Watershed Algorithm Applied In Halokinetics*

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Abstract

Visualization for the external and internal morphologies of salt bodies can lead to detailed information on halokinetic features and structural details of the encasing formations. Useful information is gained from high-end visualization (InsightEarth) of various salt and sediment features in the GOM from use of watershedding, corendering and other visualization technologies. These insights include economically important findings related to structural history, depositional stratigraphy and drilling environment parameters. We introduce watershedding, a descriptive term for volume segmentation, which is a statistical technique for dividing a volume into different regions.

Discussion and Summary

This algorithm separates a volume into regions based on the grayscale value of an attribute (Figure 1), and falls into the class of algorithms that are used for image processing. The result is the creation of enclosed, contoured regions called "basins" and "watersheds" that mark the division of discrete regions based on a selection criterion within an area of interest. Segmenting the structural analysis of a seismic volume in this fashion allows for the creation of morphologies and attributes that may be useful for structural interpretation, seismic facies analysis, and geologic reservoir modeling. Watershedding yields internal structural details within salt bodies, which are difficult to discriminate on typical reflectivity data due to low reflectivity or low reflectivity contrast (Figure 2). The ability to see internal salt structure gives the interpreter the opportunity to image overturned sections near the base of salt bodies and recurrent toe thrusts, which resemble offset stacked anvils. Identifying and mapping these features can lead to the ability to characterize intra-salt boundaries, which allows for determination of stress and centroid estimations. The results are used to estimate parameters related to drilling risks.
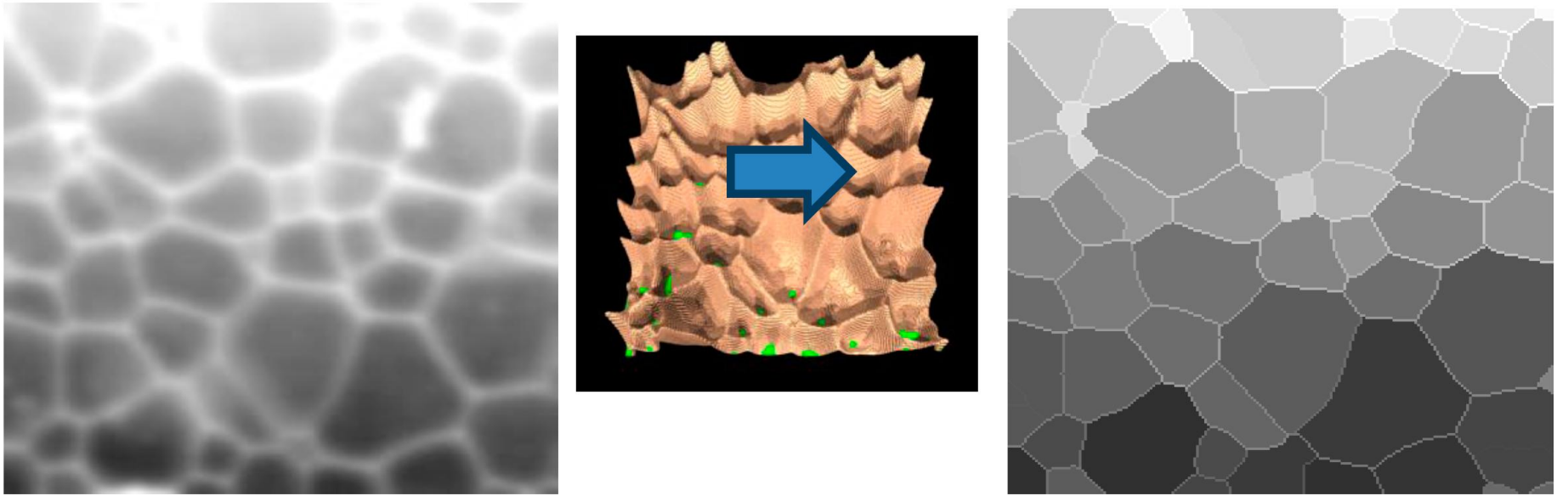
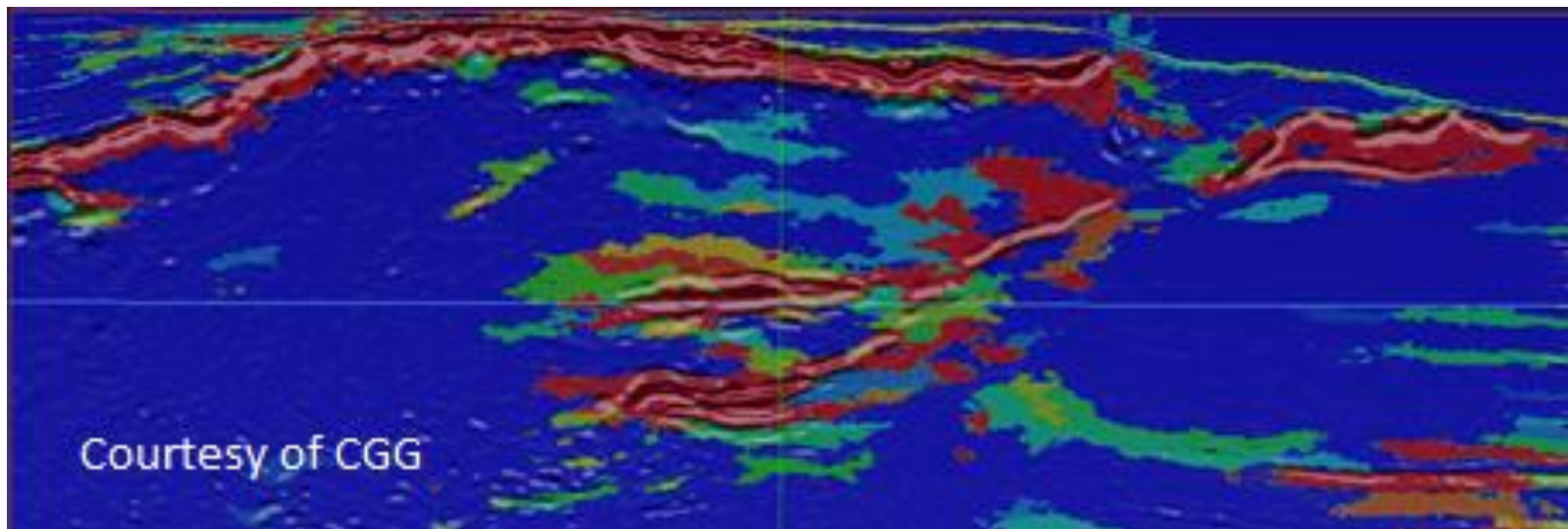Figure 1. The watershed algorithm as a clarifying filter.

Figure 2. A salt body co-rendered with Watershed and Reflectivity.