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Mapping and mineralogical discrimination of linear paleoproterozoic carbonatite complexes from Ihouhaouene area (In Ouzzal terrane, Hoggar, Algeria)



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Ihouhaouene area located in In Ouzzal terrane (Hoggar, Algeria) may be considered as exceptional by numerous carbonatite complexes contained, systematically associated to fenites at the contact with UHT granulites. They constitute one of the oldest known carbonatite which is emplaced at ca. 2 Ga (U-Pb, zircon, [1]). These carbonatites are original since they are associated with silica – saturated fenites and present a very uncommon mineralogy with wollastonite, allanite and quartz. The mineralogy, C and O isotopes and REE distributions show that the late stages of crystallization produced extremely high REE concentrations in phosphate minerals [2] such as apatite (REE = 9%) and monazite (REE = 64 – 67%). Apatite contains also micro-inclusions of britholite, mineral derived from apatite through a coupled substitution $P\ Ca \leftrightarrow Si\ REE$. The special interest of the Ihouhaouene fenite-carbonatite complex lies in its linear shape instead of usual annular complex founded in continental cratonic regions. The differences that exist among these various types of carbonatite may result from the different depths at which the circulation of the fluids is observed and from the degree of interaction with the crust. In the field, a relative chronology comprising several stages can be established for the emplacement of the carbonatite complex. Two carbonatites generations are distinguished. The first generation of carbonatite breccias corresponds to the intrusion (width: max 300 m; length: max 1000 m) which crosscuts or is parallel to the foliation in the white and the red fenite. The second generation of pegmatitic carbonatites intruded the early suite as dykes (lens) of smaller size (max width: 3 m, max length: 40 m). Furthermore, multispectral data like Landsat OLI 8 and Aster thermal Sensor are carried in order to emphasize the spectral and geological features of the Ihouhaouene area, as well as several mineralogical indices including Quartz index (QI), Carbonate Index (CI) and Mafic Index (MI). These data highlight chemical and mineralogical composition of silicate, carbonate, mafic and quartzose rocks ([3], [4], [5]). Regardless to the remote sensing technics used for mineralogical and lithology mapping, airborne survey proves to be a very powerful tool for mineral features detecting. Ihouhaouene area shows uncommon anomaly highlighted by the radiometric survey in four channels U, Th, K and Total Count which are linked to the High content of Th and several radioactive elements in the carbonatite outcrops.

References:

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[5] Ninomiya Y. et al. (2004) : P SPIE, 5234: 180-190.

