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Sand connectivity in deepwater turbidite systems: Lessons from the modern seafloor

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Coarse-grained clastic sediments in deepwater environments may be considered to be connected or disconnected from their source terranes, depending on the lateral continuity and juxtaposition of sand bodies throughout the system. Upslope stratigraphic traps comprising deepwater sands with updip terminations at their proximal end are a prime hydrocarbon exploration target in many deepwater basins, and there remains significant potential for future giant commercial discoveries. However, exploration is high risk principally due to the difficulty of predicting the presence of an effective sand pinchout: the resolution of conventional seismic means that thin sands, through which hydrocarbons can leak updip, are often difficult to detect. This project seeks to better understand sand body connectivity and associated stratigraphic trapping mechanisms through the detailed examination and review of recent and active fan systems around the world. Modern seafloor data allow for a scale of observation not present in outcrop, permitting new insights into the processes responsible for detachment, the geometries and architecture of attached and detached systems, and the larger-scale controls on how and why detachment occurs. A wealth of high-resolution data from modern seafloor turbidite systems now exist, and aside from a few key publications, are understudied with respect to sediment connectivity. Here, we present examples of recent to modern detached turbidite systems resulting from a variety of causes: CLTZ bypass, headward erosion by submarine mass movements, and downslope flow transformation, among others. Detachment through each of these processes occurs at different points along the system, and initial results suggest that the point of detachment correlates with larger-scale system parameters. Future work will compile further examples in order to more robustly test if certain system or local factors (e.g., grain-size, slope gradient, morphology etc.) are positively associated with upslope sand terminations, and to determine if existing models for detachment based on outcrops are consistent with seafloor observations.