

# **Short Cruise Report**

## **R/V Meteor Cruise M49/2 : Montevideo - Montevideo**

### **13.2. - 7.3.2001**

R/V Meteor Cruise M49/2 started in Montevideo, Uruguay, on February, 13<sup>th</sup>, to carry out marine geophysical studies at the Argentine and Uruguayan continental margin. The cruise was dedicated to a pre-site survey for the drilling proposal "Brazil-Falkland (Malvinas) Confluence: Paleoceanography of a Mixing Region" for the Ocean Drilling Program (ODP), which includes multichannel seismics and geologic sampling. From departure at 10 am we headed to the southernmost working area at 45°S. The transit time of two days was just sufficient to prepare the new scientific crew for the watchkeeping operations, to set up the sampling devices as gravity corer, multicorer and box corer, to prepare the laboratories and to make a plan for the first few survey lines. The seismic survey started on February, 15<sup>th</sup>, in the afternoon.

The first survey area was chosen in the vicinity of a system of large canyons, some with a depth of more than 1000 meters. Since the continental margin was shaped by strong contour currents passing in North-South direction as part of the North Atlantic Deep Water as well as in South-North direction originating from the Antarctic Bottom Water and shallow water masses, the survey focused on locations, where sedimentation was protected or enhanced. In the vicinity of large canyons we could observe drift deposits on both flanks, which seemed to provide more complete sedimentary sections than anywhere else near 45°S. Since the drift deposits revealed a limited lateral and downslope extent, a narrow grid of survey lines was required to identify individual depocenters. A few seismic lines towards the southern part of the working area indicated a transition to a purely erosive character at all water depths, and suitable drilling locations could not be identified. After 5 days of surveying, in the morning of February, 20<sup>th</sup>, we started a sampling program at 4 locations, before seismic surveying was continued around midnight of February, 21<sup>st</sup>. After another 18 hours, where seismic lines were collected along a dense grid near a large drift deposit on the northern flank of a large canyon, we finished the survey and collected sediment material with gravity corer from another 4 locations, partly at steep flanks to date deeper reflectors and older sediments. At this stage, we had collected sufficient data to map out depositional patterns, to trace reflectors of regional significance, but stratigraphic identification must await further shorebased analyses.

In the early morning of February, 22<sup>nd</sup>, we completed our program in the southernmost working area and moved to a box between 40°S and 41°S, reaching it for deployment of the seismic equipment around midnight of February, 23<sup>rd</sup>. To reach the goals of the proposed drilling campaign, which plans a reconstruction of the warm and cold water confluence near the coast and their evolution through geologic time as well as their impact on biologic productivity and depositional style, it would be necessary to drill a latitudinal transect. Therefore, the original proposed drilling plan was targeted to five areas from 45°S through 25°S, where it would be ideal to identify roughly evenly spaced suites of appropriate drilling locations for Neogene sediments. The area near 40°S reveals a steeper morphology than further south, but it is located on the North-South transect in a critical position just south of the Rio de la Plata depocenter. Also here, the margin is shaped by numerous canyons, drift

and slump deposits, showing sediment waves and wedge shaped units and pronounced unconformities. But sediment units are much thinner, and erosional features more pronounced. The 4-day seismic survey, ending in the afternoon of February, 26<sup>th</sup>, revealed a complex depositional style, where potential drilling locations were more difficult to find than in the South. After a small sampling program at 3 locations we therefore decided in the evening of February, 26<sup>th</sup>, to continue our work - after a 14 hour transit - off the mouth of the Rio de la Plata river near the Mar del Plata Canyon, where our Argentine colleagues had recently carried out a seismic survey.

The Mar del Plata Canyon, revealing steep flanks of more than 1000 m height, is located seaward of the Rio de la Plata mouth. In its vicinity, accumulation rates seemed to be significantly higher and in particular on a plateau from 900 m through 1300 m water depth sediment packages with parallel layering were found. On the other hand, large areas of older sediments were exposed, partly caused by massive slumping and partly by strong erosive currents in medium water depth. Seaward of the exposed Miocene sequences undulating reflectors were observed indicating drift deposits. The seismic survey, ranging from 39°S through 37°S, was planned to cover both the northern and southern flanks of the canyon and to run a sufficient number of slope parallel and downslope profiles to characterize the plateau, the exposed units and the transition to drift sediments, and to map out reflectors of regional significance. Profiling was continued over 5 days and finished in the morning of March, 3<sup>rd</sup>.

Based on observations of our Argentine colleagues, on our own survey and some results from early sampling campaigns we were able to locate sediment units of early Neogene age within this complex, which were subsequently sampled at 6 locations with gravity corer.

