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The environmental rule in the shape of soft-sediment deformation structures in the shelf to base of slope settings

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Soft-sediment deformation structures (SSDS) can be divided into in situ and detached structures. The latter include slides, slumps, and debrites (mass transport deposits) and dominate the literature compared to processes and products of deformation that takes place in situ. This study addresses in detail the origin and development of in situ SSDS and their stratigraphic and depositional context in well exposed shelf edge and upper to lower slope successions of the Karoo and the Neuquén basins.

In the study areas, in situ SSDS occur preferentially in shelf-edge/upper-slope settings, but can also develop in middle and lower slope settings in association with detached structures. Flame and load structures are the most common in situ features and a systematic quantitative study of flame structures shows that they are elongated and have preferential orientation. The relationship between morphometric parameters, such as height, width and spacing, is statistically proven to be independent of the scale of occurrence and depositional environment in the majority of the cases. This indicates that similar physical and rheological conditions occurred during their formation in both shallow and deepwater environments. Divergence in the trends can indicate changes in the boundary conditions. Comparison of statistical results from Karoo and Neuquén datasets indicates a grain size influence on the dimension of structures; the greater the grain size the shorter the flame structures.

Morphology of flame structures is independent of outcrop scale, as shown by statistical relationships. This characteristic allows prediction of the dimension/geometry of flame structures at outcrop scale. Extrapolation to scales below or above the range of outcrop limits must be done with care. The methodological basis for the evaluation of these out of outcrop scale situations are initiated here but still need to be effectively evaluated.