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# First Cenozoic ages from the Roraima's region landscape (Northern Brazil): insights from hematite and goethite (U-Th)/He dating

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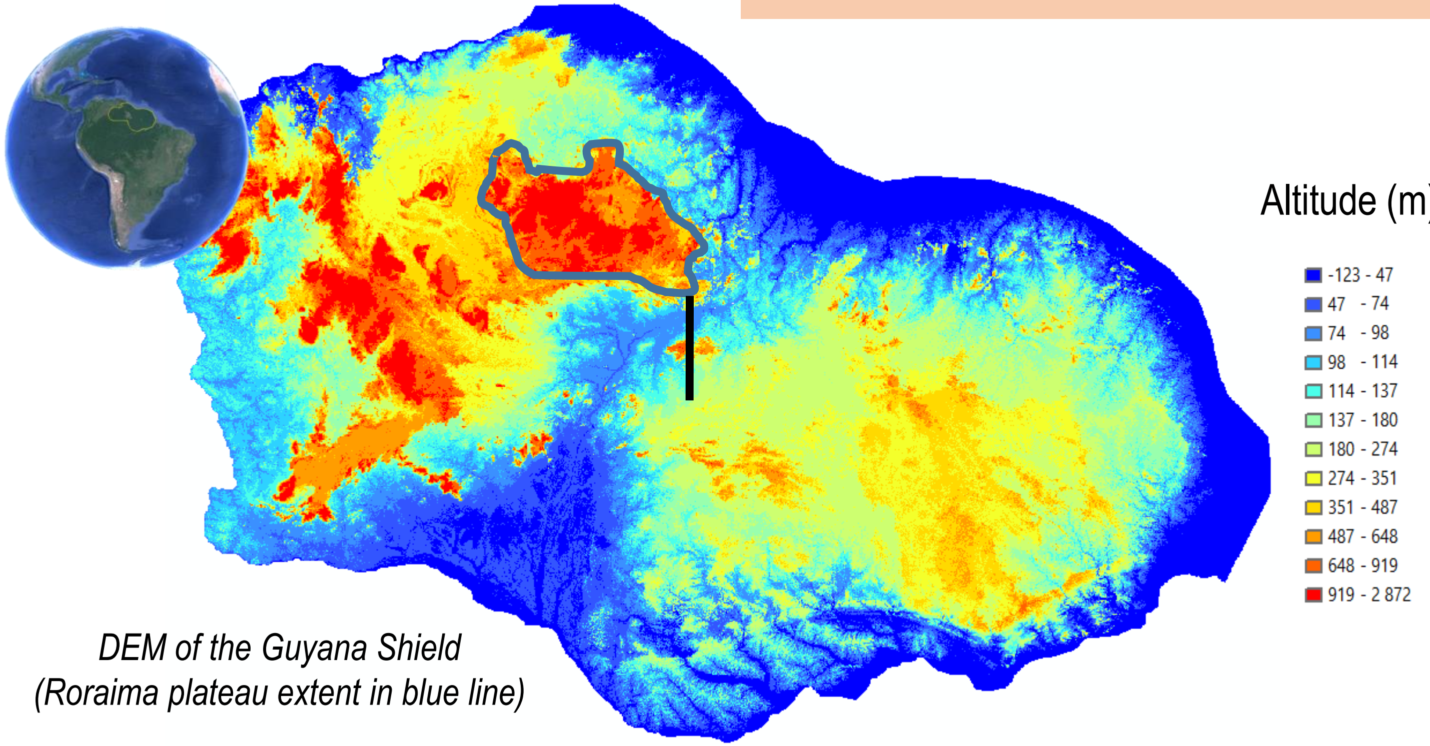
# Guyana shield paleo-surfaces



