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# Early Opening of the South Atlantic: Pre-Rift Extension and Episodicity of Seaward Dipping Reflector Sequence (SDRS) Emplacement on the Conjugate Argentine amd Namibia Continental Margins

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We will present extensive 2D multi-channel seismic reflection (MCS) and refraction data from the outer Argentine continental margin between 38°S and 48°S and the South-African continental margin between 22°S and 32°S.

On the Argentine margin the results document that the Early Cretaceous continental break-up and initial sea-floor spreading were accompanied by large-scale, transient volcanism emplacing voluminous extrusive constructions on the conjugate outer continental margins of the South Atlantic.

On the Argentine margin we interpret three major tectono-volcanic crustal units beneath a thick sedimentary succession (Hinz et al., 1999) of Cretaceous and Tertiary age (Fig 1):

- Pre- and Syn-rift basins are present on the outer shelf.
- Seaward of these basins a deeply buried, 60 – 120 km wide and several thousand metres thick volcanic wedge of seaward-dipping reflectors (SDRS) associated with the distinct magnetic Anomaly G is present.
- the seaward oceanic crust of Cretaceous age shows clear and disctinct Moho reflections 2.5 - 3 s reflection time below the top of the igneous basement deepening landward towards the SDRS wedge to > 4 s.

The final break-up of the South Atlantic at approximately 132 Ma was preceded by a phase of crustal extension in Permian times. This phase lead to the formation of 5 – 30 km wide and up to 2 s reflection time deep half grabens on the Argentine margin. The dominant strike of these grabens is in a NW - SE direction. From drilling results in the Colorado Basin we infer an Early Permian age for this extensional episode.

Between 40°S and 44°S the internal structure of the SDRS wedge is subdivided into at least three separate sequences (Fig. 2). Each of these sequences is bound by strong main unconformities and shows distinct variations in reflection characteristics (reflector curvature, reflector length/continuity). The outer seaward wedges are build up by shorter reflectors indicating an emplacement under submarine conditions. Whereas the emplacement of the inner wedges took place during subaerial conditions.

From the magnetic data we were able to deduce that the emplacement of the SDRS was diachronous. In the South the emplacement started earlier and the wedges are getting younger to the north. With the dense grid of new magnetic data in the south we were also able to identify magnetic chrons M7 to M10A which were formerly not identified.

In addition, our refraction/wide-angle reflection data on both the Argentine and the Namibian (Bauer et al., 2000) margins show thick high velocity (> 7 $kms^{-1}$) bodies beneath the whole area that comprises superimposed SDRS wedges. These high velocity middle to lower crustal sections are typical for volcanic margins. From all these observations we infer that the formation of the dipping layers along the volcanic margin of the South Atlantic was episodic and diachronous. It started in the South in the vicinity of the Falkland-Agulhas Fracture Zone over 3000 km away from the Tristan da Cunha Hotspot and moved gradually to the north.

Fig. 1: Sediment distribution along the outer shelf, slope and abyssal plain off Argentina.

