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A tectonostratigraphic comparison of the eastern and western parts of the Gamtoos Basin, South Africa

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The Gamtoos Basin is a sub-basin forming part of a series of rift basins off the southern coast of South Africa. This basin is a NW-SE trending, partly-onshore and offshore basin. It is bounded to the west by the St. Francis Arch and Plettenberg Fault and to the east by the Recife Arch and Gamtoos Fault [1] with a southern extension into the Southern Outeniqua Basin reaching the Diaz Marginal Ridge.

It is widely accepted that South African offshore rift basins are classified by two phases of sedimentation, occurring in response to tectonics, synrift phase and drift phase [1]. The synrift is an active phase of tectonics and sedimentation occurring in conjunction with continental break-up. The drift phase occurs post-rift with the cooling of the continental crust as a result of thermal subsidence and continental drift. This distinction is, however, not as clear in the Southern South Coast basins, including the Gamtoos Basin, due to the transform nature of the Agulhas Falkland Fracture. Broad et al [1] noted that the distinction between the two phases can be identified by the nature of the sedimentation. Paton et al [4] also further divided the Gamtoos Basin Synrift into two mega-sequences, Principal Syn-rift and Late Syn-rift.

In this analysis of the basin, Sequence Stratigraphy concepts were applied from Emery and Myers [3] and Catuneanu [2], with the definition of a sequence being the “fundamental stratal unit of sequence stratigraphy”. Stratal terminations were identified in order to distinguish various system tracts along with Seismic Facies Analysis, using the seismic reflection attributes of internal configuration, continuity and amplitude strength.

Two cross sections were interpreted, one located along the Gamtoos Fault and the other in the central basin area. Comparisons and differences were identified in both geometry and internal features relating to sedimentation. It has been determined that the Gamtoos Fault is largely responsible for the thickening of the basin sediments in the east which is clearly lacking in the west. System tracts across the basin appear to be generally similar yet some isolated sedimentary features were identified in one cross section as occurring more numerous than in the other. A striking difference is the identification of a Kimmeridgian source in the western cross section which has not been identified in the eastern cross section. This, along with several sedimentary features above the source sequence, could prove the area more prospective than its eastern counterpart. These observations have led to the conclusion that the Gamtoos Fault has influenced and delineated the Gamtoos Basin both sedimentologically as well as in terms of its prospectivity.

References:

[1] Broad D S et al. (2006) In: *Geology of South Africa: GSSA*, 560-562

[2] Catuneanu O (2002) *Journal of African Earth Sciences* 35: 1–43

[3] Emery D and Myers KJ (1996) In: *Sequence Stratigraphy*: Blackwell Science Ltd

[4] Paton DA and Underhill JR (2004) Basin Research 16:339-359