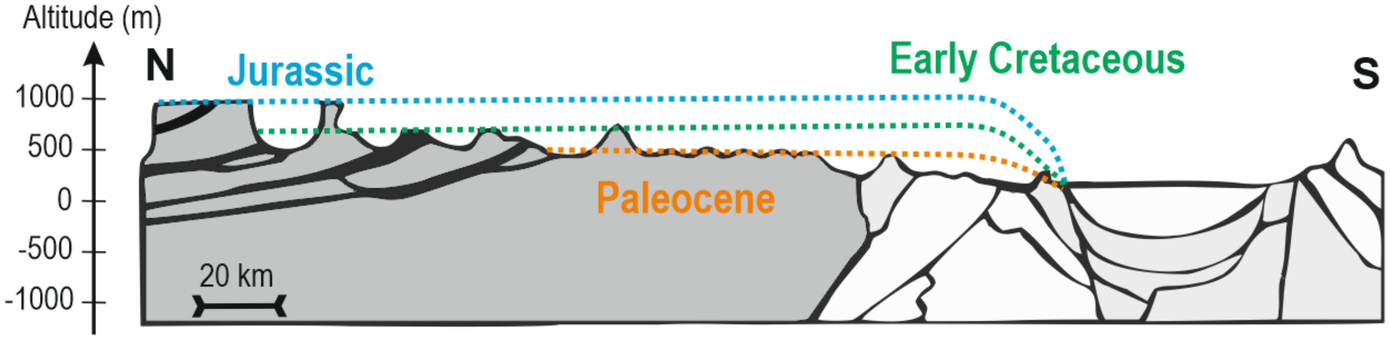



*DEM of the Guyana Shield*
*(Roraima plateau extent in blue line)*

The relationship between age and altitude of preserved surfaces has largely been discussed since the mid XIX$^{th}$ century (Davis, 1889; King, 1953, Vasconcelos and Carmos, 2018) with a specific emphasis on craton shields under tropical climates. Indeed, is there a positive correlation between paleosurfaces altitude and their age?

Scenarios have been proposed for the Guyana Shield, at the North of the Amazon, assigning an age for different paleosurfaces at specific altitudes.

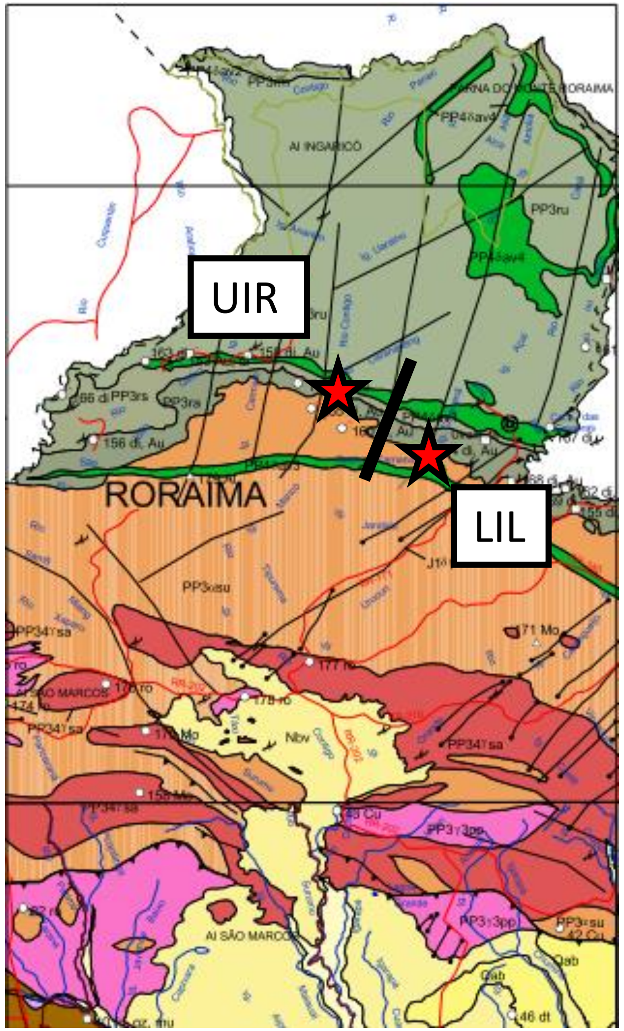
In this study we focused on the large extended Roraima plateau developed on Paleoproterozoic rocks which age is supposed to be Jurassic at around 1000 masl by dating the duricrusts on the surface by (U-Th)/He.




