

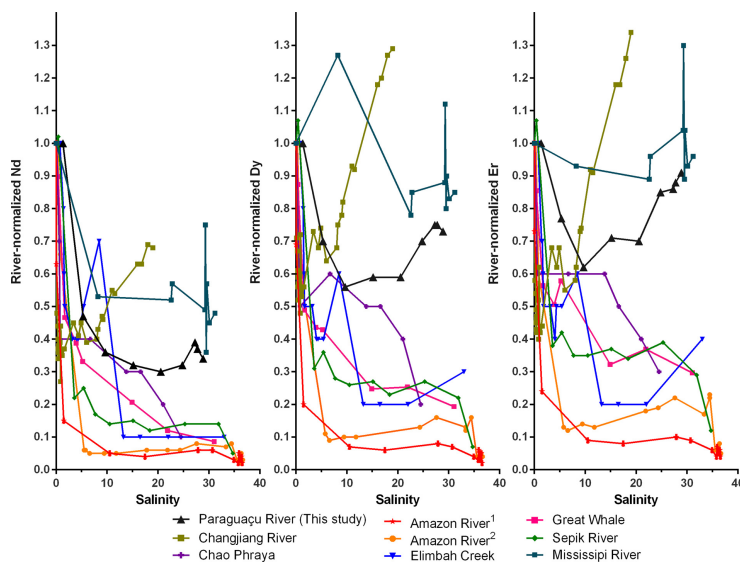
## ANNUAL REPORT ON GEOTRACES ACTIVITIES IN BRAZIL

April 1st, 2019 to March 31st, 2020

### New Scientific Results

- Rare Earth Elements fractionation along the continuum between Paraguaçu River to coastal South Atlantic waters

The results show that REE were scavenged in the estuarine low salinity region ( $< 5$ ) following the order Light  $>$  Medium  $>$  Heavy (LREE  $>$  MREE  $>$  HREE), likely due to colloids coagulation/precipitation. At mid to high salinities, REE concentrations gradually increased, starting with HREE, followed by MREE and LREE. Within Todos os Santos Bay, a clear difference between the eastern and western sides was observed: i. The western side was clearly influenced by the fluvial input, ii. the eastern side of the bay showed more scattered REE patterns, due to the influence of different sources, such as submarine groundwater discharge and the mixing with coastal seawater. During a 13h tidal cycle experiment at a mooring station, the REE pattern changed from a terrigenous (flat) at low tide to a marine-like (HREE enriched) pattern at the flood tide. Anthropogenic Gd anomalies ( $Gd/Gd^* > 1.4$ ) were observed at the estuary and also at high tide and during ebb tide along the tidal cycle experiment. Taken together, these observations show that the REE behavior along the continent-ocean continuum is quite variable. Moreover, the occurrence of anthropogenic Gd indicates that anthropogenic inputs of REE may complicate their use as a tracer for natural processes in the future.

