

Argentina Sedimentary Basins **(Claromeco & Colorado** **Geographic Basins)**

Conclusions:

After nine dry exploration wells made in the onshore of the Colorado basin (basin associated with the Atlantic opening), which all encountered red sandstones without any petroleum potential, it is normal that the consultants working for the “Secretaria de Hidrocarburos y Minería de la República Argentina”, considered that this onshore did not have significant oil potential. They also considered the underlying basin, i.e., the Claromeco basin (Permo-Carboniferous foredeep basin) had no potential. They admitted, as working hypotheses that: (i) The metamorphism encountered in the folded belt (Ventana Hills) would also be found in the foredeep up to the Siluro-Devonian outcrops of the Tandill Hills and (ii) No potential trap could be found in this foredeep. Despite this, some oil companies have taken exploration blocks there. Although the metamorphism hypothesis put forward by the consultants (Intera Information Technologies) has not yet been refuted, due to a lack of drilling, the hypothesis of a total absence of traps in the foredeep of the Claromeco basin was totally refuted by the interpretation of the seismic lines shot by Bidas.

1) Location of the Claromeco Basin

Geographically, the Claromeco onshore basin is located west of Mar del Plata, approximately 400 km from Buenos Aires. Geologically, the Claromeco basin corresponds to a Permo-Carboniferous foredeep basin, which, in large part, is surmounted by the Colorado basin, which formed in response to the breakup of the Gondwana which preceded the opening of the South Atlantic.

2) Exploration blocks

The Claromeco onshore basin is covered by four exploration blocks: CCL-1, CCL-2, CCL-3 and CCL-4. These blocks were offered at auction, in June 1992, in the third Round of the Argentina plan. These blocks were considered by the consultants working for the “Secretaria de Hidrocarburos y Minería” as having a very low oil potential. The reasons given were: (i) The uncertainty on the degradation of permo-carboniferous sediments (diagenesis), where, in principle, potential source-rocks are possible and (ii) The absence of potential traps. These predictions were based on the study of the folded belt outcrops in the region of the Ventana Mountains, and on a geologic section between these mountains and the Tandill Hills. Despite unfavorable geological predictions Bidas took these blocks in the hope that the diagenesis decreases as one moves away from the folded belt and that a seismic survey will highlight potential traps in the foredeep.

3) Geological Context of the Claromeco Basin

The geologic section between the Ventana Mountains and the Tandill Hills shows above a Precambrian substratum a westerly dipping monocline series assumed to be as Silurian-Devonian. These sediments, which outcrop in the eastern section of the section and in the Tandill Hills, are part of an old divergent continental margin developed by thermal contraction over Proterozoic rift-type basins, which are very clearly visible on the seismic data. An angular unconformity (enhanced unconformity) separates the rift-type basins from the divergent Silurian-Devonian margin. The sediments of the divergent margin are metamorphosed and, therefore, no petroleum subsystem is possible there. Their upper limit is marked by an important unconformity associated with a flexural subsidence which marks the beginning of the Permo-Carboniferous foredeep basin, which is, closely, linked to the aggregation of the Pangea supercontinent.

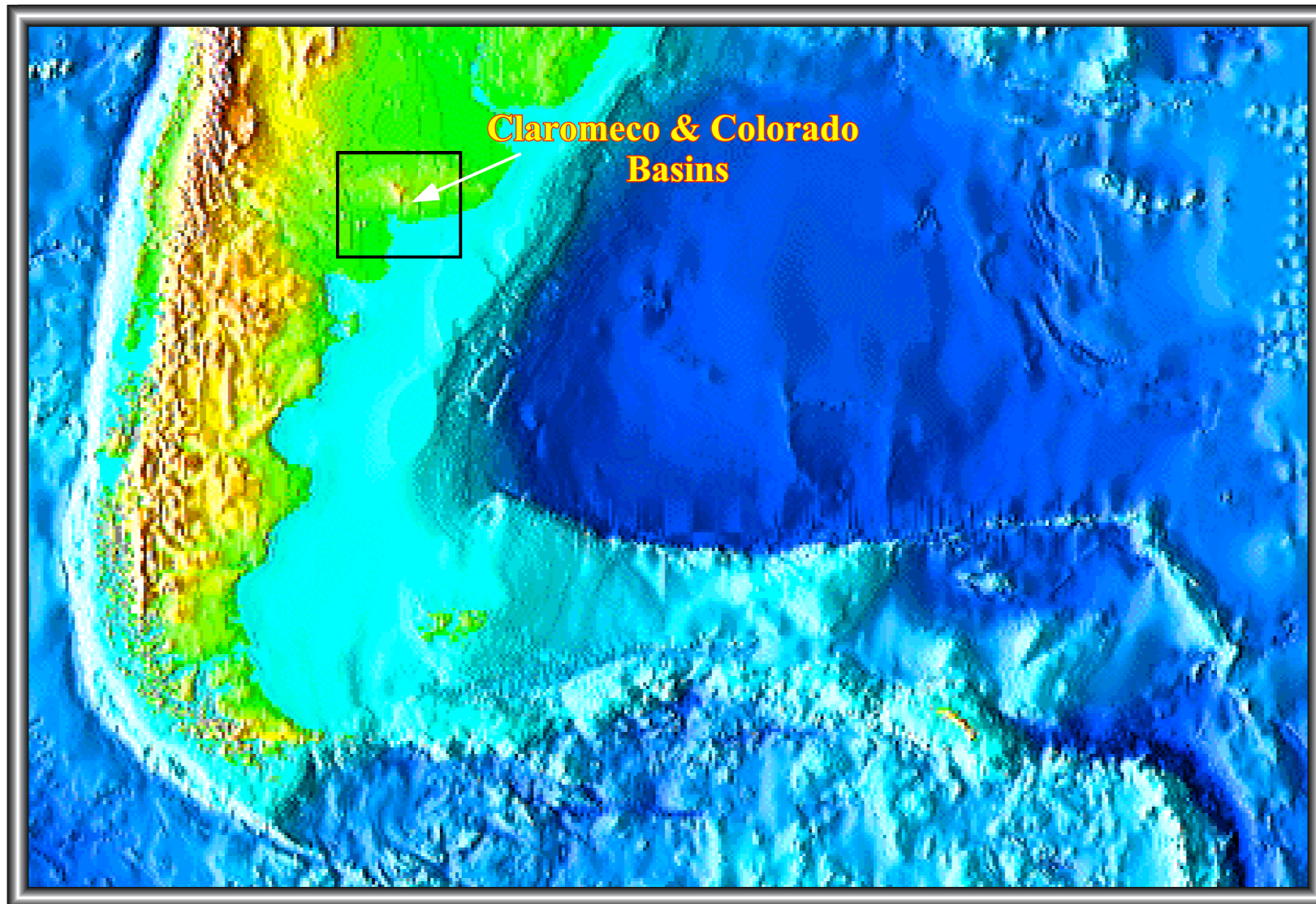
The geological context of the Claromeco basin has been very well known to the scientific community since the 1920s. It has often been cited by advocates of continental drift as one of the proofs, if not of continental drift, at least of Pangea's rupture. Indeed, as we know, the vast majority of geoscientists agree to correlate the mountain belt in the south of the Claromeco basin with the folded belt in Cape Town, South Africa. Likewise, the Claromeco foredeep basin is only the spatial continuation of that found to the north of the folded belt of the Cape, whose petroleum interest is, to my knowledge, non-existent. The Colorado basin that we have drawn on a few figures belongs to a whole different geological context. Thus, if the former is associated with the aggregation of the Pangea supercontinent, the Colorado basin, on the contrary, is associated with the rupture of the Pangea. For documentation, in these notes we have added the paleogeographies of the Wenclokian, that is, about 450 Ma ago, Famienian (365 Ma) and Anesian (248 Ma ago). These figures clearly show: (i) The divergent margin during the Silurian and much of the Devonian ; (ii) The beginning of the sea closure, which produced the great unconformity at the end of the Devonian and (iii) The aggregation of the different continents, which, a few million years later, would give the supercontinent Pangea. The Tethys Sea as well as some microcontinents are also clearly visible. Subsequently, the rupture of the southern part of Pangea will initiate and several rift-type basins surmounted by divergent margins will develop, between which the Colorado basin.