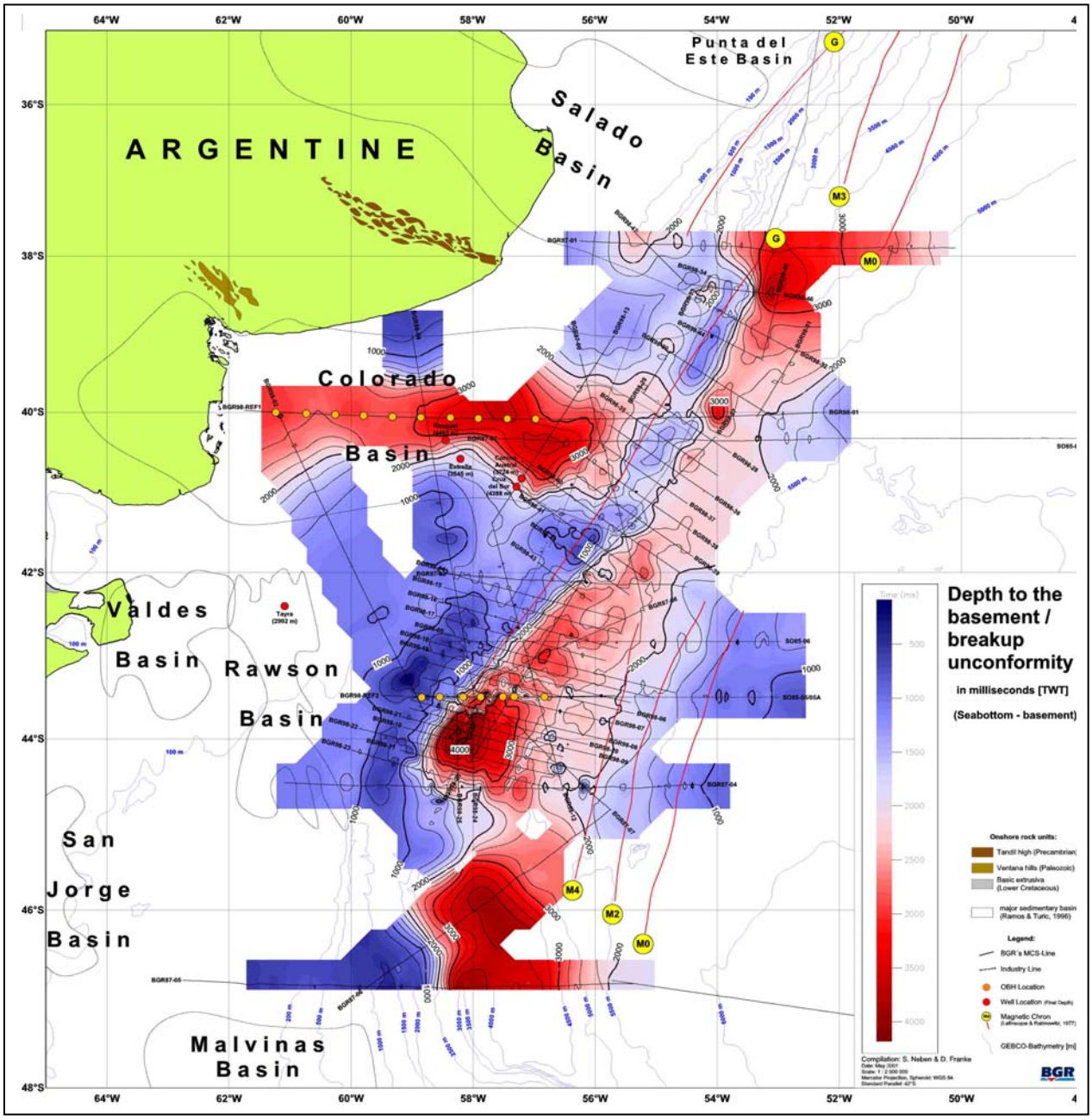
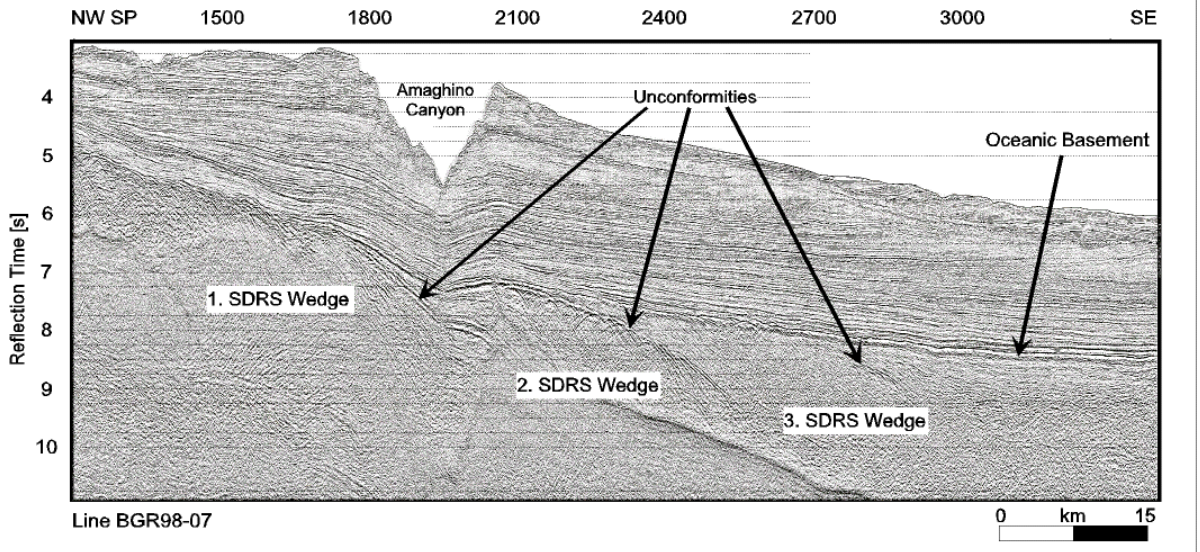


Fig. 2: Seismic section across the Argentine shelf at ~43°30'S.




Seismogram section (migrated) of line BGR98-07 (at ~ 43°30'S) showing three distinct consecutive wedges of SDRS separated by strong unconformities, the adjacent seaward upper crustal unit consists of a sequence of flatlying basaltic flows.

References:

Bauer, K., Neben, S., Schreckenberger, B., Emmermann, R., Hinz, K., Fechner, N., Gohl, Schulze, A., Trumbull, R.B. & Weber, K. (2000): Deep Structure of the Namibia Continental Margin as derived from integrazed Geophysical Studies. *J. Geophys. Res.*, **105**, pp. 25.892-25.853.

Hinz, K., Neben, S., Schreckenberger, B., Roeser, H.A., Block, M., Gonzalvez de Souza, K. & Meyer, H. (1999): The Argentine continental Margin north of 48°S: Sedimentary successions, volcanic activity during breakip. *Mar. Petrol. Geol.*, **16**, pp. 1-25.