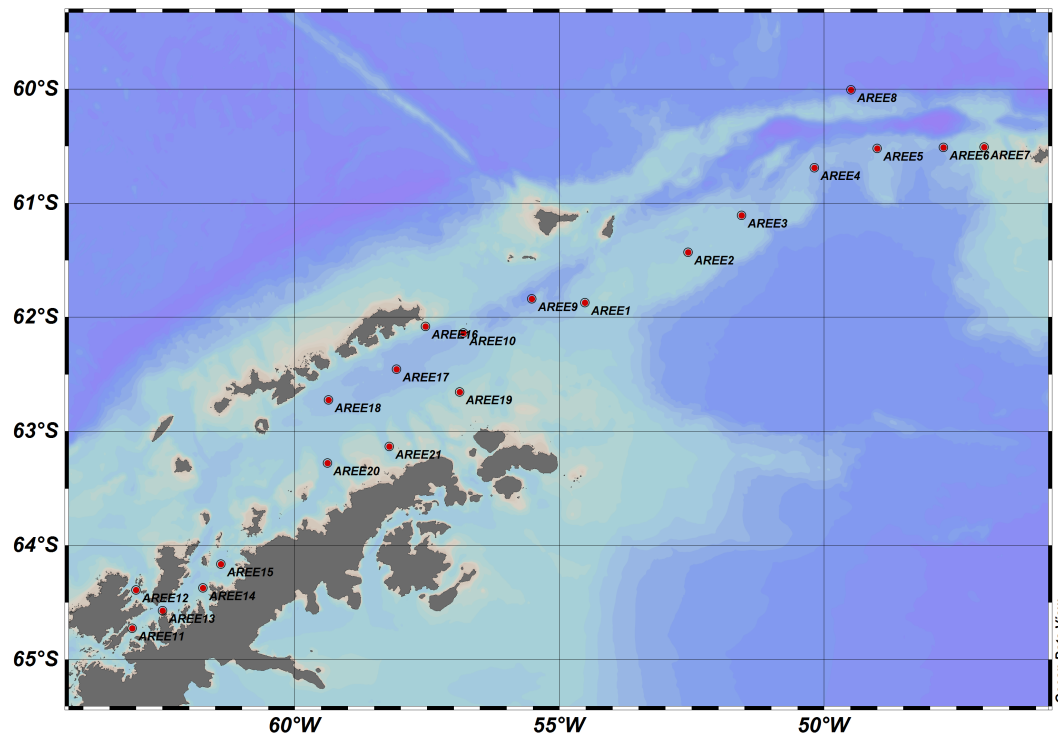


**Figure 1:** Estuarine concentrations of Nd (LREE), Dy (MREE) and Er (HREE) normalized to the REE concentrations of the freshwater endmember of Todos os Santos Bay and estuaries elsewhere. Worldwide references are Wang and Liu, 2008, Sholkovitz and Symczak, 2000, Lawrence and Kamber, 2006, Nozaki et al., 2000, Goldstein and Jacobsen, 1988, Rousseau et al., 2015, Sholkovitz, 1993 and Adebayo et al., 2018.

Reference: Andrade, et al., REE fractionation and human Gd footprint along the continuum between Paraguaçu River to coastal South Atlantic waters. CHEMICAL GEOLOGY, v. 532, p. 119303, 2020.

## *Cruises*

- The PROVOCAR/GEOTRACES GApr15 cruise was performed between February and March 2020 on board the Polar Vessel *Alte. Maximiniano*. Full depth profiles were performed to collect waters for the determination of nutrients, biogenic silica, and particulate carbon and nitrogen (Fig. 2) to be analyzed by Rodrigo Kerr (FURG). We also collected waters for the analysis of dissolved REE, and isotopes of C, O, Nd and Ba.



**Figure 2.** Stations profiles for the GApr15/PROVOCAR 2020 cruise.

## *Other GEOTRACES Activities*

- V. Hatje is a Full Member of SCOR Working Group 145: Modelling Chemical Speciation in Seawater to Meet 21st Century Needs (MARCHEMSPEC).
- V. Hatje is serving as a member of the IAEA Standing Advisory Group on Nuclear Applications (SAGNA).
- V. Hatje is serving as a member of the SCOR Capacity Building Committee.

## *GEOTRACES-related articles*

- Andrade, Raíza L.B. ; Hatje, Vanessa ; Pedreira, Rodrigo M.A. ; Böning, Philipp ; Pahnke, Katharina. REE Fractionation And Human Gd Footprint Along The Continuum Between Paraguaçu River To Coastal South Atlantic Waters. *Chemical Geology*, V. 532, P. 119303, 2020.

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- Amorim, Artur Moraes ; Sodré, Fernando Fabríz ; Rousseau, Tristan C.C. ; Maia, Poliana Dutra. Assessing Rare-Earth Elements And Anthropogenic Gadolinium In Water Samples From An Urban Artificial Lake And Its Tributaries In The Brazilian Federal District. *Microchemical Journal*, V. 148, P. 27-34, 2019.
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- Jones, Matthew W. ; Arag o, Luiz E. O. C. ; Dittmar, Thorsten ; Rezende, Carlos E. ; Almeida, Marcelo G. ; Johnson, Ben T. ; Marques, Jomar S. J. ; Niggemann, Jutta ; Rangel, Thiago P. ; Quine, Timothy A. . Environmental Controls On The Riverine Export Of Dissolved Black Carbon. *Global Biogeochemical Cycles*, V. 1, P. 2018gb006140-26, 2019.
- Fadina, O. A. ; Venancio, I. M. ; Bel m, A ; Silveira, C. S. ; Bertagnolli, D. C.; Silva-Filho, E. V. ; Albuquerque, A. L. S. Paleoclimatic Controls On Mercury Deposition In Northeast Brazil Since The Last Interglacial. *Quaternary Science Reviews*, V. 221, P. 105869, 2019.

### ***GEOTRACES presentations in international conferences***

- One GEOTRACES presentation during the Regional Planning Workshop for the South Atlantic (Rio de Janeiro, 2019);

Submitted by Vanessa Hatje (vhatje@ufba.br).