Partially buried giant mounded drifts in the Argentine continental margin: origins, and global implications for the history of thermohaline circulation

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Partially buried giant-drifts, characterised as asymmetrical giant mounded elongated contourite drifts, are located at the base of the slope on the southernmost sector of the Argentine continental margin. They are described based mainly on the bathymetric and multichannel seismic reflections profiles database. Its genesis and evolution in the Argentine basin is decoded and its implications in a crucial area for geologic and palaeocenographic reconstruction between the Atlantic and Antarctica are discussed. Buried giant drifts are located below the present active Contourite Depositional System (CDS), with a north trend at the base of the slope at 5300-5400 m water depth. Its summit outcrops at present sea-floor, generating a bathymetric jump which represents an important change in the slope gradient trend at the base of the slope. The occurrence of giant-drifts leads to the following considerations: • Giant-drifts were generated in an open deep marine environment. Two major drifts are identified south and north of a large seamount (El Austral Seamount): the southern drift and the northern drift. The southern drift is about 40-50 km wide, 250-300 km long, with a sedimentary thickness of 830-950 m. The asymmetrical external shape is characterised by a steep west side and an east gently-dipping smooth side. Here, internal reflections prograde eastward. Meanwhile, the northern drift is about 35 km wide, and 767 m thick. Here, the giant- drift has an opposite geometry if compared with the southern zone, with a steep east side and a west gently-dipping smooth side. Here, internal reflections prograde westward. • The seismic facies of the giant-drift show very weak to transparent acoustic response with discontinuous reflections and abrupt changes in the seismic facies. Some high amplitude reflections with greater lateral continuation (but affected by many faults), are evidence that large-scale cycles of drape deposition and erosion have combined to form the giant-drift. • We infer that the southern drift was generated by the southward flowing of Antarctic Bottom Water (AABW), which was initiated after the Eocene-Oligocene boundary until middle Miocene. The drifts are inferred to record a major paleoceanographic change between the middle to very late Miocene, and the regional hydrological model changed in part as a result of the initiation of North Atlantic Deep Water (NADW) circulation in the southern hemisphere. That water mass conditioned the formation of Lower Circumpolar Deep Water (LCDW) in Antarctica and the deepening of AABW circulation in the Argentine Basin, which has been the major controlling factor of sedimentary processes in the lower slope and abyssal plain since middle Miocene to present. • From middle Miocene to present day a new oceanographic scenario is therefore established, being responsible for: a) the partial burial of the giant-drifts and b) a new margin morphology with the development of present day morphosedimentary features within the Contourite Depositional System generated by the northward flowing of the Antarctic water masses. • Some seismic facies are good indicators for gas hydrates, fluids and free gas occurrence within the giant-drifts. Therefore the giant- drifts should have a good potential interest for energy resource exploration in future, and consequently constitute a good example of the possible economic importance of contourite deposits in deep marine environments. Our results are an example of how large contourite drifts present in the deep marine environment can provide evidence for the reconstruction of palaeoceanographic changes, and help to explain Thermohaline Circulation and climate in the past.