Public Abstract
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Title: Igneous Intrusions and Thermal Evolution in the Raton Basin, CO-NM: Contact Metamorphism and Coal-bed Methane Generation

Tertiary mafic dikes and sills intrude coal-bearing formations of the Raton Basin. The basin contains significant accumulation of coal-bed methane. This study investigates the role of intrusions in generating methane from coal on a local scale, and their effect on the thermal history of the basin.

Coal samples, collected in profiles across intrusions, at four different outcrops were analyzed by vitrinite reflectance, carbon isotopes and petrography. Results show very distinct reflectance and isotopic patterns for dikes versus sills. Reflectance values within the contacts of sills are elevated over a wider contact zone than for dikes. Coal $\delta^{13}C$ values increase by approximately 1‰ approaching the contacts of dikes, which is consistent with the loss of ^{12}C-rich volatiles during metamorphism. Coal $\delta^{13}C$ values decrease by approximately 1.5‰ in the contact zones of sills due to the addition of ^{12}C-rich material such as pyrolytic carbon, derived from cracking of volatiles.

Several xenoliths and xenocrysts were collected. Textural observations show little evidence of dissolution for xenoliths within sills while much more dissolution has occurred for xenoliths within dikes. The lack of dissolution indicates an extremely short residence time within the magma, suggesting that sills within the Raton Basin cooled rapidly, once emplaced. The elevated reflectance pattern observed at sills therefore cannot result from long emplacement durations, and suggests instead that the very low thermal conductivity of coal is responsible. Regionally elevated temperatures probably result from intrusion-triggered hydrothermal convection. Therefore, intrusions may be very important for methane generation in sedimentary basins.