

Short Cruise Report

R/V Meteor Cruise M49/1 : Capetown - Montevideo

4.1 - 10.2.2001

R/V Meteor Cruise M49/1 started in Capetown/South Africa on January, 4th, to carry out marine geophysical studies off the coast of South Africa, Namibia and on Walvis Ridge. After departure on the evening of January, 4th, the seismic equipment was set up on deck and in the seismic lab, being ready for deployment in the afternoon of January, 6th, after a transit to a latitude of 29°30'S.

The first working area was related to Leg 175 of the Ocean Drilling Program carried out in 1997, during which several sites off the coast of Namibia and South Africa were drilled. In particular, the part between ODP Sites 1085 and 1084 at 30°S and 25°S, resp., was selected for a high resolution multichannel seismic survey to investigate the transition between carbonate dominated sediments in the south and organic and opal rich sediments derived from coastal upwelling in the north and to trace the occurrence of dolomitic horizons further to the south.

Until January, 11th, we continued seismic surveying on our way to the north to 25°S near ODP Site 1084. We extended our first test measurements and survey profiles beyond the planned period, since we were expecting an important airfreight, which was diverted to Walvis Bay/Namibia due to a severe delay in Europe/USA. However, further complications hindered the timely delivery, so that we had to decide to leave the area and to head to the first main working area which is directly related to the drilling proposal for Paleogene sediments on Walvis Ridge. Its intention is to investigate unusual states of the Earth's climatic system, which had been identified in Paleocene, Eocene and Oligocene sediments, which could never be recovered in sufficient quantity, quality and completeness. The drilling proposal was related to DSDP Leg 74, carried out in 1980, where these sediments had been found, although at this time drilling technology was not appropriate to undisturbed recovery of relatively deeply buried sediment in several hundred meters sub-bottom depth.

Based on data collected during previous visits with R/V Sonne and R/V Meteor, as existing ODP and DSDP drill sites for seismostratigraphic correlation, we started our survey at 20°S on January, 13th, on the eastern Walvis Ridge near DSDP Site 532/362. Moving towards the west allowed us to trace major reflectors out to a plateau, where older sediments were known to be present closer to the sea floor at DSDP Site 363. A first pick for a drill site was chosen near the DSDP Site 363, since burial depth of Paleogene sequences was limited, disturbance of sedimentary units minor, and seismic characteristics indicative of a complete Paleogene section.

From this position at 9°E, which we crossed a second time on January, 15th, we moved westward with seismics to study the longitudinal variation of deposition on the crest of the eastern Walvis Ridge. Minor changes of apparently relatively low sedimentation rates were observed, and the survey was continued to 4°E, where we tried at the northern flank of the Walvis Ridge to find places where the Neogene sediment cover was missing due to slumping, and older sediments were exposed close to the surface. On the 18th of January, we found two locations within a narrow, canyonlike incision, and decided to finish the seismic surveying for a day of maintenance and transit.

Starting again on the 19th of January in the main working area around previously drilled sites of DSDP Leg 74, we spent a full week to understand the depositional pattern in the area, in particular to avoid areas of disturbed sedimentation due to currents or slumping. Our main objective was the identification of alternate locations for the original DSDP sites, which were better suitable to recover continuous, undisturbed sediment sequences from moderate burial depth, and which represent the target horizons within the Oligocene, Eocene and Paleocene, where extreme climatic conditions of the Earth's system can be studied in detail. Finally, more than 13 alternate locations could be identified from our very high resolution seismic records, which were pre-processed onboard to compare with the drilling results to clearly identify target horizons and to ensure stratigraphic integrity and completeness. In many parts, the working area seemed to be heavily affected by slumping due to an extraordinarily flat volcanic basement, which may have been served as gliding plane. In some locations, slumped, but unfractured blocks were chosen to be drilled, in other places sediments on top of basement highs seemed to have remained in place. In some places, currents may have affected sedimentation such that particles were either winnowed and removed or accumulated from a current ventilated through the rough topography.

After having completed the survey around the DSDP Leg 74 drill sites on January, 26th, we decided to extend the survey towards the west, following the idea of a longitudinal transect of drill sites, as it was expressed in the ODP drilling proposal.

The Walvis Passage, located between 2°E and 3°W, is a known deep water passage for Antarctic Bottom Water from the Cape Basin into the Angola Basin. Since such currents may be clearly evidenced in sediments deposited in the vicinity of the passage, we decided to spend the rest of the available survey time with surveying both the bathymetric highs with a pelagic sediment cover as well as the pathways and nearby protected areas, where accumulation rates may be even increased. Several places for additional drill sites were located either near 1°E-2°E and 29°S-30°S, where high accumulation rates are observed, and even Neogene sediments may be more completely represented than elsewhere on Walvis Ridge, and near the main passage around 32°S. The survey west of the Leg 74 area lasted from January, 27th, to January, 30th, and the seismic gear was retrieved after 12 days of continuous surveying in the evening of January, 30th.

