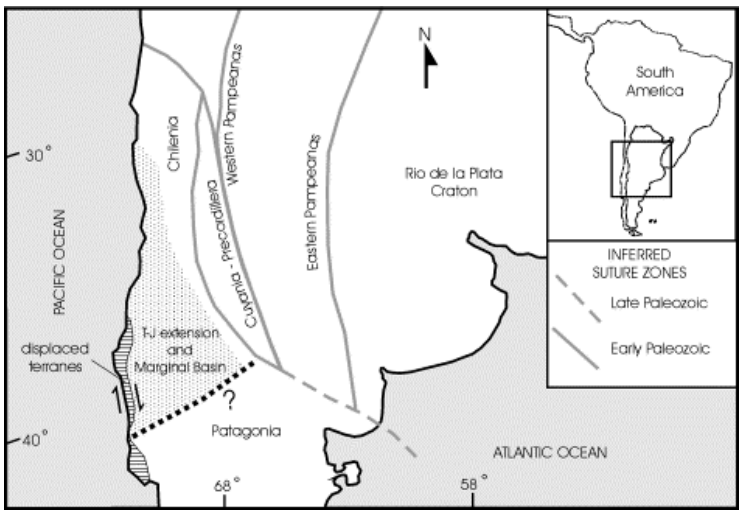
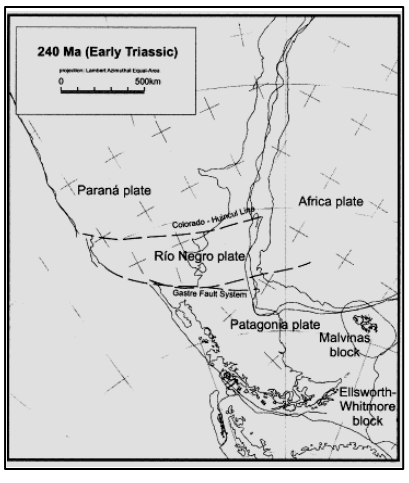
Rifting and Extension of the South American Continent From Late Triassic Through the Jurassic

Joshua Stroup

Area of Focus



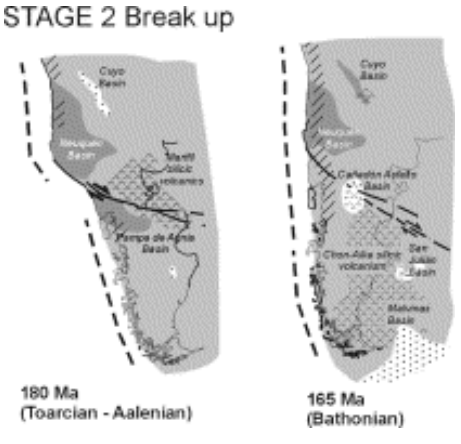
Strike-Slip movement



Micro plates move along each other as the plate rotates

Right lateral movement facilitates rotation

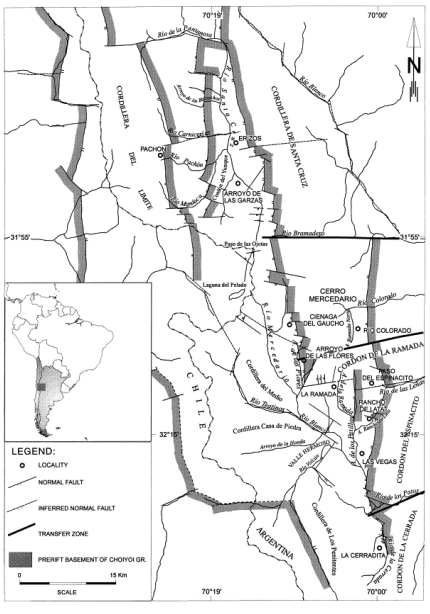
Movement on a sphere



Movement pulls plates apart

Plates accommodate this by thinning

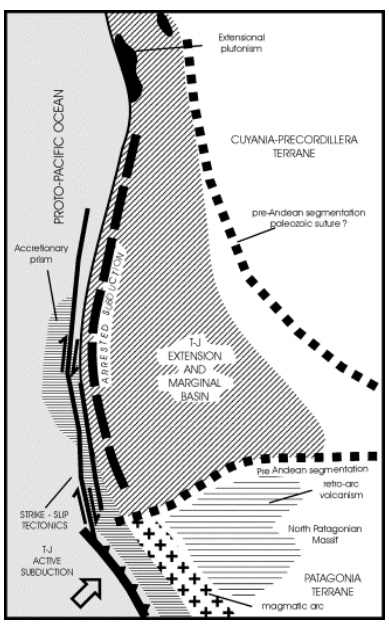
Thinning is accomplished through faulting



