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Petrogenesis of late Ediacaran volcanism in the Nama Basin (southern Namibia) revealed by apatite compositions in stratigraphically constrained ash layers

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The Nama Basin in southern Namibia and northwestern South Africa is a foreland basin related to the collisions between the Kalahari craton and the Congo (Damara orogen) and Río de la Plata (Gariep orogen) cratons during Gondwana assembly in the Ediacaran–Cambrian. The Nama Group is divided into the Kuibis, Schwarzrand, and Fish River subgroups and comprised of marine siliciclastic and carbonate rocks containing terminal Ediacaran biota and recording their disappearance prior to the Ediacaran-Cambrian transition. Nama Group deposition was punctuated by extensive arc-related magmatic activity that produced numerous ash layers. These ashes have been the subject of extensive geochronological investigation aimed at providing high-precision temporal constraints on the timing of deposition of the Nama Group. However, the petrogenesis of the Nama ashes remains poorly constrained, hindering a full understanding of the nature of the magmatic activity in the Nama Basin and its link to basin development. In this study, we focus on the geochemical characterization of ash layers in the Schwarzrand subgroup using apatite volatile (Cl, F, OH) and trace element compositions determined by electron microbe analysis and LA-ICP-MS, respectively. All the ash layers are stratigraphically well-constrained; therefore, variations in the composition of the apatite crystals can be used to infer spatial and temporal changes in the magmatic activity. Preliminary results show that all analyzed crystals are fluorapatite and have relatively low S and Cl contents. Variations in Eu anomaly in ash layers at different stratigraphic levels may indicate eruption events tapping variably evolved magma batches. Within individual formations, the results can be used to fingerprint individual ash layers and to evaluate the potential of apatite geochemistry as a tool for basin-wide correlation.