Except for a short period for equipment testing near the Ewing drift in the Argentine Basin on February, 7th, the remaining time was used for the long transit to Montevideo, where the journey ended in the morning of the 10th of February.

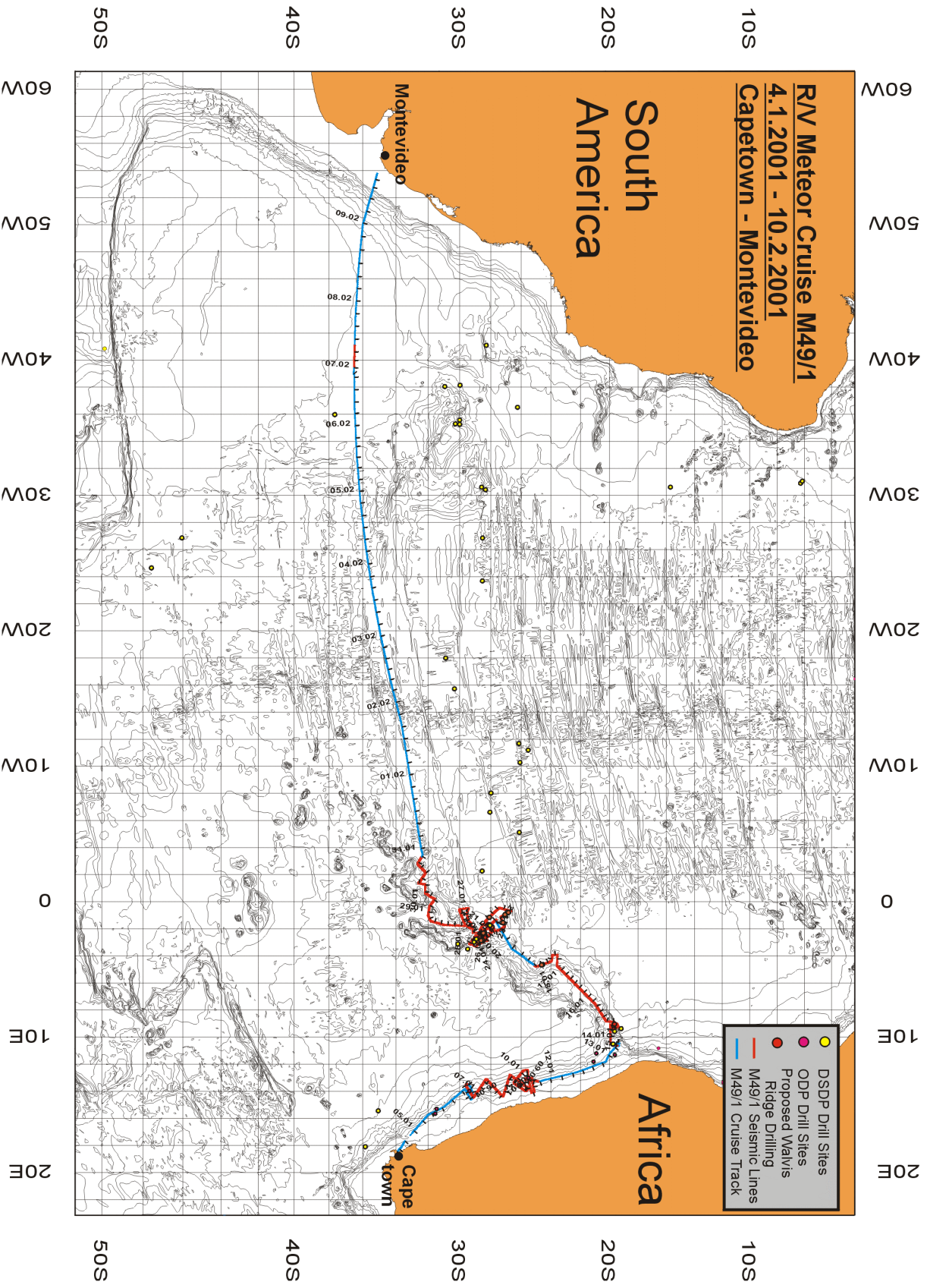


Figure 1: Track Chart of RV Meteor Cruise M49/1 with seismic lines indicated in red, HydroswEEP/Parasound survey lines in blue, DSDP drill sites in yellow, ODP drill sites in magenta and proposed ODP drill sites in orange. Bathymetry from Gebco Digital Atlas.