Faulting in the Rift Zone

Strike-slip faults form first

Normal faults separate blocks



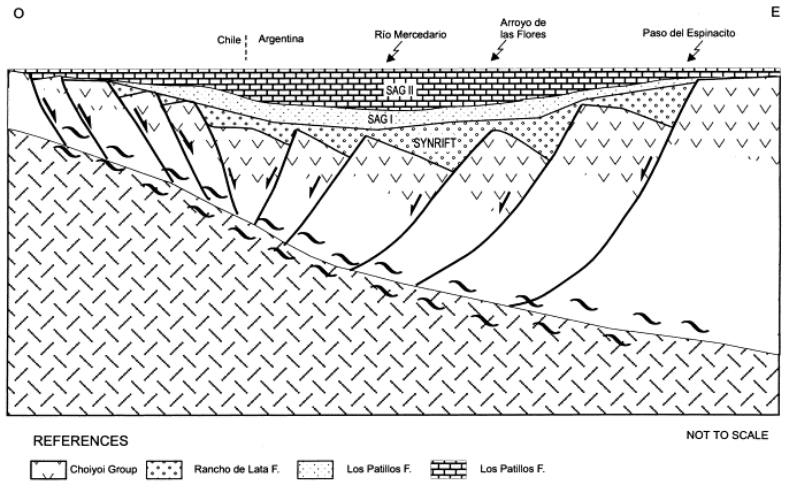
Tectonic Setting of Central South America

Active subduction in the south

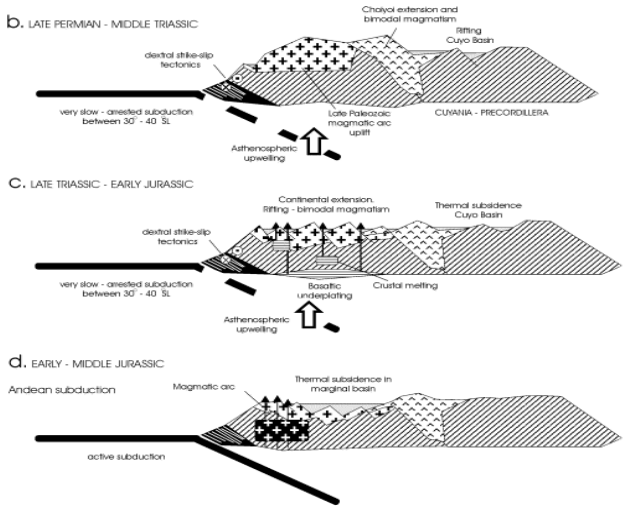
Arrested subduction in the center

Transform faults take over plate motion in the center and move accretianary prism along the plate margin

Generalized Conception of Mercedario Rift

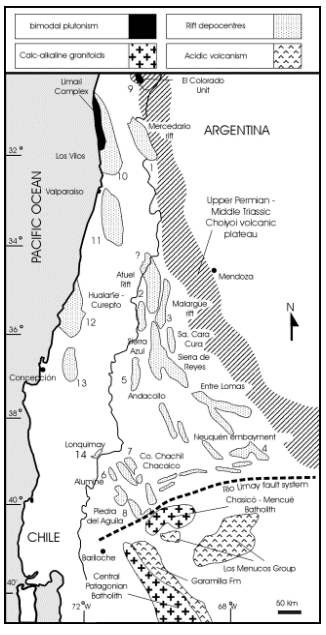


Tectonic Model



Mechanisms of Extension and Rifting

- Strike-slip movement causes rotation and extension in the crust
- Basaltic underplating and remelting of silisic rocks weaken the crust and lead to bimodal plutonism
- Lystric faults detach at depth and propogate to the surface as normal faults



