

New geochronological, paleomagnetic and compositional constraints on magmatism within the Tadpatri Formation (Cuddapah basin), Southern India

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The Cuddapah basin, the largest of the Purana basins, is host of numerous sills and dykes. This study focuses on three sills and two dykes intruding the Tadpatri Formation in the lower part of the Cuddapah basin. Previous studies have recognized the ~1.9 Ga magmatism in the sampling area and the investigated Tadpatri intrusions are assumed to be part of this event. Thin sections reveal doleritic composition, mostly consisting of clinopyroxene and plagioclase. Comparisons of compositional ranges of samples with existing geochemical data did not allow to confirm the exact chronology of the studied rocks. The ⁴⁰Ar/³⁹Ar whole-rock date of ~1530 Ma (pseudo-plateau) from one dyke is most likely affected by isotopic disturbance and corresponds to a minimum age. Stepwise demagnetization revealed characteristic magnetizations that are steeply inclined with both positive and negative polarities. These directions are considered as primary based on the high stability (>500°C) of the magnetic carrier (i.e., magnetite) and the absence of high-grade metamorphic activities that could have reset the original remanence in the study area. Our likely primary magnetizations are statistically distinguishable from known ~1.9 Ga magnetizations (shallowly inclined north west and south east) in Southern India. The above observations could well indicate that the studied rocks were not emplaced at ~1.9 Ga, contrary to the previous assumption. This may imply that the Tadpatri Formation is host of another igneous event that is chronologically distinct from the known ~1.9 Ga magmatism. Precise radiometric ages are needed for further testing.