Polygonal patterns, sedimentary facies and basin analysis

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Polygonal patterns ranging from approximately 15 cm to 300 m in diameter are familiar features in sediments. Two pattern types can be recognized: 1) orthogonal polygons with straight and/or curved sides and 90° intersection angles and 2) non-orthogonal (usually hexagonal) polygons with tri-radial intersections of approximately 120°. The origin of sediment polygons can be attributed to a variety of processes, which include: 1) contraction, 2) contraction and expansion, 3) sediment loading and buoyancy displacement and 4) sediment intrusion.

Volume reduction (e.g. desiccation, syneresis, frost shrinkage) locally with secondary infilling (e.g. ice-wedge and evaporite polygons) and alternating periods of contraction and expansion

(e.g. "patterned" ground in permafrost areas) are examples of the first two processes. Polygonal patterns resulting from loading and sediment intrusion are less well known. They reflect intrastratal transposition of sediments along reverse density gradients that take place with or without the aid of induced shear.

Considering the variety of conditions and circumstances that can lead to the formation of polygonal patterns it is clear that the correct interpretation of sediment polygons is essential in facies and basin analysis.

Reference will be made to the polygonal patterns occurring in Permo-Carboniferous strata of the Maritime Provinces, Canada, with particular emphasis on those of the West Bay Formation of the Parrsboro area, Nova Scotia. Current research suggests that the polygonal patterns within this formation are not desiccation features but are polygonally oriented clastic dikes that reflect sediment intrusion in response to unstable sediment density distributions and possibly earthquake motion.