The Influence of Flow Efficiency and Degree of Confinement on the Architecture of Sheet-Like Turbidite Systems

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ABSTRACT

Individual turbidite beds are distributed according to the properties of the flow that deposited them, and the interaction, if any, of these flows with the basin margins. We have studied intervals that exhibit the deposits of flows with different flow efficiency in different basin settings, which allows us to investigate the role of flow efficiency and degree of confinement on the geometry of individual beds. We report four contrasting units within three systems. Three of these are of Bashkirian age, occurring in the Mississippian/Pennsylvanian Paganzo basin in NW Argentina: the Las Lajas system (Jejenes Formation) is developed in a 0.8 km wide paleofjord in San Juan Province; the Cerro Bola system (Guandacól Formation), in La Rioja Province, of which two different units were studied (TS2 and TS4), was deposited in a much larger sub-basin with a width of at least 15 km. The Paine C system of Campanian (late Cretaceous) age is part of the Cerro Toro Formation of the Magallanes Basin in southern Chile; these are confined by an incision surface with a width of 3km. A total of 124 beds were chosen in the four systems, representing flows of varying efficiency and differing degrees of confinement. Individual flow efficiency is determined by the flow volume (based on cross-sectional area of individual beds at outcrop), and percentage of mud. The degree of confinement experienced by the flows was assessed quantitatively by comparing the flow efficiency with the estimated basin width. We found that: 1) TS4 has very high flow volumes (and thus high flow efficiency), interacts with the basin margin (so is effectively confined), whereas TS2 has lower efficiency due to smaller volumes, and behaves as unconfined, even though within the same basin as TS4; Las Lajas has high flow efficiency because it has high percentage of fines, and it is closely confined. Paine C has lowest flow efficiency because it is very sand rich. Overall the degree of confinement (efficiency divided by basin length scale) influences the individual bed geometry, highly confined flows having a higher tabularity (smaller thinning rate); 3) Individual bed correlation length and confidence are much higher in high efficiency, confined systems. Flow efficiency and degree of confinement work together to control the architecture of the turbidite sandstone beds.