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Palaeoceanographic significance of sedimentary features at the Argentine continental margin revealed by multichannel seismic reflection data

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The thermohaline circulation in the Argentine Basin today is characterized by the interaction of northward flowing Antarctic water masses (Antarctic Intermediate Water, AAIW; Circumpolar Deep Water, CDW; Antarctic Bottom Water, AABW) and southward flowing North Atlantic Deep Water (NADW). The transfer of heat and energy via both AABW and NADW constitutes an important component in maintaining the global conveyor belt.

We aim at a better understanding of both paths and intensity of this current system in the past by investigating an extensive (> 11000 km) set of high quality seismic reflection profiles from the Argentine continental margin. The profiles show a significant contourite system containing both erosive and depositional features that formed through the evolution of water masses and their modifications (path, physical and chemical properties) due to plate tectonic events such as the opening of the Drake Passage or the extensive emplacement of volcanic flows at the Rio Grande Rise. Overall the depositional features indicate that along slope (contour current) transport dominates over down slope (turbiditic) processes at the southern Argentine margin south of 45º S. Further to the North down slope transport was more extensive as indicated by the presence of submarine canyons crossing the slope down to a depth of ∼3500 m.

Here we present preliminary results from the southern part of the continental margin (42º-50º S) where we focus on a set of ∼50 km wide terraces on the slope and rise separated by contouritic channels. The terraces developed over time in alternating constructional (depositional) and erosive phases. An initial age frame was developed by mapping regional reflectors and seismic units known from previous studies.

The sedimentary layer between regional reflectors AR 4 and AR 5 spanning roughly the time interval from the Eocene/Oligocene boundary to the early middle Miocene is thin (0.1 – 0.4 s TWT) below the Valentine Feilberg Terrace but thickens towards the East forming a giant buried drift and also towards the West building a unit of plastered drifts below the Piedra Buena Terrace. Here, the maximum thickness of this unit is ∼1.4 s (TWT). In contrast to this the sediments of late Miocene to recent age are very thin or completely eroded over the Piedra Buena terrace but form drifts at the Valentin Feilberg terrace that can be further divided into subunits whose reflections have stratified facies with good lateral continuity. Mounded drift structures on the western and eastern edges of the terrace are bounding an onlap fill structure possibly associated with bottom currents of reduced activity. With an assumed age of ∼15 Ma for reflector AR5 the average sedimentation rate since the middle Miocene is estimated to be > 10 cm/ka and thus would make a drill site on the terrace suitable for high resolution palaeoclimate studies.