4) Seismic Lines

The problem of the metamorphism of the Permo-Carboniferous sediments of the foredeep remains, as yet, unanswered. For some, the metamorphism decreases as one moves away from the folded belt and it is possible that a generating petroleum subsystem exists far from the fold belt. However, others consider that the decrease in diagenesis was not sufficient for the exclusion of potential generating subsystems. According to K. Miura the ground samples are very altered and the results of the analyzes are very contradictory. This question will be resolved soon because, like the seismic lines that Bidas drew, it was possible to highlight several structural traps of significant size. Bidas has, probably, decided to do an exploration well. Personally, we are not very optimistic, we believe that the Permo-Carboniferous sedimentary series is at least anchimetamorphic. As we said, Bidas must use the Bernard Kubler criterion, in other words the Kubler index, as we did in Angola, several years ago, in order to determine the petroleum potential of the Karoo clays. In fact, on X-rays, if illite (autigen) is crystallized, which marks the start of anchimetamorphism, the sediments can no longer generate hydrocarbons.

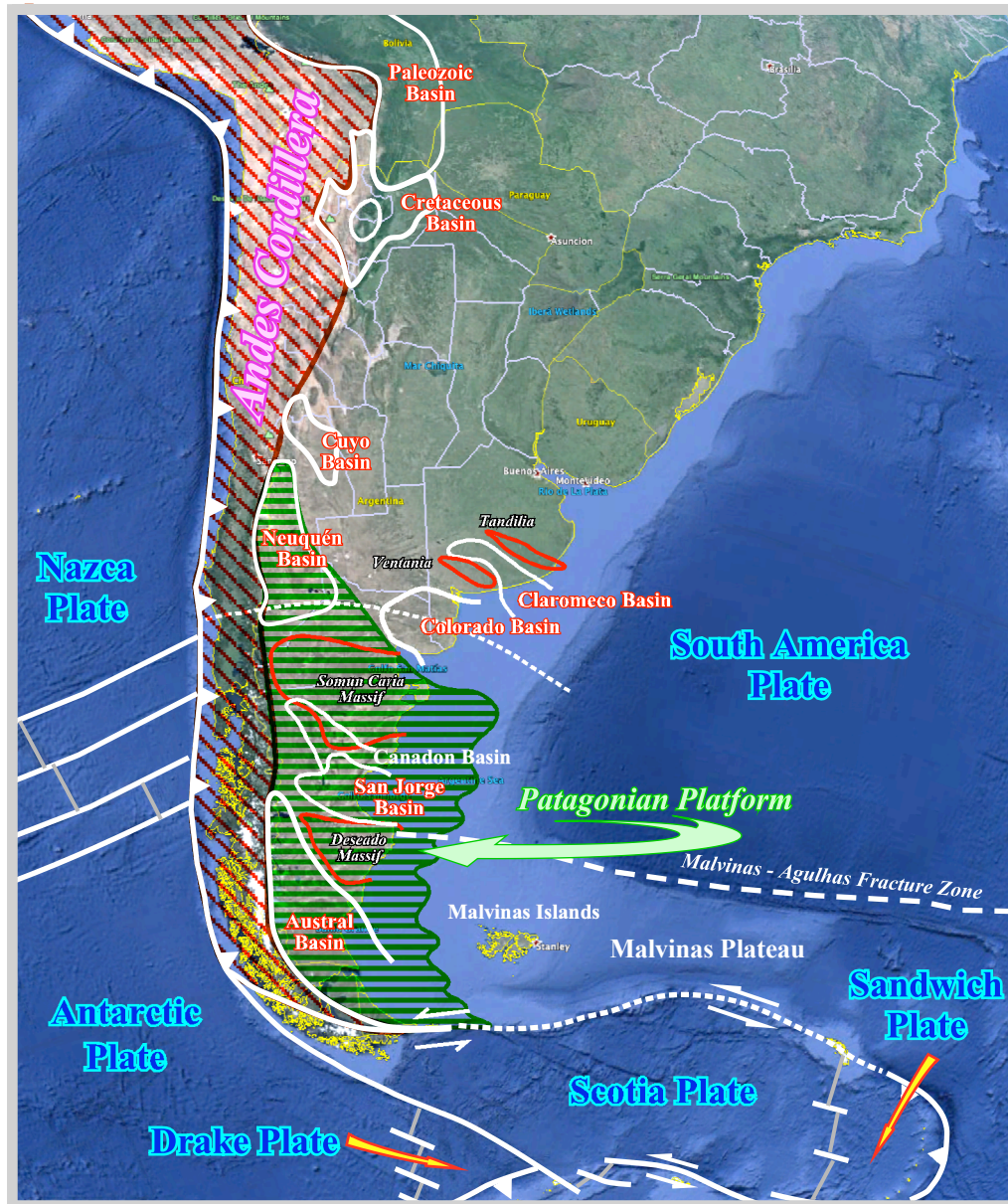
We have added to these notes several seismic lines from the Colorado onshore basin so that we can see the difference between a foredeep basin and a rift-type basin surmounted by a margin. Unfortunately, Colorado's rift-type basins appear to be completely filled with red sandstones.

Location Map

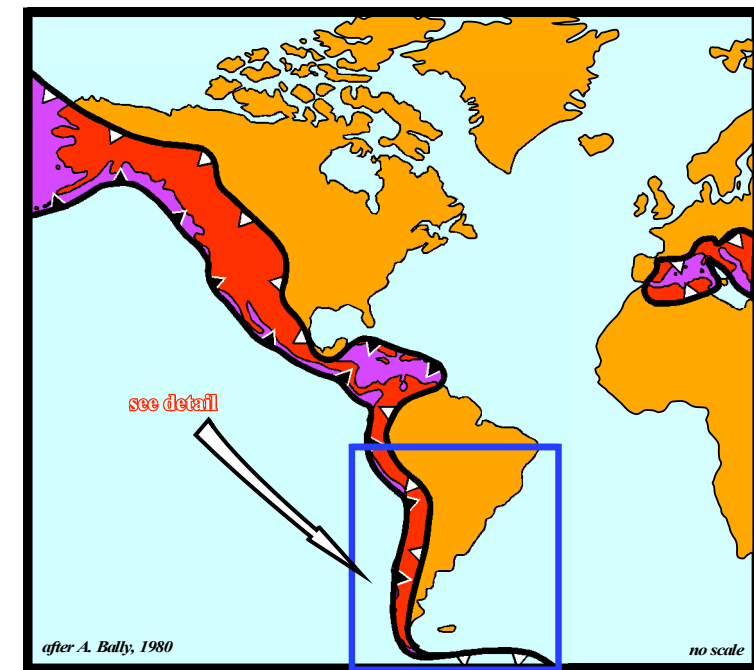


Claromeco basin is located in Argentina, largely below the Colorado basin. Wells drilled in the Colorado offshore have, often, encountered Paleozoic sediments belonging to the Claromeco basin. The quality of the seismic data does not make it possible to follow the continuation of the basin seaward.

