INTRODUCTION

In recent years, two vastly different interpretations of Ordovician paleogeography in the Iapetus region have been proposed. Both interpretations apparently are permissible using the available paleomagnetic, biogeographic, and lithologic data. One widely cited reconstruction is that by McKerrow and others (1991) who suggest that during Middle Ordovician time, Laurentia straddled the equator and Avalonia and Baltica lay to the south and east and apparently were drifting in a northward direction relative to Laurentia (Fig. 1A). Alternatively, Dalla Salda and others (1992) and Dalziel and others (1994) suggested that during the same time interval the eastern margin of Laurentia was in juxtaposition with the western margin of South America (Fig. 1B). Essentially this is seen as a continent/continent collision. The Ordovician deformation, metamorphism, and plutonism in the Famatinian belt east of the Argentine Precordillera, collectively known as the Ocloyic event (Ramos and others, 1986) is interpreted to have resulted from this Laurentia-Gondwana collision as is also the Taconian event of the Appalachians (Dalziel and others, 1994). Support for this idea is the fact that there is considerable similarity between the Taconic and Ocloyic orogenic belts both in structure, stratigraphy, and geologic history. The Taconic orogen disappears beneath the Mesozoic and Cenozoic cover of the Gulf Coastal Plain, and the northern termination of the Ordovician Famatinian belt is obscured by later Andean tectonic overprinting. A variation of the Dalla Salda/Dalziel model is that the Argentine Precordillera and eastern North America were a conjugate rift pair rather than a linear continuation of one another (Astini and others, 1995).

Dalziel and others (1994) also suggested that when these two continents separated during post-Taconian rifting, a continental fragment from the region of the Ouachita embayment stayed attached to South America forming the Occidentalia terrane, and that this terrane was part of Gondwana by Late Ordovician time. The interpretation of Dalziel and others (1994) can be viewed as an outgrowth of the hypothesis that the Laurentian and East Antarctic-Australian cratons were continuous during the late Precambrian, and that the conjugate margin of the southwestern U.S. is present in the Precambrian region of East Antarctica (Dalziel, 1991; Moores, 1991). This proposal, referred to as the southwest U.S.-east Antarctica connection (SWEAT hypothesis), has prompted a re-evaluation of the previously held assumption that the ancestral Appalachian margin rifted from northwestern Africa and remained opposite that margin until the assembly of Pangaea (Dalziel and others, 1994).

One novel way to test these paleogeographic reconstructions is to study the stratigraphic and geographic distribution of Ordovician volcanic ash beds. Many ash beds, now altered to K-bentonites. If the Appalachian or Ouachita and proto-Andean margins were involved in a collisional event during the Ordovician, then associated explosive volcanism should have left a record in the form of K-bentonite beds on both land masses. In recent years, we have developed a detailed framework of the stratigraphic distribution, as well as chemical, mineralogical, and geochronological databases, for the Ordovician K-bentonites of North America and northwestern Europe. One outcome of these studies is the observation that ash beds in eastern North America, which become coarser-grained, thicker, and more numerous from west to east, show just the reverse pattern in these respects compared with coeval beds in Baltoscandia. When plotted on the McKerrow and others (1991) map the overall pattern suggests a common source for both continents. Regional thickness patterns of these ash falls plotted on the two paleogeographic reconstructions under discussion (Figs. 1A, B) provide insight into the positions of the continents relative to volcanic centers and relative to each other. If portions of the two plates were the depositional sites of the same ash falls with a volcanic source located off southeastern Laurentia, then it is reasonable to suggest that Baltica in Middle Ordovician time was situated...