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Central Appalachian Valley and Ridge Province Cenozoic igneous activity and their relation in space and time with the Late Jurassic rift to drift related alkalic dikes.

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A Swarm of Late Jurassic alkalic intrusions and geographically limited mainly to the Augusta County in western Virginia has been studied geochemically. These dykes were emplaced along a northwest-southeast cross-strike basement fracture zone during Mesozoic extension. However, not all igneous rocks in Virginia are Jurassic; published K-Ar ages already suggested an Eocene age activity around Monterey, VA (e.g. Fullagar & Bottino 1969). We first systematically sampled and studied these rocks geochemically and used the Ar-Ar dating technique to define a more precise age (around 48Ma) for this youngest volcanic activity East of the Mississippi. The younger igneous bodies have traditionally been interpreted as intrusive bodies representing old plumbing systems of eroded volcanic centers. This hypothesis is based on studies of aphanitic to porphyritic and occasionally vesicular hard rocks from quarries and road cuts. Pyroclastic deposits have mainly been neglected during theses earlier studies. However additional petrographic studies of volcanic sediments are able to shed light not only on the volcanic nature of these pyroclastic rocks but also on eruption mechanisms and magma crust interactions. Our petrographic studies defined that these volcanic sediments contain different clasts of igneous and sedimentary country rocks (sandstones and limestones of different formations), fresh glass shards and crystals of predominantly pyroxene, hornblende and micas. A previously unmapped, massive, m-thick andesitic pyroclastic deposit has been studied in detail to shed light on the formation of theses volcanic sediments. Field relations and observations (e.g.denser rock fragments are enriched in the lower part of the sequence and bedding is largely parallel to the present topography) are consistent with a massive welded ignimbrite. As a result, surface erosion after the eruption must be less significant than previously believed and some rocks are clearly volcanic in nature. Petrogenetically the Jurassic magmas are much more alkalic and particularly K-rich, and thus have all the characteristics as described for delamination magmas by Kay & Kay (1993). This confirms that delamination seems a substantial process during the rift to drift transition. After Jurassic delamination of lithosphere below Virginia hot asthenosphere has been transformed into lithosphere by lithospheritisation. This newly formed lithosphere has later been the mantle source of the Eocene volcanic activity. As a result, the suggested geodynamic model is not only important for the petrology community but also to understand the local geomorphology, seismicity and hot springs.