*(Age of the paleosurfaces in the Roraima Brazilian region after Schaefer et al.,1996)*

# Northern Brazil Roraima study zone

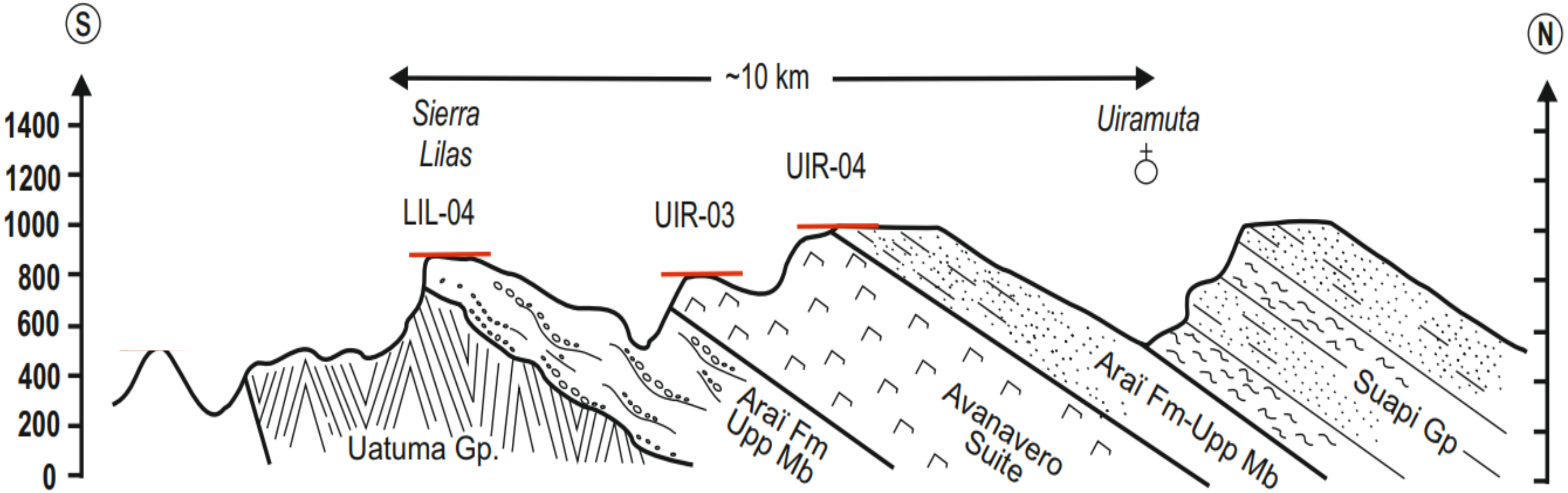





- Roraima group sandstone
- Surumu intrusive group
- Saracura intrusive suite
- Pedro Pintada intrusive group
- Cenozoic cover

*North Roraima geological map (Boa Vista : 1/200000, CPRM)*

In this study, two sites were sampled, the first one named Sierra Lilas (LIL) where developed on ~1.9 Ga sandstone from the on Roraima group sandstone at 835 m on a remnant hill. From the second zone, Uiramuta (UIR), 3 samples were taken on 1.7 Ga intrusives between at 835 m and around 950 m high.




*Topographic profile of the study site and altitudes.*

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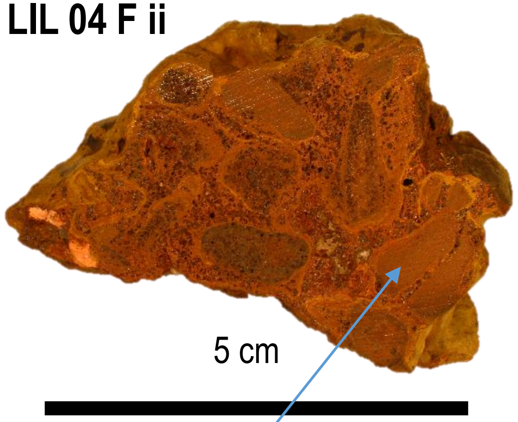
# Methods : oxides characterization and (U-Th)/He dating

