Aspects of coalification as indicated by vitrinite reflectance anisotropy in Alberta and Nova Scotia, Canada

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Vitrinite reflectance anisotropy was determined from oriented coal blocks collected in Alberta and Nova Scotia. In the western part of the Alberta Foreland Basin, rank maps of the lower Cretaceous Gates Formation show pre-deformational coalification patterns in the north (Grande Cache area) and components of syn-deformational (Cadomin area) and post-deformational coalification (Mountain Park area) in the central parts of the Foothills. Along the deformation front, the amount of tectonic burial increases from northwest to southeast. Biaxial vitrinite reflectance anisotropies, with R_{max} parallel to fold axes, indicate the presence of tectonic stress during the later stages of sedimentary burial and subsequent deformation. An increase of strain, tectonic burial, and degree of biaxial anisotropy in a southeasterly direction suggests a relationship between vitrinite anisotropy and deformation. The biaxial ellipsoids result from superposition of a tectonic stress field on a sedimentary, burial related uniaxial anisotropy.

In contrast to the Alberta example, the Upper Carboniferous Sydney Basin of Nova Scotia is an intracratonic basin with prevalent uniaxial vitrinite reflectance anisotropies. This indicates coalification during sedimentary burial before regional deformation (pre-deformational coalification). The general increase in rank of individual coal seams in a northeasterly direction indicates an increase in sedimentary burial in that direction. Some tilting of strata before the main coalification is possible, and our data may support an early phase of syn-depositional deformation in the area.