Detection and Analysis of Cross-Strike Discontinuities in Fold Belt Regions

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Integrated analysis of high-resolution aeromagnetic, gravity, digital topography and satellite imagery data reveals the presence of faults and fracture systems that cut and offset potential hydrocarbon traps in fold belt regions. These structures can be divided into the three categories: 1) “tear faults” that consist of small-scale individual strike slip faults. These structures are usually confined to a single thrust sheet, dying out at the regional major decollement surface. 2) Cross-strike discontinuities that consist of a wide zone of faults and fractures and cut the entire fold belt region. These types of structures are usually originated by strike-slip reactivation of basement faults, and 3) Large-scale, high-angle, basement faults with significant vertical separation, acting as ramps to the overriding thrust sheets. This last category of structures usually exerts a significant control on the geometry and spatial distribution of potential hydrocarbon traps in the area.

A series of examples will be given, supported by surface and subsurface controls. These illustrate how integrated analysis of different remote-sensing tools can be used to detect cross-strike structures, and assess their potential influence on hydrocarbon plays. Examples cited include: the Jura Mountains in Germany and Switzerland, the Ouacita Mountains in Oklahoma, and the fold and thrust belt region of the North Slope of Alaska. We conclude the discussion with a quick examination of several different cross-cutting features that have been detected along the Canadian Fold Belt.