During a 9 hour transit we moved from Argentine to Uruguayan waters to carry out only seismic investigations in the last survey box between 36°40'S and 36°S, beginning in the early morning of March, 4<sup>th</sup>. This area had been visited already during the Meteor Cruise M29/2 in 1994, and sediments of Pleistocene age were well known from several sampling sites to be fine-grained and organic rich. They derive from the suspended matter transported by the Rio de la Plata, which is moved northward by coastal currents into the working area. High water content and low rigidity supported frequent destabilization of slope sediments and mass flow deposits extending over wide areas. The seismic data revealed that the continental slope deeper than 1500 m water depth was heavily affected by slumping and suitable drilling locations could not be identified. Only at the upper slope, candidate locations for drilling were chosen, but geologic sampling was not appropriate due to the lack of exposed sections older than latest Neogene. 18 hours before arrival in port we finished the survey program in the northernmost area of the Meteor M49/2 Cruise around noon on March, 6<sup>th</sup>. In the night we headed towards the port of Montevideo to arrive in the morning of March, 7<sup>th</sup>. Port activities were limited to crew exchange only, since the following cruise should continue the survey program for the drilling proposal. However, the successful cruise was complemented by a very successful reception with more than 50 guests on March, 8<sup>th</sup>, expressing the thanks to the friendly welcome in Uruguay, crew and scientists had received several times in Uruguay in recent years.

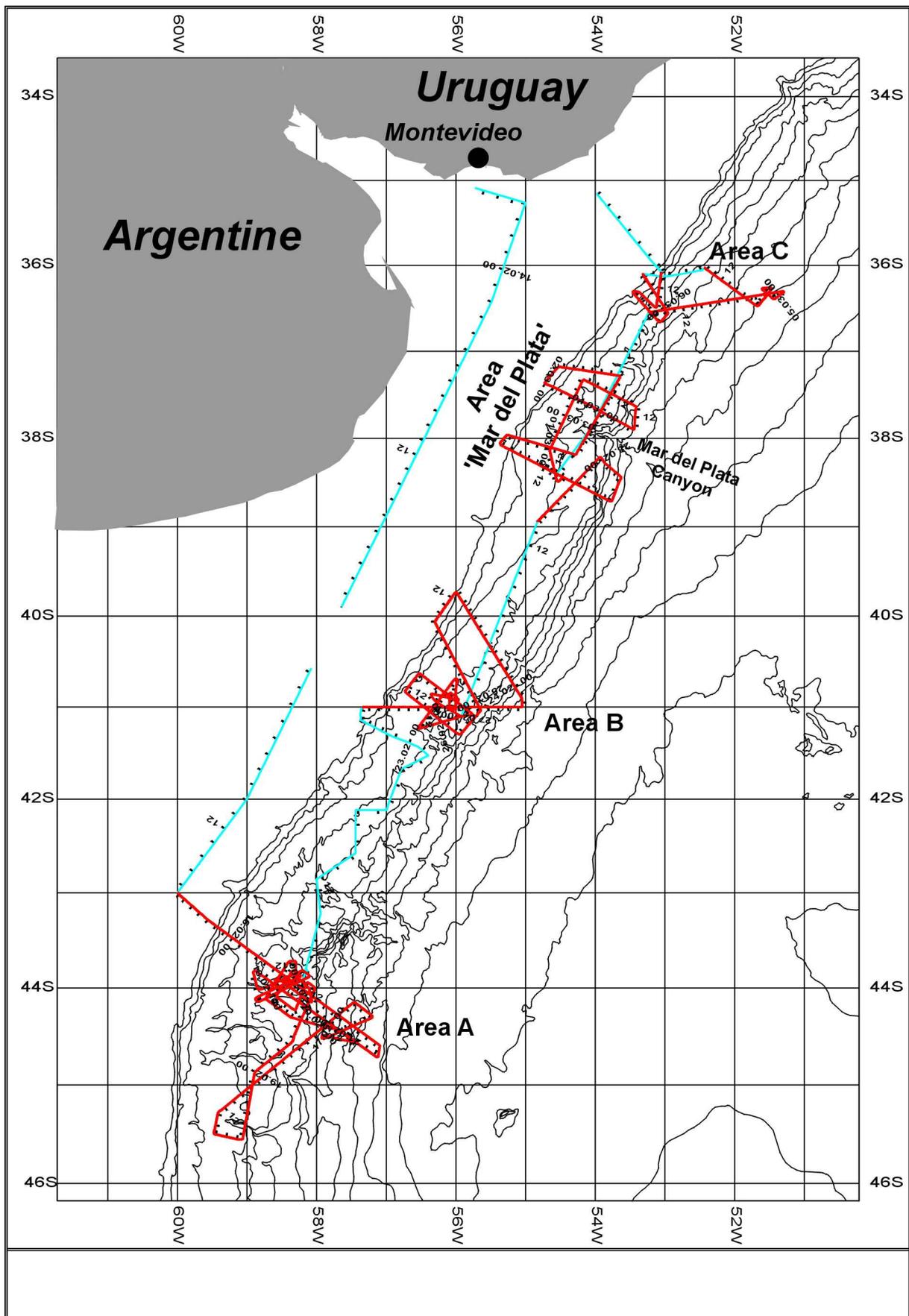


Figure 1: Track Chart of R/V Meteor Cruise M49/2 with seismic lines indicated in red, Hydrosweep/Parasound survey lines in blue. Bathymetry from Gebco Digital Atlas.