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Mass wasting on the Orange Cone of the Atlantic Margin, South Africa

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The South African Atlantic Margin represents the rift-drift passive volcanic margin sequence which records the break-up of Gondwana around 155 Ma and the subsequent opening of the South Atlantic Ocean. The Orange Cone - the morphological expression of the sediment buildout and modification of the continental margin along the southwest African continental margin - has undergone extensive mass failure and slope modification over a protracted period. This failure extends all the way to the present-day toe of the Orange Cone. This paper outlines the data and analysis by South Arica in support of its Submission to the Commission on the Limits of the Continental Shelf. South Africa has, in its submission, identified and mapped a considerable number of gravity-driven failure features and deposits as evidence of the Orange Cone being classified as a slope in the sense of Article 76 of UNCLOS. Sediment mass failure, which includes slumping, sliding, mass transport deposits, etc., are known to be continental slope phenomena because they are gravity-driven and thus require a free slope upon which gravitational forces can cause kinetic action. Upper slope failure is ubiquitous on the Orange Cone and has been well documented. The most striking example of slope modification and downslope movement in the upper slope of the Orange Cone/Basin is the paired, gravity-driven deformation system, over 100 km across, with extension high on the submarine slope and contraction toward the toe of slope. The lower slope of the Orange Cone has experienced multiple episodes of failure in the form of glides, slides and debris flows. Failure on the lower slope is highly relevant for the purposes of delineating the foot of the continental slope as the deposition location represents the terminus of the slope processes. These gravity-driven failures are inherently linked to upper slope failure processes although their expression is markedly different. The change in gradients between the upper and lower slope corresponds to a change in the style of mass wasting where the failure regime changes from one of faulting and mass wasting to one of detachment and debris flows. Much of the material that is redeposited at the base of the upper slope is in turn remobilised and transported downslope on the lower slope. Some MTDs are likely disaggregated extensions of more coherent slides that have their origin in the upper slope. The lower slope is characterised by bathymetric scarps and translation of material along distinct glide planes. Seismic interpretation suggests that these relatively coherent units disaggregate further downslope resulting in debrites.