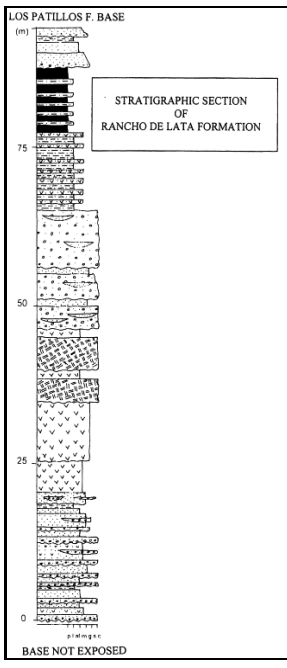
The Mercedario Rift Zone

Zone Occurs parallel to Paleozoic suture zones

Rifts become depositional centers for late Triassic and Jurassic sediments

Transform faults separate the rift zone from active magmatic zones to the south

To the north where extension is least, active zones of bimodal plutonism are found

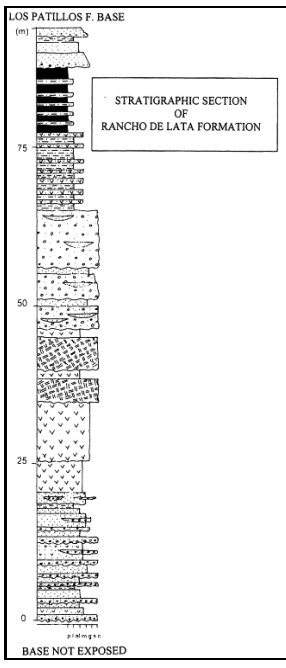


Lower Section

Chaotic conglomerates, red beds and tuffs locally separated by normal faults from the Choiyoi volcanic rocks

Pyroclastics include ignimbritic breccias, flow tuffs, plinian tuffs, and olivine dikes and sills are abundant in this unit

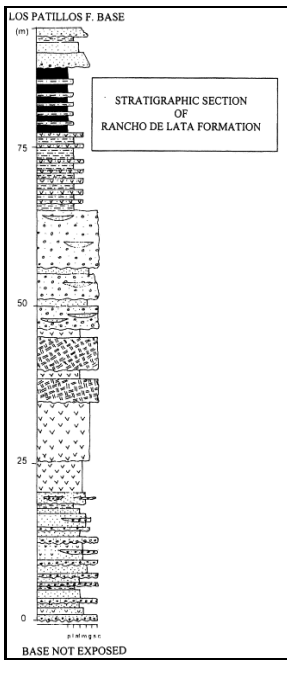
- Indicates continental environment
- Near the source of erosion
- Tuffs indicative of a large degree of explosive volcanism
- Olivine dikes and sills support bimodal plutonism



Middle Section

Basin fill silisic volcanics have been redeposited in alluvial fans, fluvial and lacustrine environments. These are overlaid by another ignimbritic episode that starts with welded tuffs and a large volume of altered material.

- The deposits here imply a deepening of the basin
- The welded tuffs indicate hot emplacement and therefore a nearby vent
- The large volume of altered material suggests continued volcanic activity and heat before lithification



Upper Section

Interbedded siltstones and calcareous limestones transition to dark gray shales and are topped by some ash siltstones and distal turbidites

- This is typical of a deepening basin
- A great reduction in ash and the inclusion of organic material implies the end of explosive volcanism

Putting It All Together

Strike-slip movement allows plates to move apart

Lystric faults allow the crust to spread and thin

Asthenospheric upwelling and crustal melting and cause bimodal plutonism

Magma rises through the thinned crust, and vent over an extended period of time

Sediments fill in the deepening basins

References

- Alvarez and Ramos, 1999, The Mercedario Rift System in the Principal Cordillera of Argentina: Journal of South American Earth Science v.12 (1) p. 17-31.
- Franzese and Spalletti, 2001, late Triassic-early Jurassic continental extension in Southwest Gondwana: Tectonic Segmentation and Pre-Breakup Rifting: Journal of South American Earth Science v.14 (3) p. 257-270.
- Franzese, et al., 2003, Tectonic and Paleoenvironmental Evolution of Mesozoic Sedimentary Basins Along the Andean Foothills of Argentina: Journal of South American Earth Science v.16 (1) p. 81-90.