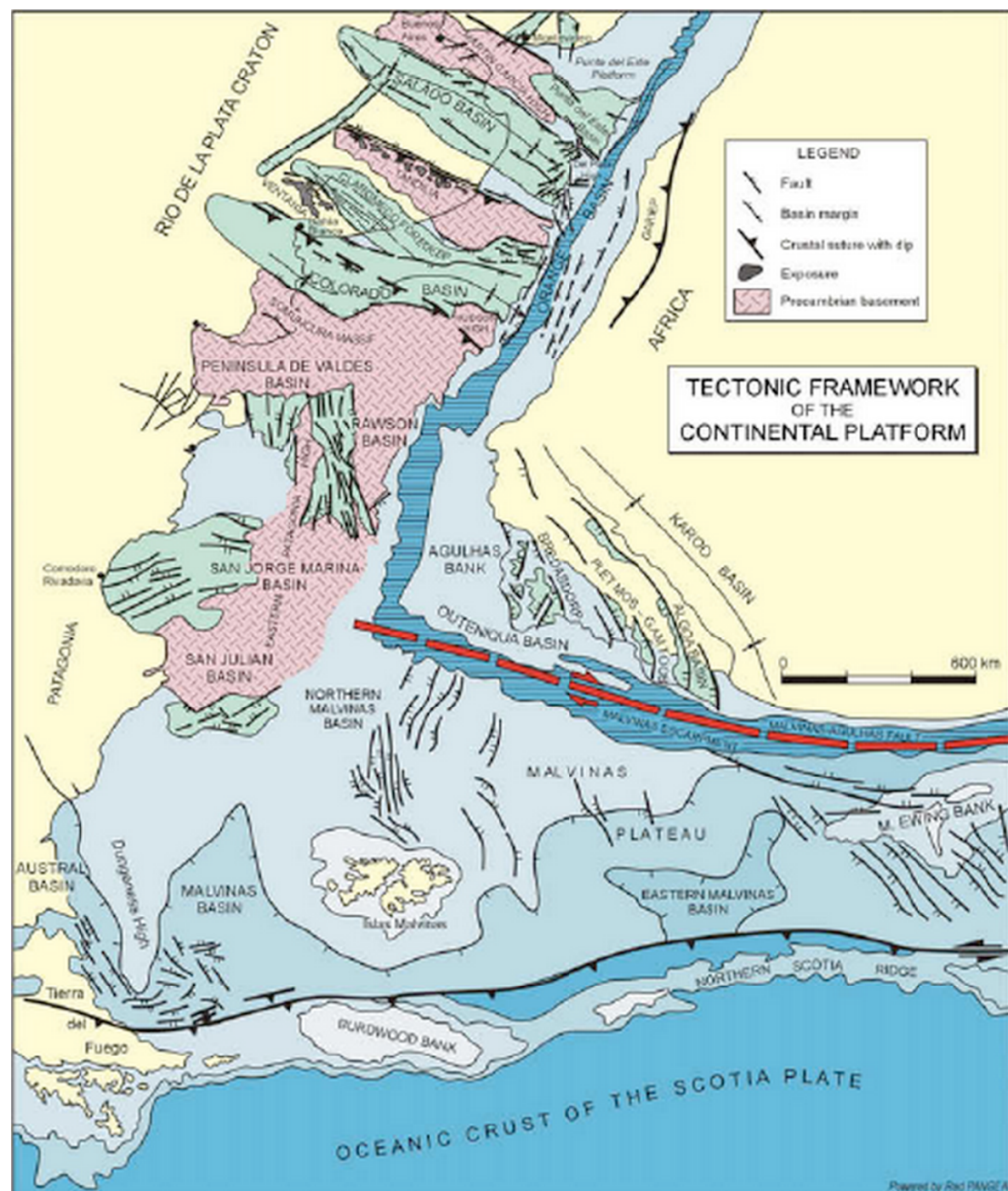
Regional Macrotectonic Features



Meso-Cenozoic Megasuture

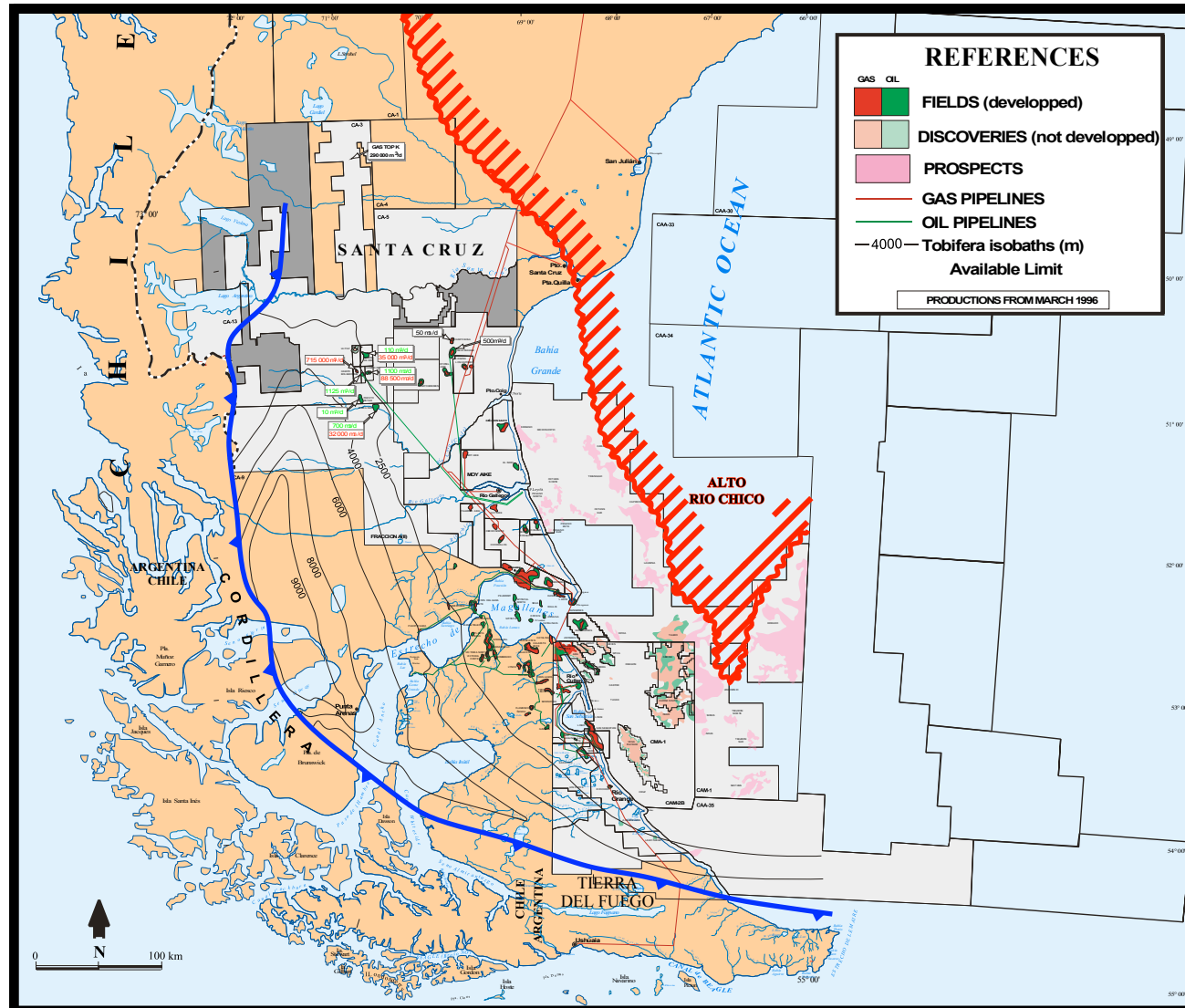


- Subduction B (Benioff)
- Subduction A (Ampferer)

