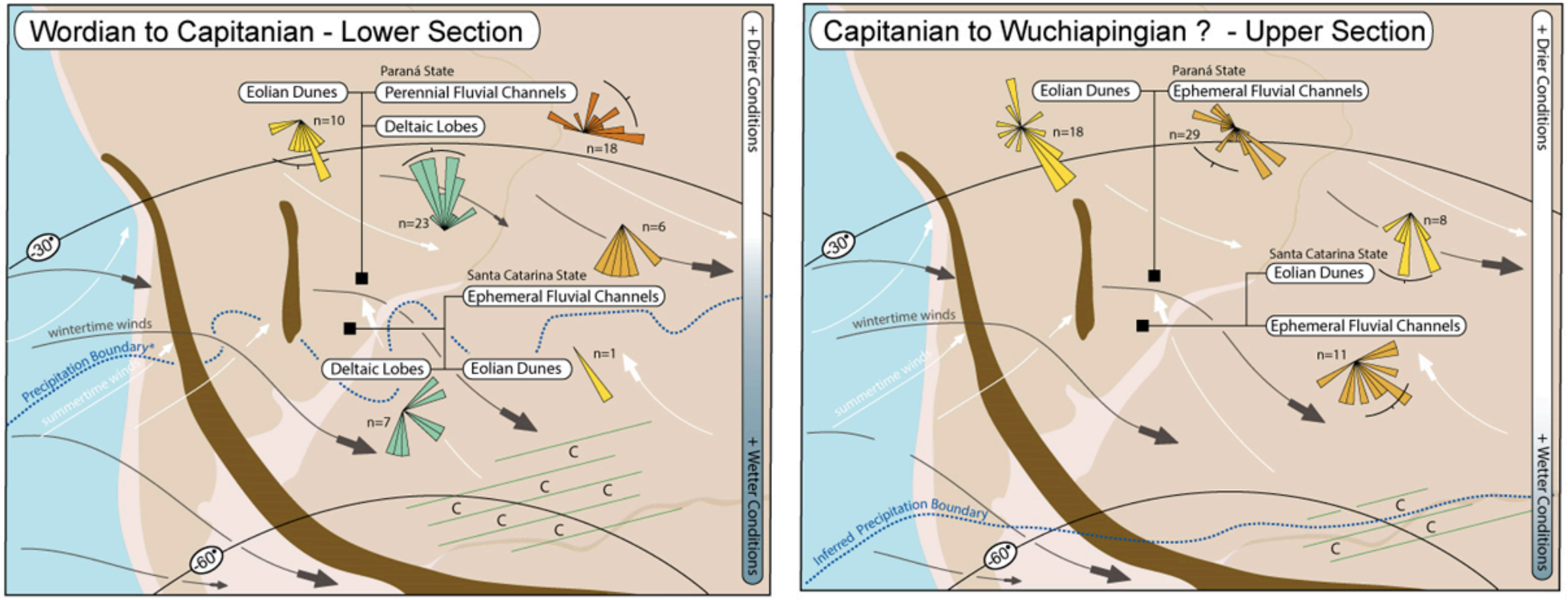
DISCUSSION



- Variations in fluvial architecture and the decline in diversity of fossil bivalve, conchostracan, and tetrapod assemblages suggest significant climatic changes in the interior of Western Gondwana.

- The absence of northward-flowing, perennial fluvial deposits in the intermediate to upper portion of the stratigraphic succession, coupled with the increased presence of ephemeral fluvial channels from the Asunción Arch towards the top, indicates a shift in the fluvial discharge patterns of the African source regions.

DISCUSSION



- The change in discharge observed in the African source areas is also evident in the Karoo Basin, resulting from the migration of the moisture center to southern regions of the globe.

- The migration of the moisture center intensified the already arid conditions in the interior of Western Gondwana.

ACKNOWLEDGMENTS

UFRGS
UNIVERSIDADE FEDERAL
DO RIO GRANDE DO SUL

EGU

UFSC

UFRGS
INSTITUTO DE
GEOCIÊNCIAS

PPGGeo UFRGS
Estratigrafia

L'ABGEO
RESERVATÓRIOS

PRH 14.1
Geologia do Petróleo

prh
Programa de
Recursos Humanos
da ANP

fapesc