

NORDESTE: NEW SCIENCE FOR A NEGLECTED BIOME

The northeast region of Brazil is relatively dry compared to the rest of the country but the soils there are relatively fertile and the area is reasonably densely populated. This has led to extreme land-use pressures on the natural vegetation and widespread degradation of remaining lands.

The natural vegetation of the area is a form of deciduous scrub, known locally as caatinga which has been relatively neglected to date, in terms of both conservation programmes and scientific enquiry. This is despite the area being of a high biodiversity and a home to many endemic species. Caatinga may also be considered an analogue to the sort of vegetation that might be expected should areas of the Amazon Basin dry out as a result of climate change.

Designed as a ca. £2M integrated research program involving both Brazilian and UK researchers 'Nordeste' aims to:

- establish a permanent plot network similar to that existing in tropical forests for the monitoring of short- and long-term responses of caatinga vegetation to climate change.
- better quantify and understand the biodiversity of the region
- understand and model the key plant adaptions associated with success in a semi-arid environment

As well as being located in the driest areas of Brazil, a second characteristic of caatinga vegetation is that the vegetation there is subject to extreme variations in precipitation amount from year to year. This is shown in the accompanying diagram where a simple inter-annual precipitation variability index is plotted as a function of average mean annual precipitation (1961–2010) is compared for 100 randomly chosen areas of caatinga shrubland versus cerrado savanna vegetation.

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ABOUT THE PROJECT

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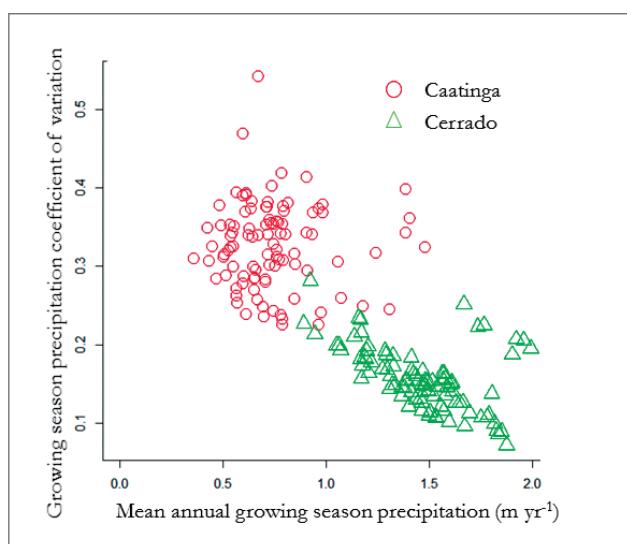
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SUMMARY OF RESULTS

During the development of this project two new rare earth minerals were described, waimirite-(Y) and parisite-(La). Also the gadolinite supergroup of minerals was established and a nomenclature system for them was developed. The most interesting feature of the new mineral waimirite-(Y), YF_3 , from both the crystal chemical and potential application aspects, is the distribution of REEs. Ideal waimirite-(Y) contains 60.93 wt% of yttrium, whereas Y content in ideal xenotime-(Y) is 48.35 wt%. Waimirite-(Y) could be therefore a spectacular ore mineral. Parisite-(La), ideally $\text{CaLa}_2(\text{CO}_3)_3\text{F}_2$, is the second new mineral studied and is the La-dominant analogue of parisite-(Ce). Gadolinite is a very important ore for three metals of beryllium, thorium, and yttrium (this metal is used to provide red color in color TV sets). Also, thorium is often occurs as an impurity within the body of the mineral (thorium is a radioactive metal that may be converted to fissionable uranium-233).

MAIN PUBLICATIONS

Atencio D, Bastos Neto AC, Pereira VP, Ferron JTMM, Hoshino M, Moriyama T, Watanabe Y, Miyawaki R, Coutinho JMV, Andrade MB, Domanik K, Chukanov NV, Momma K, Hirano H, Tsunematsu M. 2015. Waimirite-(Y), orthorhombic YF_3 , a new mineral from the Pitinga mine, Presidente Figueiredo, Amazonas, Brazil, and from Jabal Tawlah, Saudi Arabia: Description and crystal structure. *Mineralogical Magazine*. **79**: 767-780.

Baćík, P, Miyawaki, R, Atencio, D, Câmara, F, Fridrichová, J. 2017. Nomenclature of the gadolinite supergroup. *European Journal of Mineralogy*. **29**: 1067-1082.

Menezes Filho, LAD, Chaves, MLSC, Chukanov, NV, Atencio, D, Scholz, R, Pekov, I, Costa, GM, Morrison, SM, Andrade, MB, Freitas, E, Downs, RT, Belokovskiy, DL. 2018. Parisite-(La). Parisite-(La), ideally $\text{CaLa}_2(\text{CO}_3)_3\text{F}_2$, a new mineral from Novo Horizonte, Bahia, Brazil. *Mineralogical Magazine*. **82**: 133-144.