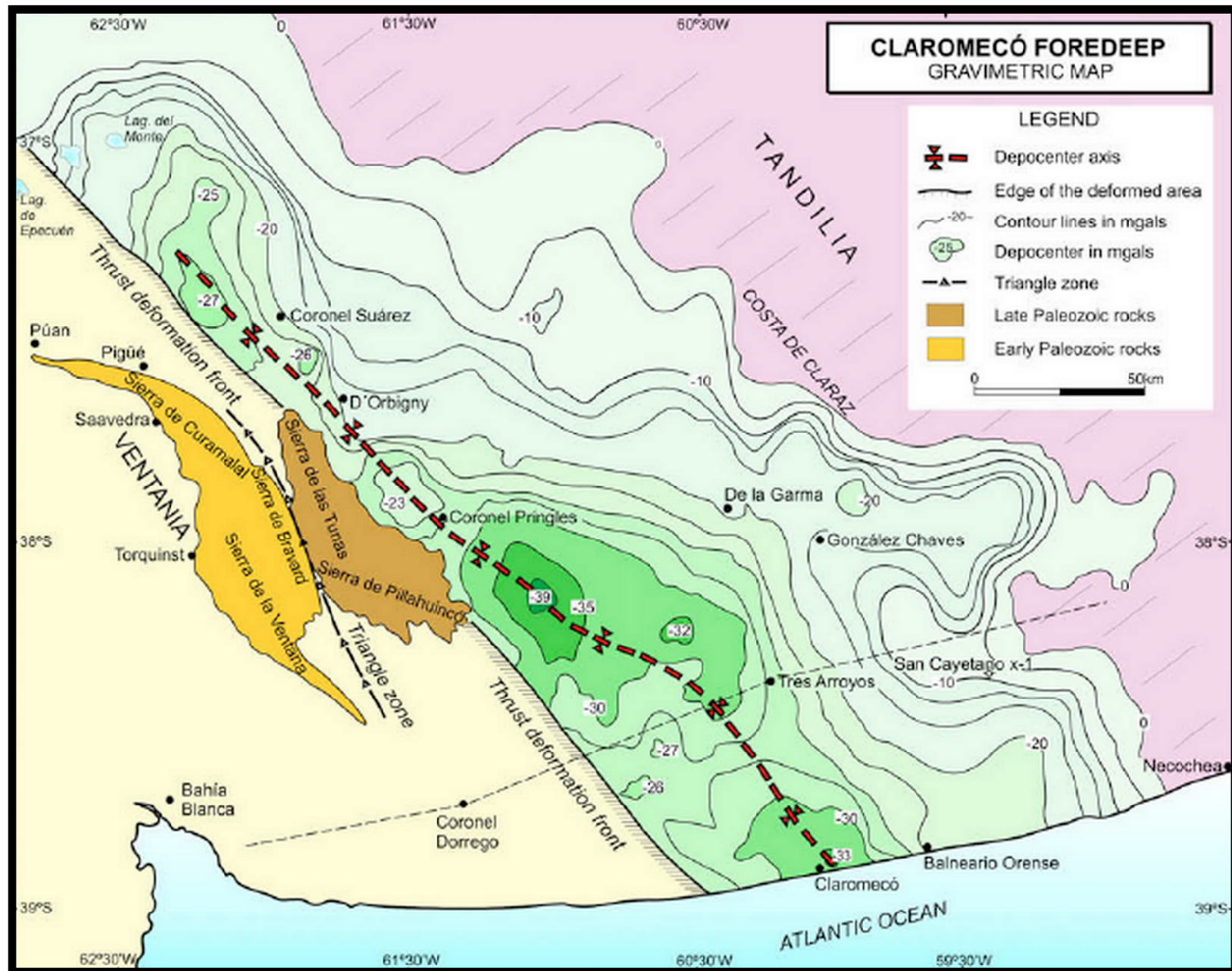


Austral Basin

Oil & Gas Fields /Discoveries /Prospects / Pipelines



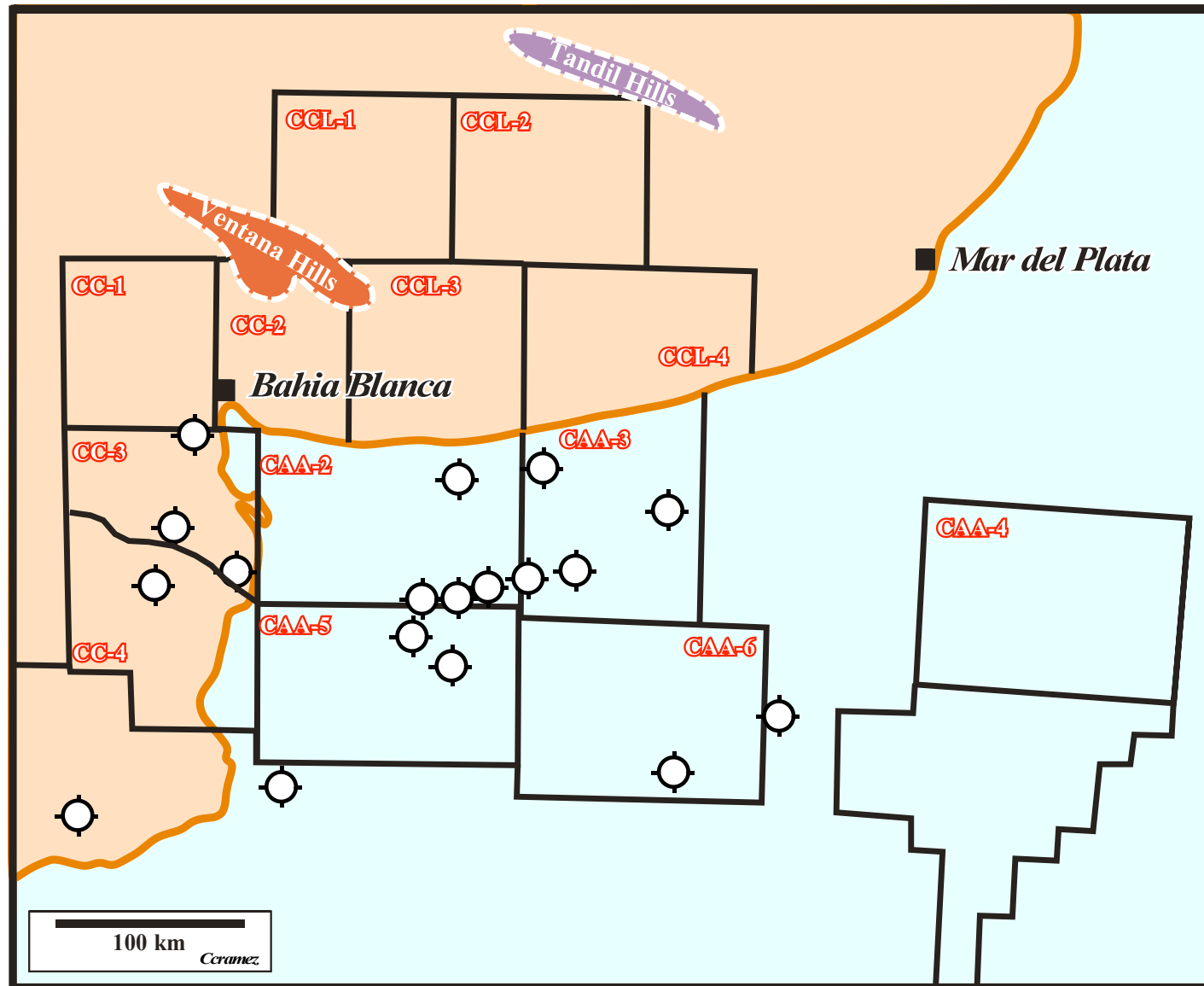




The different units of the Ventania fold and thrust belt associated with the Claromecó foredeep, formed by crustal loading in Early Miocene to Middle Permian. Note the location of the thrust deformation front and the axis of the > 10 km foredeep (based in Ramos and Kostadinoff, 2005).

