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Landsat Analysis Techniques, Some Applications for Bakken Exploration in the Williston Basin.

A plate tectonic model is introduced to explain thermal maturation and fracturing of the Bakken Formation in the central Williston Basin. Punctuated diagenesis, a relatively new concept, is presented as an important mechanism for expulsion of hydrocarbons from the Bakken. Action occurred during the Late Cretaceous and Paleocene, and probably died out by mid-Eocene. Combining Laramide plate tectonics with punctuated diagenesis, creates a useful aid in exploring for fractured Bakken reservoirs. Fracture zones can be found using Landsat data.

Landsat TM imagery and digital data combine to form one of the least expensive yet most effective tools to aid exploration in tight oil reservoirs. Careful basin-wide analysis of multispectral data, particularly false color infrared photographic imagery, may be quickly completed to build a lead map of fracture trends, fault zones, and often evidence of structure, groundwater leakage, or mineralization haloes may be directly detected.

Follow-up work with digital multispectral data may be done using simple software on a personal computer. Township-sized data areas are available from Eosat on floppy disk at reasonable prices. Software allows the imaging and manipulation of this data on the PC screen and, often, the development of direct leads to drill sites. Histogram manipulation, stretching, band ratioing and various enhancements may be accomplished on the PC to locate or substantiate anomalies. These anomalies, then, may be field checked to determine ground truth. Various geologic signatures are susceptible to band ratioing; several common types are discussed. Application to Bakken exploration is stressed.