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Asia From Space: New Ideas for Exploration

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Megafans, also known (incorrectly) as *inland deltas*, are partial cones of fluvial sediment with radii >~100 km. Each is generated by a formative river avulsing across a lowland. The alluvial tract (channel, levee, overbank, etc.) is the building block for megafans. Planform and sectional analyses, based on SRTM data, reveal their conical, low-angle morphology.

Megafans are not geologically rare—as often assumed—but a normal feature in the hierarchy of fluvial features that is slowly beginning to be understood. Our global survey contains a total of >150 examples worldwide, in all tectonic basin types, with a majority of smaller, more easily distinguished megafans occupying classic foreland basins (54%)—which may explain the general view that megafans only form in Himalaya-like foreland basins, especially since the Kosi Megafan in the Indogangetic Plain is one of the best known in the geological literature.

Recent research has shown that all actively alluviating basins are occupied by fanlike sediment masses, from the well known smaller and steeper *alluvial fan* (level 8 in Miall's hierarchy of fluvial forms), to the much larger megafan feature (level 9). A close relationship exists between upland basin size and fan size and slope. Larger upland drainage basins give rise to low-slope megafan sedimentation, which can cover very large areas where the receptacle basin exists—individual megafan areas are 10^{3-5} km^2, and collectively cover 1.2 million km^2 in South America, for example. The habitat of megafans is now sufficiently well understood that prediction of some modern cryptic megafan locations has been successfully achieved. Underground prediction therefore seems possible, where sufficient data exists.

It seems necessary to distinguish megafans from (i) steep, coarse-grained mountain-front alluvial fans which are overwhelmingly coarse-grained, (ii) deltas, since megafans lack distal shoreline processes), and (iii) confined floodplains which lack radial drainage. Numerous other differences can be identified.

As a normal component of the modern fluvial environment, megafans must exist in the subsurface. Megafan size, predictable channel patterns of the formative river, and the gradation from coarser to finer sediments from apex to toe of megafans are characteristics that ought to assist in understanding subsurface patterns of hydrocarbon host rocks, and possibly source rocks as well. We show examples from various producing basins.

A roughness map of Asia, based on an algorithm developed for Mars, shows megafan landscapes to be dominated by short baseline roughness and low

slopes, consistent with megafan-dominated plains worldwide. Interestingly, this a unique signature for a larger continental landform.

Keywords: megafan, Asia, sedimentary bodies

Oral Presentation