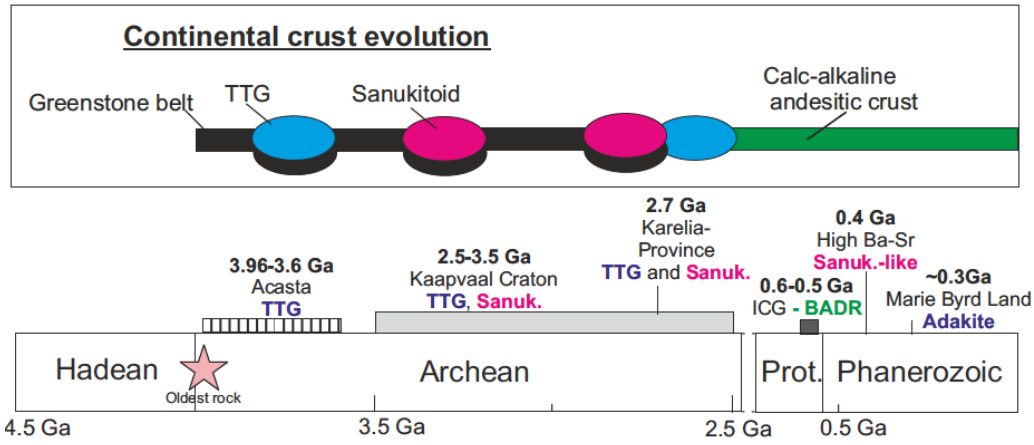
EVOLUTION DE LA CROUTE ANCIENNE PAR L'ANALYSE DES MINERAUX ACCESSOIRES

L'étude de phases de terres rares dans différents magmas à travers les temps géologiques révèle que ces minéraux résistants à l'érosion et aux processus secondaires, permettent de reconstruire l'évolution magmatique de l'Archéen à nos jours. Cette étude donne une nouvelle opportunité de mieux comprendre l'évolution de la croûte ancienne via l'analyse de ces petites phases minérales. Elle ouvre de nouvelles perspectives sur la compréhension des premières croûtes terrestres, via leur étude dans les sédiments produits de l'érosion des continents anciens. Cette découverte a fait l'objet d'un article publié dans *Geochemical Perspectives Letters*.

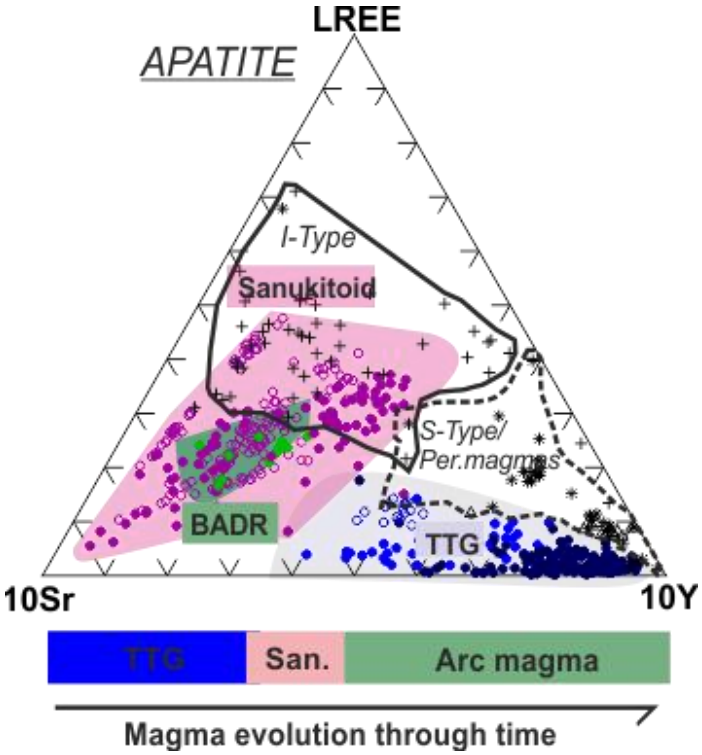
ACCESSORY MINERAL CONSTRAINTS ON CRUSTAL EVOLUTION: ELEMENTAL FINGERPRINTS FOR MAGMA DISCRIMINATION.

Underexplored accessory minerals such as titanite and apatite have the potential to give insights into the nature and the petrogenesis of their host rock. Their trace element and REE-rich compositions carry a record of crystallization history and chemical characteristics of their source. Moreover, titanite and, to a certain extent, apatite are resistant to erosion during sedimentary cycles which makes them ideal to reconstruct the history of long-eroded continental landmasses. The study of these underexplored minerals led by researchers from the laboratoire magmas and volcans (LMV, Université Clermont-Auvergne / CNRS / IRD / Université Jean Monnet / OPGC), give new insights into their behaviour in magmas through time.

Here we report new trace element data on apatite and titanite from granitoids of different Archean cratons and comparative granitoids from the Phanerozoic (Figs. 1, 2). Trace element signatures of both minerals reveal systematic chemical trends in Y, LREE and Sr contents related to the nature of their host magma, which are used to construct discrimination diagrams delineating Archean TTGs from sanukitoids, and modern adakites from S/I-type granites (Fig. 2). By comparing Archean granitoids (TTG and sanukitoids) and their Phanerozoic counterparts (adakite and high Ba-Sr granites), we show that the robust nature of these phases makes them reliable recorders of petrogenetic information from Archean rocks, that usually have been affected by secondary processes (metamorphism, deformation, hydrothermal activity). Applied to the rock record, both phases potentially provide detailed archives of magmatic evolution through time.



Caption: Cartoon of continental crust evolution, from TTG and sanukitoid in the Archean towards typical arc magma in the Phanerozoic, plus samples studied in this contribution.



Caption: Ternary discrimination diagrams; 10*Sr-LREE-10*Y for apatite

Reference:
Bruand E., Fowler M., Storey C., Laurent O., Antoine C., Guitreau M., Heilimo E., Nebel O. (2020). Accessory mineral constraints on crustal evolution: elemental fingerprints for magma discrimination. Geochemical perspective Letters vol.13, p.7-12, DOI:10.7185/geochemlet.2006