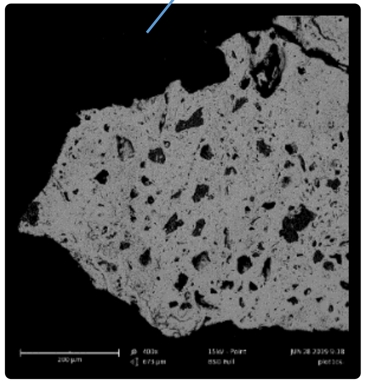


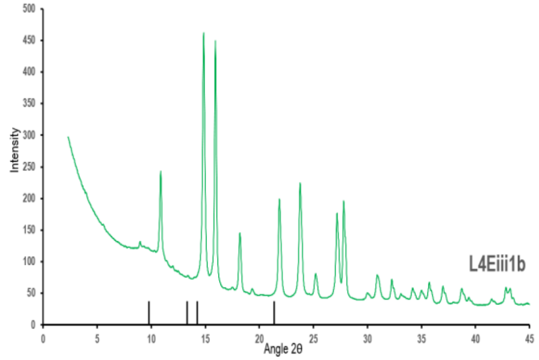


**LIL 04 F ii**




**UIR 04 B iii**




Before dating the samples the mineralogy has been characterized on every visible generation first at macro scale (apparent density, colour and morphology) and micro scale (SEM and XRD).

Here, the samples present various petrologies : mainly pisolithic (LIL) and iron massive banded iron types (UIR). The XRD analysis revealed that the LIL sample are hematite and UIR sample are mainly goethite.

The (U-Th)/He dating method is based on the accumulation of $^4$He, in the mineral struct to radioactive decay from mainly U and Th elements. For this purpose we measure the daughter and the father element concentration to obtain the age. We replicate several aliquots on the same generation.

**Characterization** SEM + XRD → **He Extraction** LASER-QUAD-MS + **U-Th Measurements** ICP-MS

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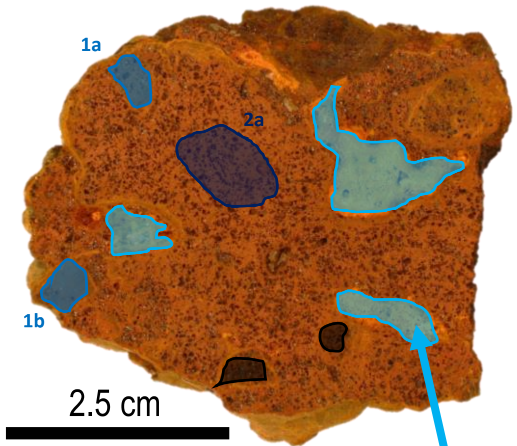
# Several generations



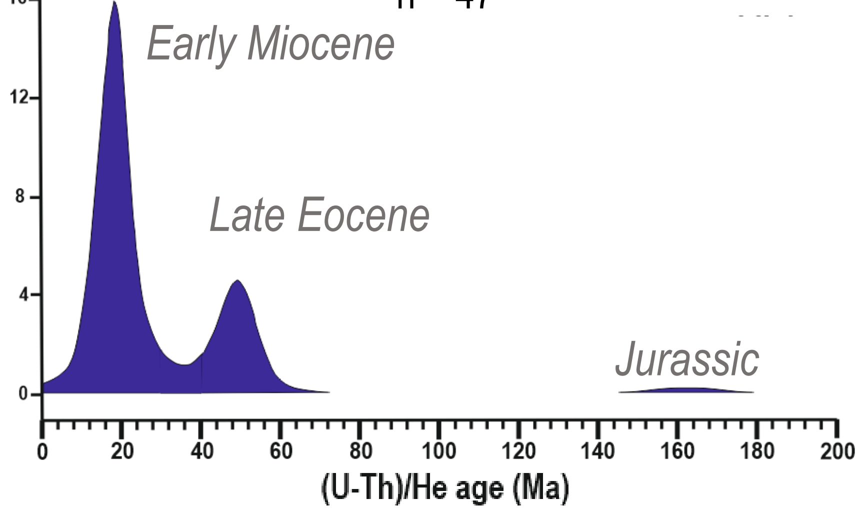
## LIL 04 A i



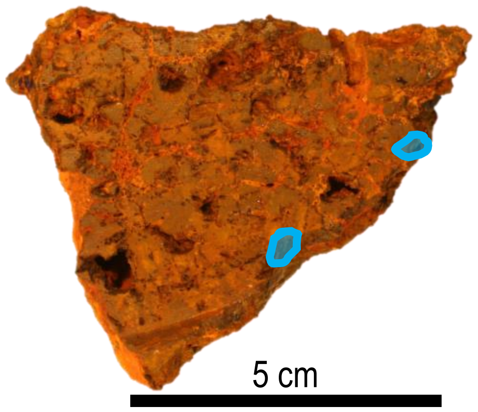

Kaolinite dating (EPR dating in process method, see Allard et al., 2018)