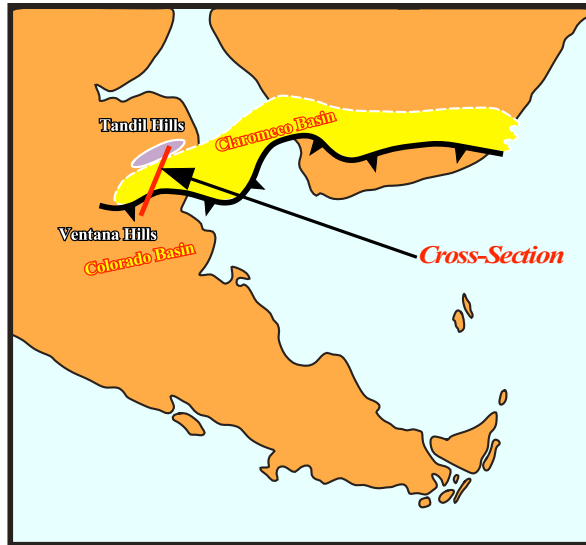
Claromeco & Colorado Basins

Location Map

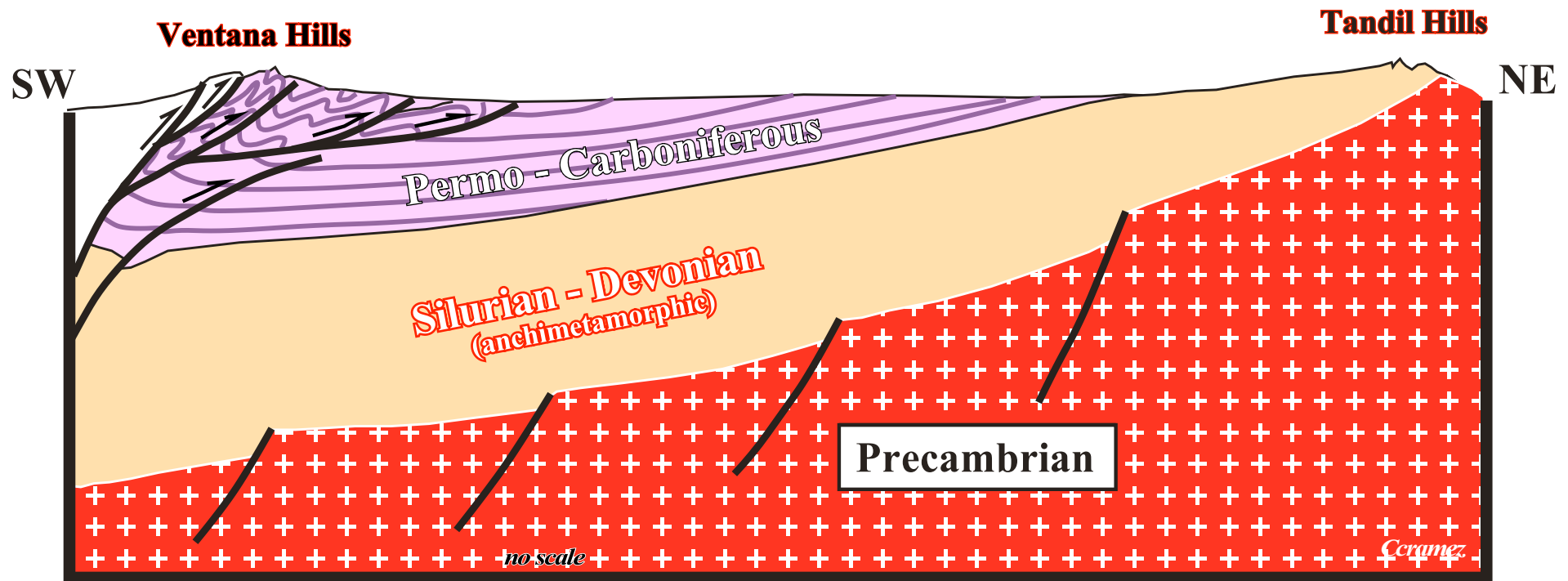


The blocks taken by Bidas in the Claromeco basin, in other words the blocks CCL-1, CCL-2, CCL-3 and CCL-4, are located between the mountains of Ventana (in red) and the Silurian-Devonian outcrops that form to the east the hills of Tandil (in purple). The seismic lines shown in these notes are located in this figure.

Location Map

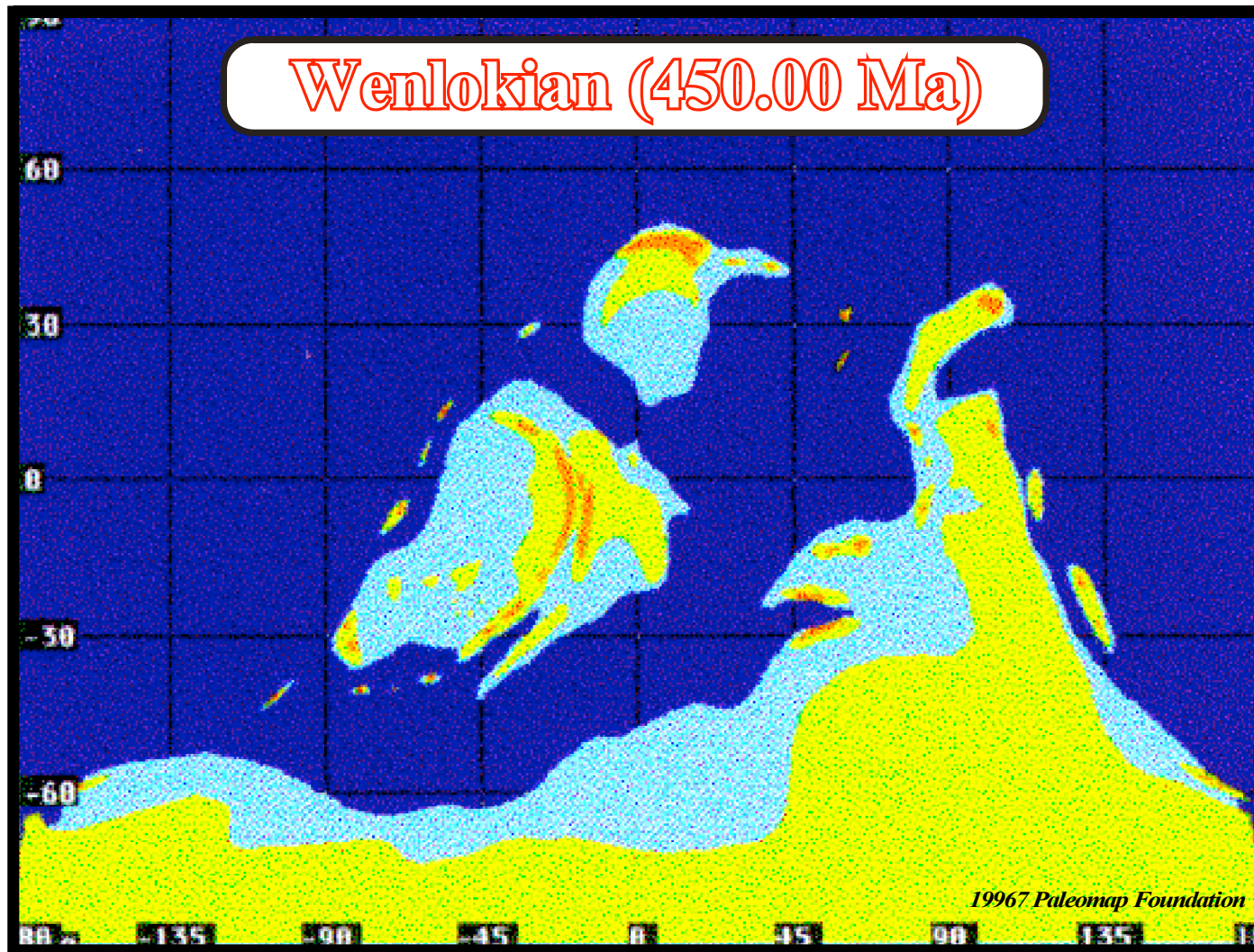


Claromeco Basin Cross-Section



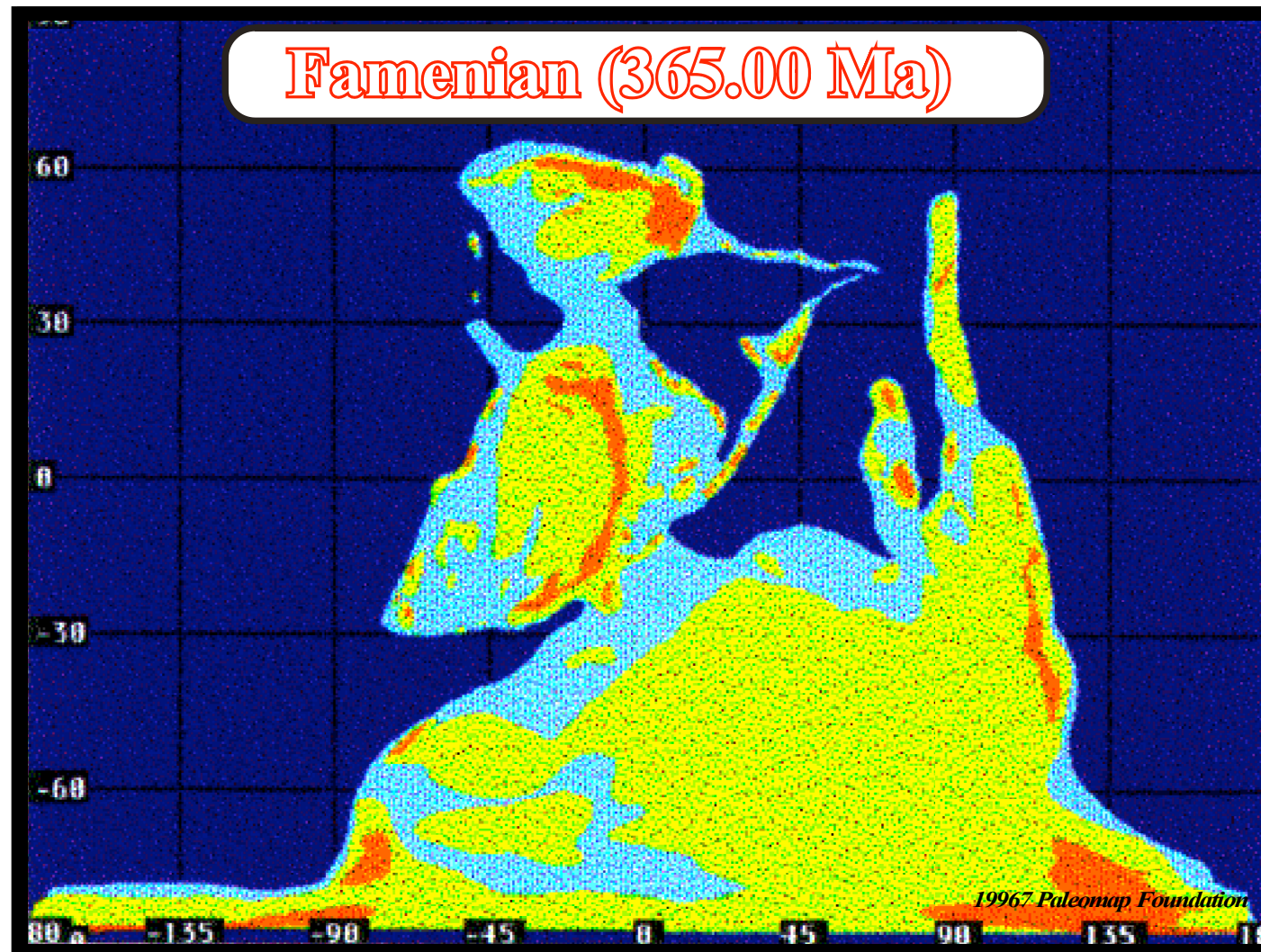
Geological section of the Claromeco basin, between the mountains of Ventana and the hills of Tandill proposed by Intera. An important unconformity is admitted between the divergent Silurian-Devonian margin and the Permo-Carboniferous foredeep. The absence of traps in the foredeep is obvious.

