The bathymetry and acoustic backscatter of Santos Basin, Brazil were mapped using a SeaBeam 2112 (12 kHz, 151 beam) Multibeam Echosounder (MBES) aboard the R/V Falcon Explorer. This MBES data was acquired from January-November, 2000, during a high-resolution multi-channel 3D seismic survey, resulting in 380 parallel lines of 90 km length, spaced 250 m apart. The final survey mapped an area of 5,000 km$^2$ in water depths of 900–2000 m. These closely spaced multibeam tracks resulted in an average overlap between swaths of 1000%, thereby ensonifying most areas of the seafloor at least ten times. Traditional (hand) processing of a dataset this dense is time-consuming and tedious, and is prone to subjective decisions and operator fatigue. However, the density of the survey makes it ideal for automatic processing methods. Recently, we have developed an algorithm called CUBE that addresses the twin concerns of robustness and reliability that are often raised about automatic processing methods. Based on a very robust multiple hypothesis Bayesian estimator, CUBE processes MBES bathymetry directly into a set of gridded products representing the best estimate of probable depth, and a measure of the uncertainty associated with this estimate. We apply CUBE to the Santos Basin data, illustrating in terms of processing time and human effort the advantages of processing such data automatically. We compare the automatically generated data with a hand-processed set, showing that the results agree to within the estimated experimental uncertainty. We next illustrate the use of CUBE as a data quality measure, indicating areas of concern in the data. Finally, we utilize the bathymetric grid resulting from CUBE to investigate the seafloor morphology, which includes a set of linear depressions parallel and perpendicular to the Shelf break. These linear depressions are the surface expression of fault planes related to subsurface salt walls. In the shallowest part, the detailed bathymetry also shows various pockmarks (350 m wide) possibly associated with fluid expulsion, while in the deeper portion we observe a small number of larger ones (2500 m wide), which are clearly inactive as they are partially filled with recent sediments. Some pockmarks are aligned with fault planes, suggesting a preferential pathway for fluid expulsion. The acquisition geometry for this survey allowed us to analyze the behavior of the backscatter response as a function of grazing angle for any given piece of seafloor, thus eliminating the need to assume a homogeneous seafloor across the swath. Although the backscatter is not calibrated, the variation in response can be used to investigate the effects of gas in shallow sediments of the survey area.