



Delta geomorphological patterns

A. Feola (1,2,4), K. Caylor (2,4), I. Rodriguez-Iturbe (2,4), C. Paola (3,4), M. Marani (1), A. Rinaldo (1)

(1) University of Padova and "International Center for Hydrology D. Tonini", Italy; (2) University of Princeton, USA; (3) University of Minnesota, USA; (4) National Center for Earth-surface Dynamics, USA; (contact: feola@idra.unipd.it)

Deltas are the dynamic product of the net balance of supply, transport and deposit of sediments by the river and the ability of the receiving waters to remove them. The planar structure of one of the biggest and most rich deltaic systems is analyzed in order to evaluate metrics of the main features of patterns and identify signatures characteristic of the dynamics. The topology of the skeletonized network is analyzed as a graph (segments and nodes) and associated to the bi-dimensional geometry of the system (dimensions of channels and islands). Statistical analyses of the main geometrical features (length and mean width of segments, island size) indicate that segments length, islands area and islands length display a log-normal distribution of size. A detailed analysis was carried out of the looping portion of the network which is of particular topological importance as well as a crucial component of the transportation dynamics. Length to width ratio of segments obtained from the graph of this part of the network exhibits a log-normal distribution. An analysis of island different features (area, perimeter, main axis) is performed in order to relate drainage-transport processes to islands and surrounding channels size. A novel procedure is proposed to evaluate direction of flow within the looping portions of the network where flows cannot be determined simply by continuity. A variety of tools built to analyze large resolution images is described which is applicable to the analysis of any deltaic network structure, as well as to empirical data obtained from physical models of delta dynamics.