## LIL 04 age compilation

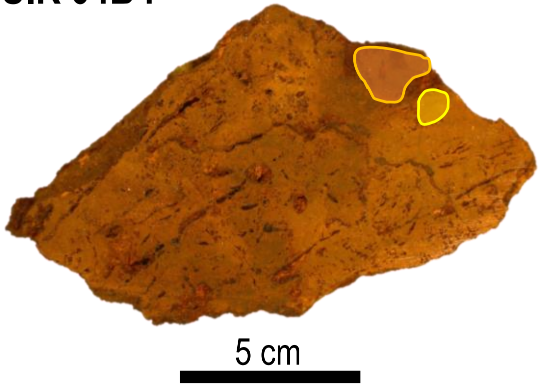
n = 47




## UIR 03Ciii

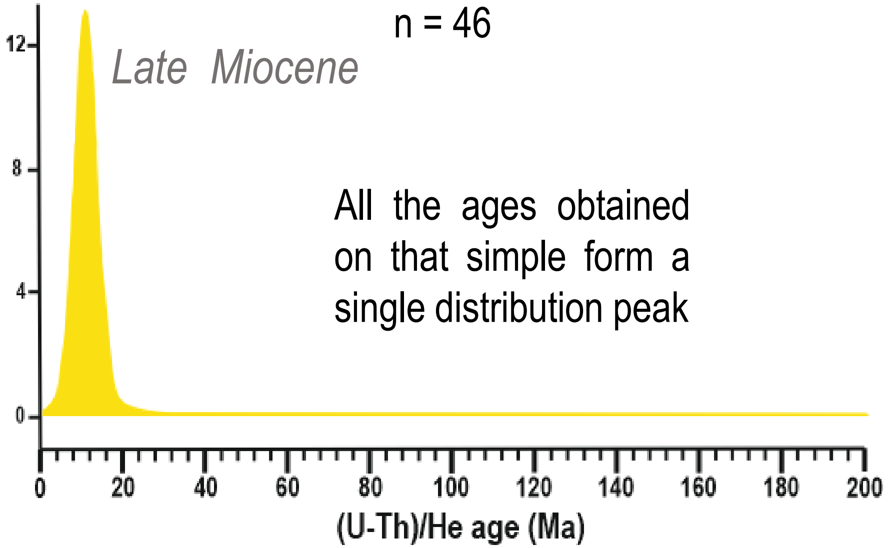



## UIR 04B i



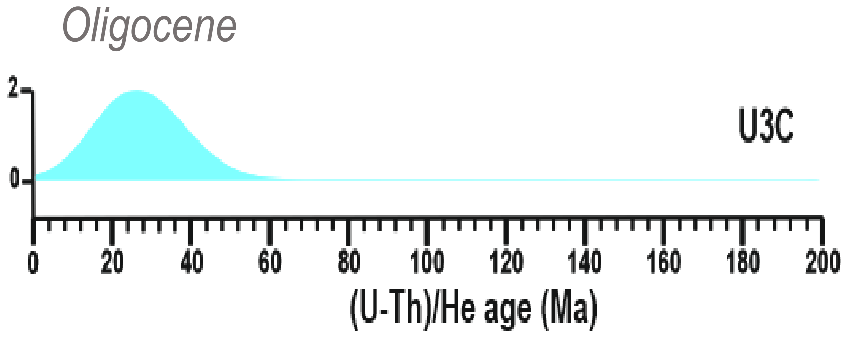

## UIR 04 age compilation

n = 46




## UIR 03 age compilation

n = 7



# Roraima's plateau age(s)



- The ages obtained from the **Roraima plateau are principally Cenozoic ranging from late Miocene to Eocene** ( with the exception of one aliquot indicating a Jurassic age), younger than proposed in the literature.

- The ages are robust and consistent for each sample. However there is **no positive correlation between the altitude and the (U-Th)/He ages** of the sample.

- Climatic implications have been demonstrated : different climates can explain the diversity of iron oxide mineralogies. Indeed the dehydrated hematite form preferentially under warm climate and goethite hydrated mineral are related to cooler and humid climatic conditions (Tardy et al., 1991).

- The strict differences in terms of iron oxide mineralogy, age distribution difference and the U-Th concentrations strongly suggest **different processes in forming the duricrusts** as topographic and lithologic which are still under investigation.

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