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# Spatiotemporal sedimentary facies variations in the Permian Whitehill Formation, main Karoo Basin

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Recent global efforts by the hydrocarbon industry to develop unconventional gas reservoirs in black shale successions increased the geological interest in the carbonaceous Whitehill Formation that was deposited in the Early Permian within the main Karoo Basin of South Africa. Re-characterizing this remarkably heterogeneous shale unit and explaining the spatial and temporal variations in its geometry, composition and organic carbon distribution are long overdue. Aimed to illustrate and interpret these variations in the light of recent advances in the field of shale sedimentology, in this study we use a combination of field, petrographic and geochemical proxies. Based on this integrated approach, we distinguish five sedimentary facies of varying textural, bedding, and compositional features that suggest diversity in depositional conditions. These inherent differences, ranging from sediment transport mechanisms to syn-depositional and early diagenetic chemical conditions, were ultimately responsible for the primary distribution of facies and carbon content in space and time.