Retrodeformable cross sections for 3-dimensional structural analysis, Ouachita orogen, Arkansas

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A fundamental tectonic problem is how deformation proceeds from hinterland to foreland in a fold and thrust belt. Wedge models explain many of the first-order observations, but they have not been tested at the scale of the individual faults and folds. Moreover, most of the data available on, for instance, the sequence of events is best dated in the syntectonic sediments. Timing of uplift and motion of interior structures are not clear when using the dates from these syntectonic sediments. The purpose of this project is to develop an evolution model of the Ouachita orogen through the construction of a series of retrodeformable cross sections. A novel aspect of these cross sections is the combination of new and published thermal and thermochronologic data collected at various stratigraphic depths along the section lines. These data will help to determine the cessation of thrust motion as well as the initial depth from which the thrust sheet emerged. An Ordovician Mazarn sample in the eastern exposed core has zircon grains with 55% reset fission track ages, whereas an overlying Ordovician Blakely sample about ~30 km to the southwest along strike has 15% being reset. Illite 'crystallinity' (IC) values indicate maximum burial metamorphism temperatures of anchizone (~250-350˚C). Regionally, IC decreases from the culmination of the Benton Uplift and to the southwest along strike for similar stratigraphic age samples. These new timing and thermal constraints on an improved kinematic model are the necessary first steps in testing wedge models on an individual thrust sheet basis.