Paleogeography



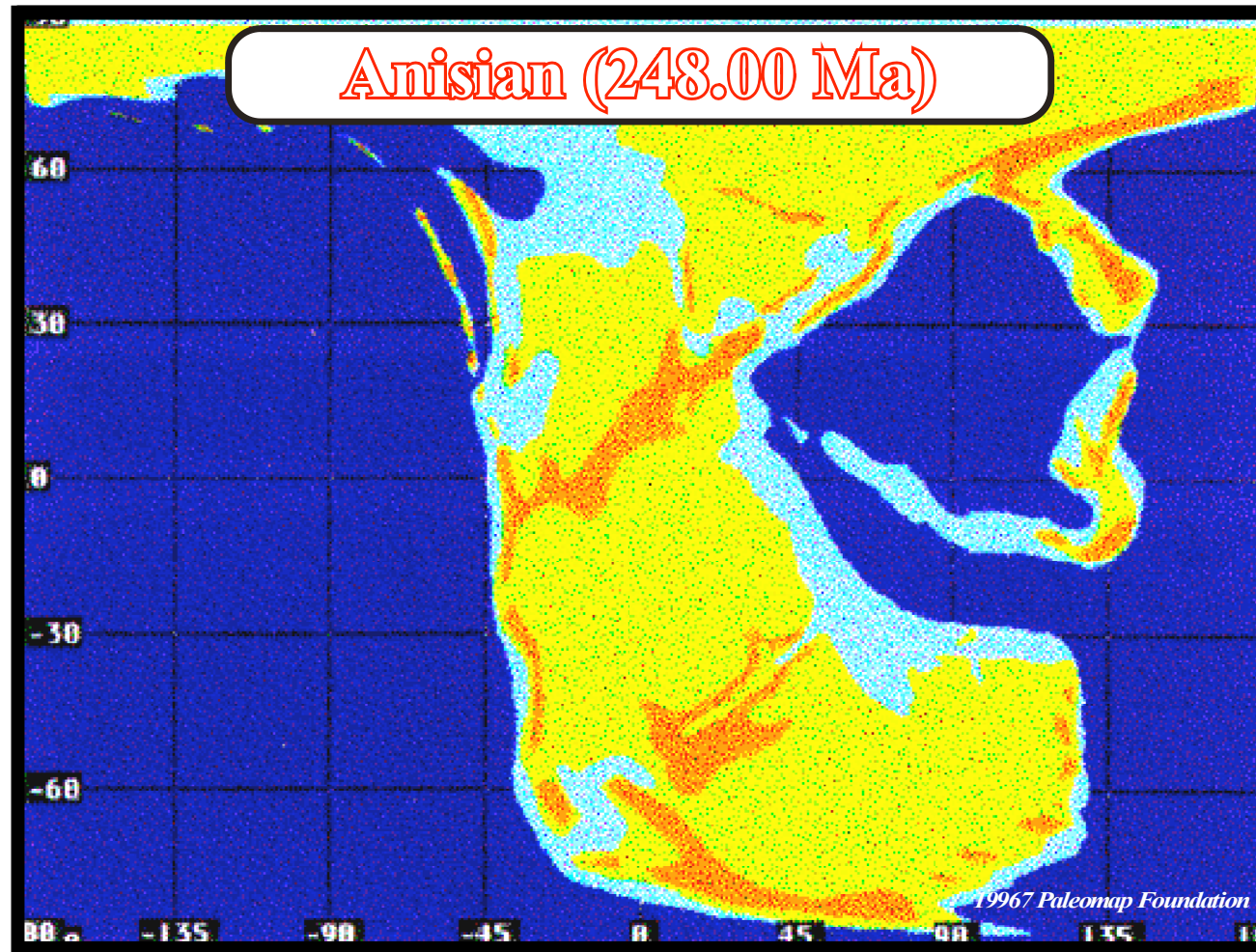
Silurian paleogeography clearly shows the southern margin of the Iapetus Sea where Silurian and Devonian sediments were deposited.

Paleogeography



The closure of the Iapetus Se, as Laurentia continent approaches, produces significant orogeny. The Permo-Carboniferous sediments deposit over an important unconformity.

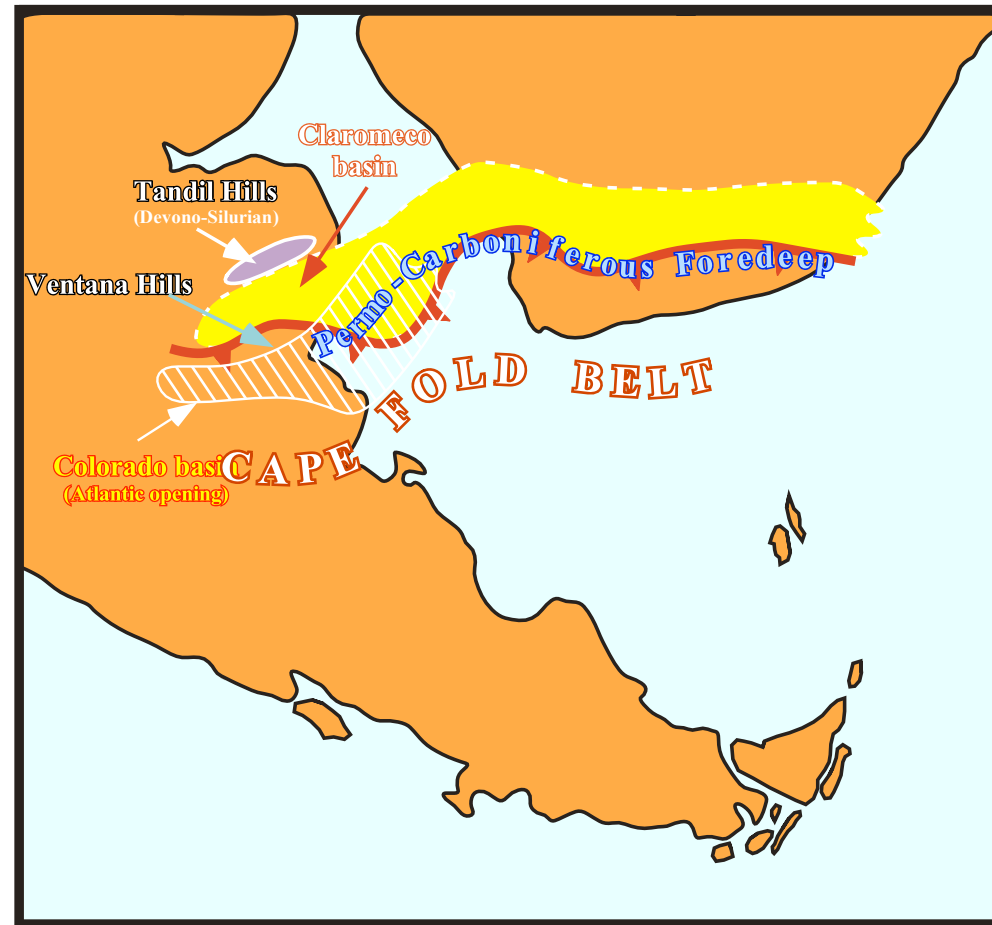
Paleogeography



By the end of the Permo-Carboniferous, the agglutination of the continents is at the origin of the orogeny which induces the folded belt of the Cape, which is nothing other than the fold belt limiting limits the south the foredeep of Claromeco basin.

