Deciphering complex facies distribution in a narrow basin: the western fragment of Skole Nappe (Campanian–Paleocene, Ropianka Formation, Polish Outer Carpathians)

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The evolutionary history of the Skole Basin during the Campanian–Paleocene period exhibits several cycles of progradational and retrogradational movement, accompanied by shifts from carbonate to siliciclastic-dominated sedimentation, which are recorded in the Ropianka Formation deposits (Kotlarczyk, 1978). These changes are primarily driven by fluctuations in relative sea levels and tectonic activity (Kotlarczyk, 1988; Kędzierski & Leszczyński, 2013). The study area is located south of Tarnów and encompasses western part of the Skole Nappe, the most external major tectonic unit in the Polish Outer Carpathians. Skole Nappe stands as a folded and thrust remnants of sedimentary infill of the Skole Basin, being one of a several deep-water basins located at the northern margin of the Tethys Ocean (Ślączka *et al*., 2012). The progradational-retrogradational cycles initiate with the appearance of sand-rich bodies at the lower part of the sedimentary log, which gradually diminish up the section. The depositional environment of the study area contains a broad range of distinguished submarine fan setting including channel-fill deposits, the transition zone between channels and lobes, and various sub-environments within depositional lobes such as the lobe axis, off-axis and lobe fringe, distal fringe, and interlobe areas. The intricate distribution of facies throughout the studied time interval can be attributed to the basin's asymmetry, characterized by a steep southern slope and a gentler northern slope, as well as the influence of multiple sediment sources. The significant aggradation of specific depositional elements, variations in calcareous sediment content, and changes in palaeotransport directions indicate the presence of morphological obstacles and/or the semi-confined nature of the Skole Basin in the study area.

Further field investigations have identified two distinct submarine depositional settings characterized by sediment bypass: channel-lobe-transition zone and marl-dominated lower slope or base-of-slope bypass zone. Despite domination of marls, the second type of bypass zone tends to show two different end-member variants. The first type involves a higher proportion of thin- and thick-bedded coarse-grained lag deposits, while the second type consists of dune scale bedforms with intraformational. Log with more intermediate characteristics occurs as well, reflecting the spatial continuum of facies changes in the marl-dominated bypass zone and transition to the marl-dominated lower slope and base-of-slope deposits. Record of intervals with siliciclastic sediment bypass within areas of predominantly marly deposition can serve as valuable indicators of turbidite system progradation despite relative sea-level highstand connected with carbonate production. Moreover, such deposits may indicate small-scale sea-level changes or tectonic pulses within deep-water monotonous sedimentary successions predominantly composed of fine-grained sedimentation.

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