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Supercritical sedimentary structures and bedforms and criteria for recognition in the field: insights from the Middle Eocene deep-marine Morillo and Guaso systems, Ainsa Basin, Spanish Pyrenees

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It has long been acknowledged that for most submarine slopes with gradients > 0.5, common to many deep-water environments, they should contain abundant evidence of supercritical flows and their deposits. However, it is common for deep-marine sands/sandstones to be routinely modelled using the Bouma (1962) sequence for turbidites. Recently, the importance of supercritical flows has been highlighted from seafloor observations, with numerical and physical experiments. Such experiments have produced previously unrecognised bedforms which fail to be interpreted adequately by Bouma's model, including antidunes, chutes-and-pools, and cyclic steps. Fieldwork in the Middle Eocene Ainsa Basin, Spanish Pyrenees, has been undertaken in the Morillo and Guaso systems of the Upper Hecho Group. Approximately 5,000 beds were measured and documented in detail, e.g., grain size, sedimentary structures, bedforms and facies. Collectively, this data can be used to understand supercritical versus subcritical flow. The relative importance of supercritical flow can then be compared and contrasted within individual ancient deep-marine systems. The Morillo System is relatively coarse-grained, compared with the Guaso System. The results of this research contribute to an improved understanding of the processes in deep-marine systems, and directly benefit the hydrocarbon industry by providing better constraints to predict deep-water reservoir composition and architecture.