Permo-Carboniferous Foredeep

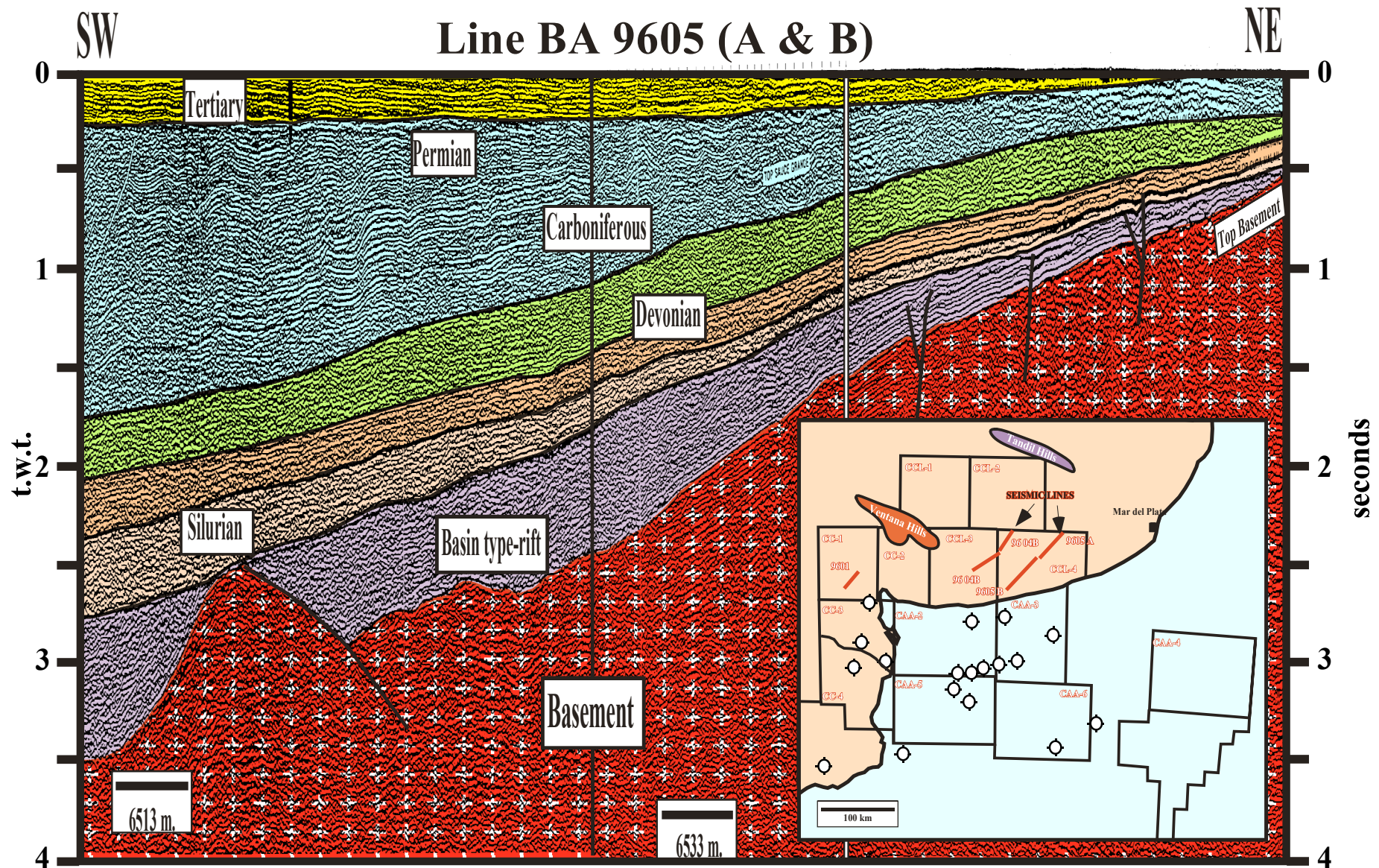
(Claromeco basin)



Probable extension of the Cape fold belt and the Permo-Carboniferous foredeep. The region interesting us is located in the Argentinian onshore, limited between the Tandil Hills and the Ventana Mountains. The Colorado Basin (in white) is posterior and associated with the opening of the South Atlantic Ocean.

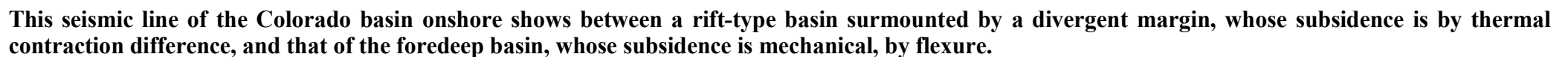
Claromeco Basin

(Onshore Argentina)



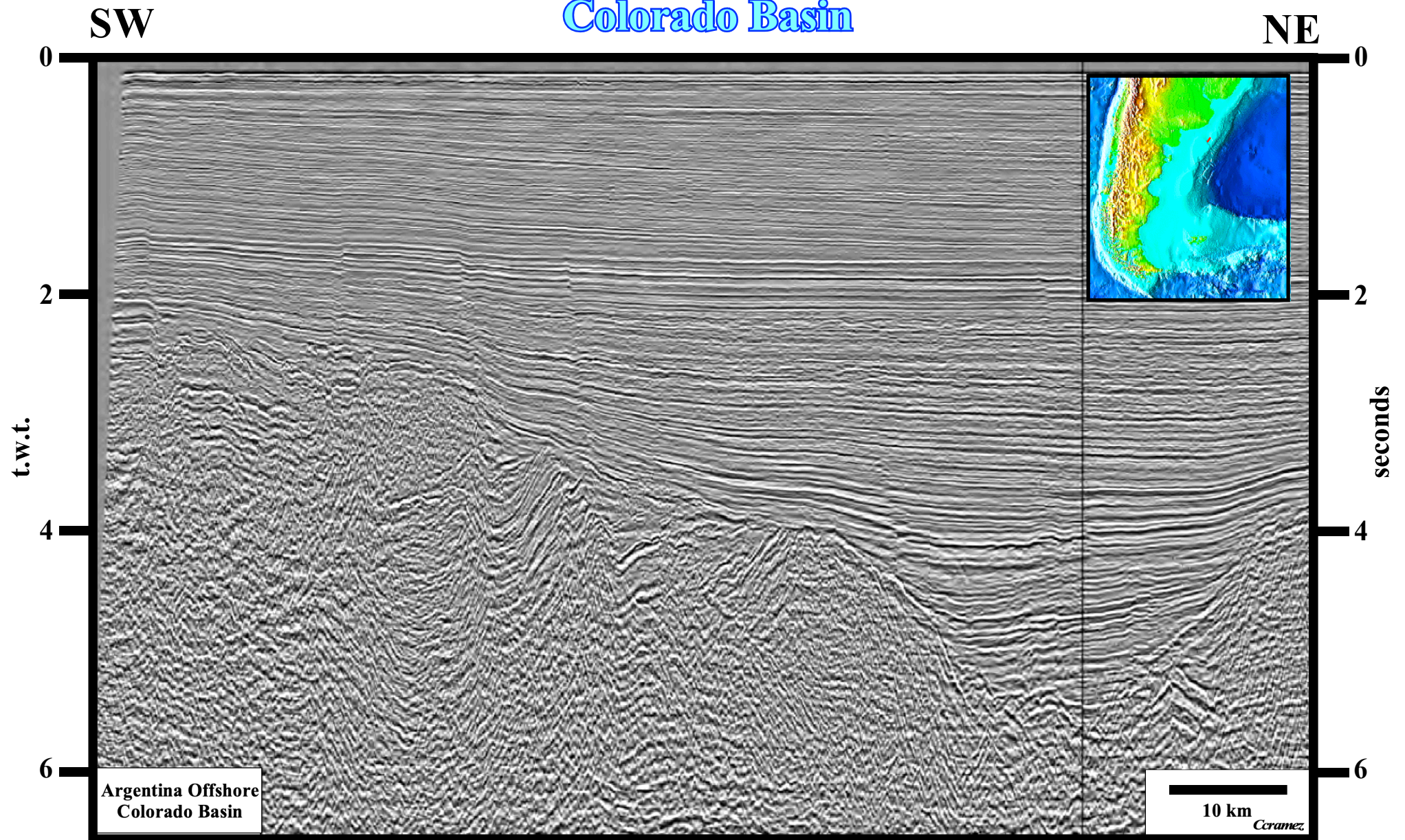
Composite seismic line crossing the foredeep of Claromeco basin. This line does not show obvious traps. However, they are clearly visible in parallel lines a few kilometers away.





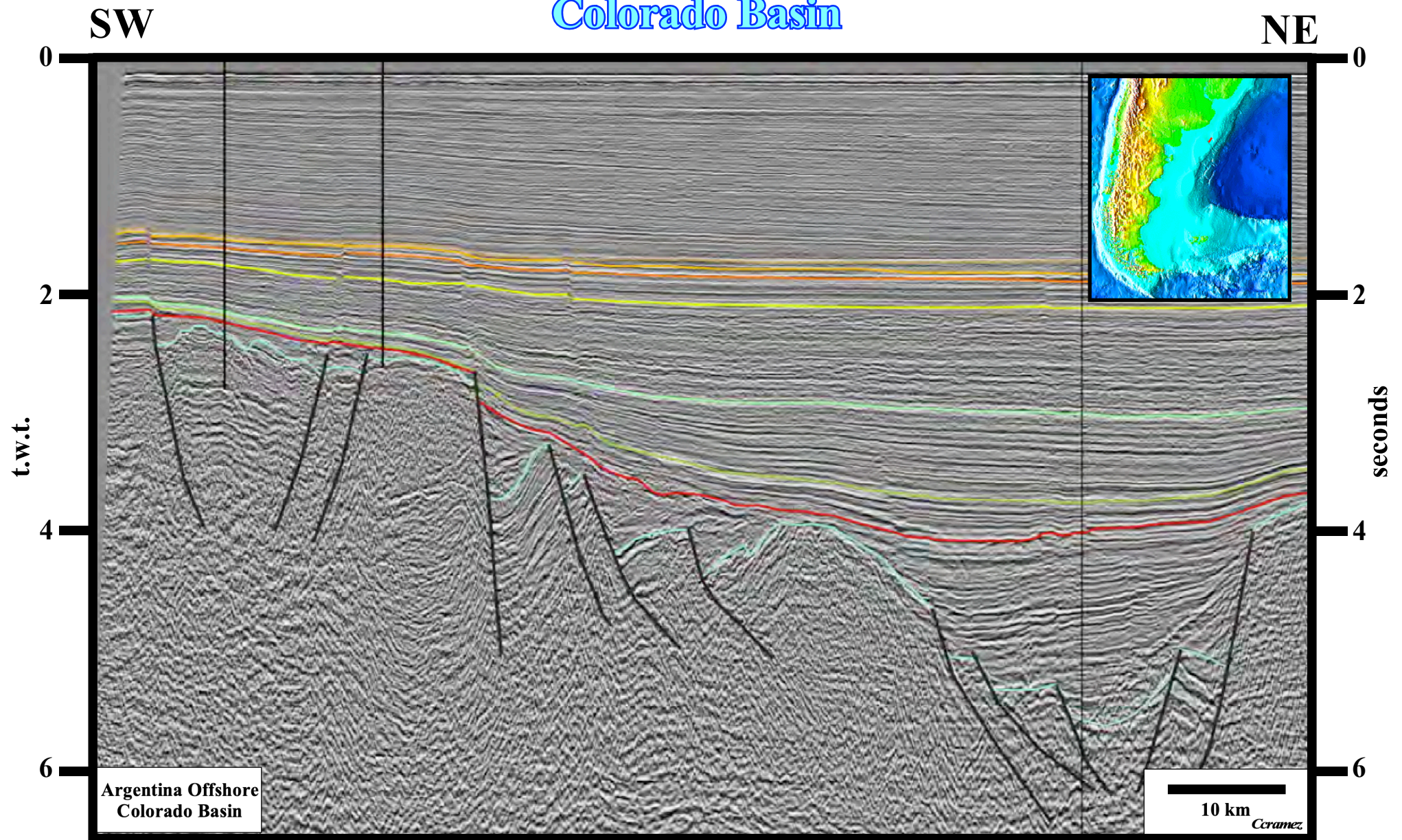
Argentina Offshore

Colorado Basin



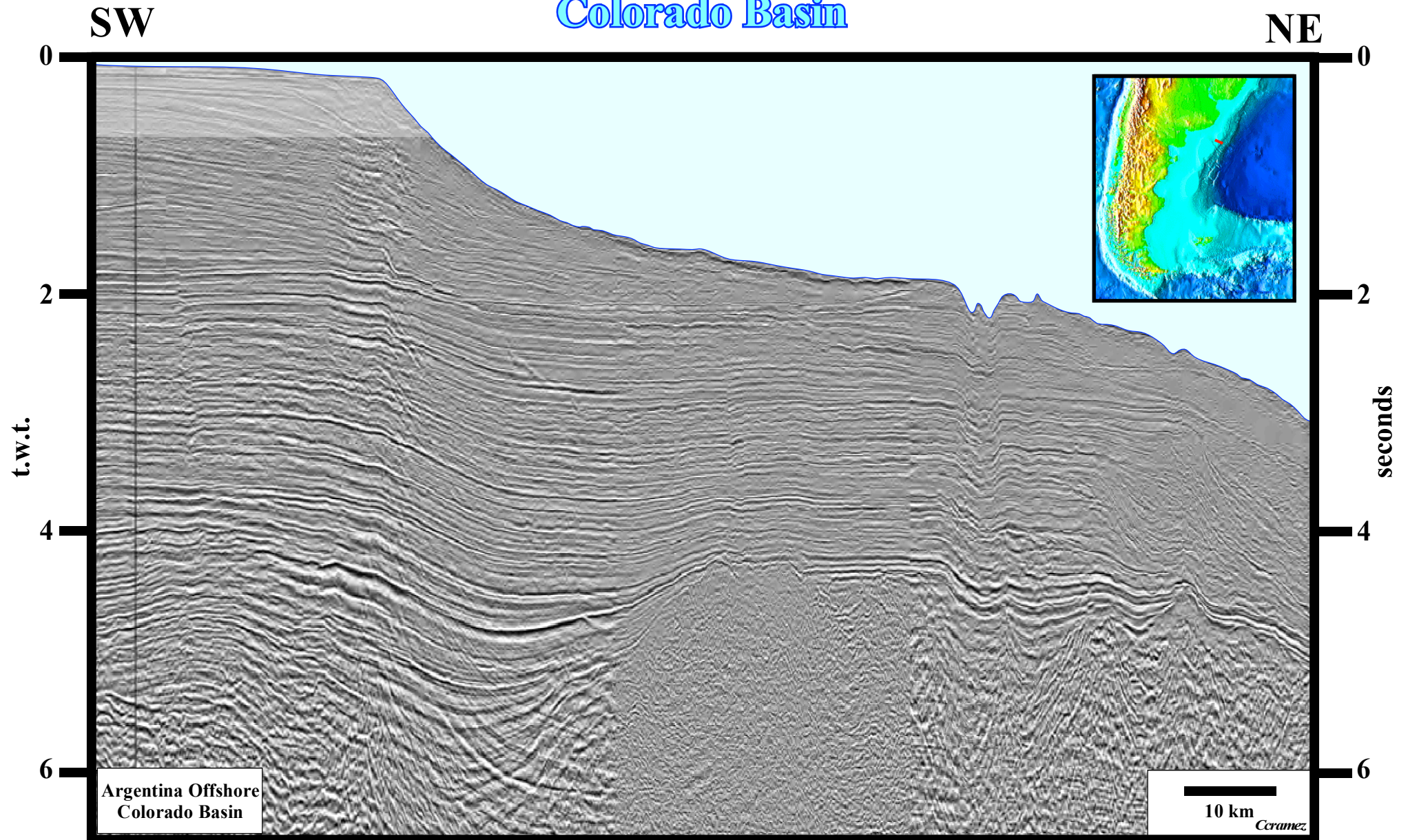
Argentina Offshore

Colorado Basin



Argentina Offshore

Colorado Basin



Argentina Offshore

Colorado Basin

