São Paulo School of Advanced Science on Ocean Interdisciplinary Research and Governance

THE INFLUENCE OF TROPICAL ATLANTIC OCEAN FOR EXTREME DROUGHT AND RAINFALL EVENTS IN NORTHEAST BRAZIL

Maurício Rebouças Rocha[1]; Rodrigo Azevedo Nascimento[2]
maureboucas@gmail.com[1], PhD Student at the Postgraduate Program in Meteorology of National Institute for Space Research;
r.azevedonascimento@gmail.com[2], PhD Student at the Postgraduate Program in Geosciences, Federal Fluminense University.

INTRODUCTION

The *sertão* of Northeast Brazil is characterized by a semi-arid climate modulated mainly by seasonal variability (Figure 1). In this region, problems related to dry conditions may be further aggravated by strong precipitation anomalies.

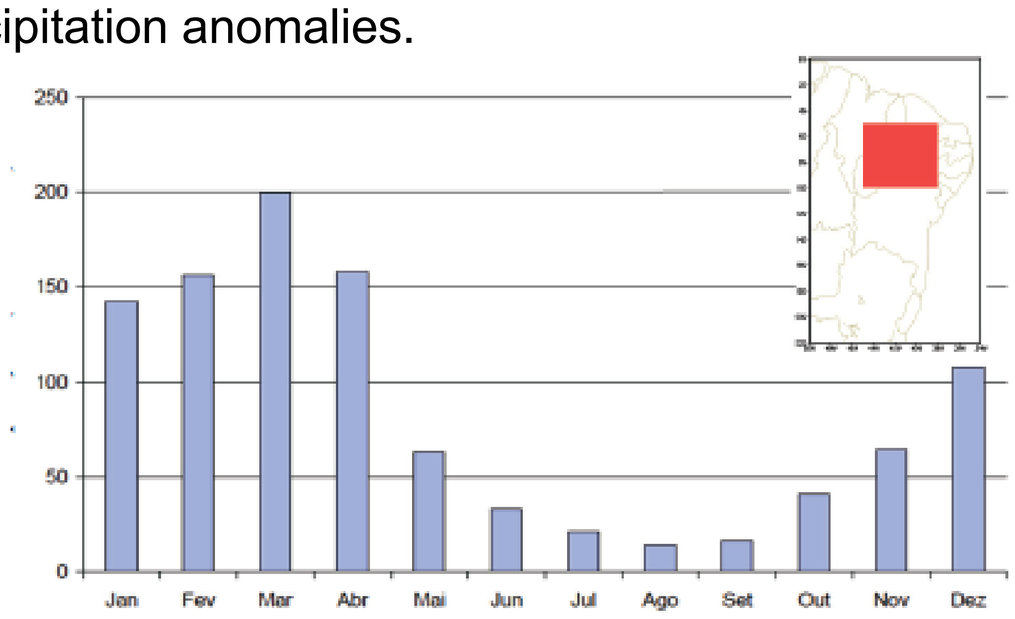

Figure 1: Precipitation climatology (mm month^{-1}) for the highlighted region, from 1971 to 2000. From: Marengo et al. (2011).

The rainfall regime of *sertão* is modulated by the seasonal latitudinal migration of the Intertropical Convergence Zone (ITCZ). During the wet season, from December to March, the ITCZ reaches its southernmost position on the Atlantic Ocean, resulting in precipitation over the Northeast Brazil (Hastenrath and Heller, 1977). The latitudinal excursion of ITCZ system follows the migration of the warmer waters band in the equatorial Atlantic.

PROJECT PURPOSE

Since different variability modes of the Tropical Atlantic are important to modulate SST and its influence on precipitation anomalies in Northeast Brazil. This research project purpose to improve our understanding of the contribution of dynamics and thermodynamics of the Tropical Atlantic for its SST variability modes, focusing on control mechanisms. Another aim of the project is to increase the knowledge of the relation between extreme drought and rainfall events of Northeastern Brazil and the state of the Tropical Atlantic Ocean.

In general, sea surface temperature (SST) in tropical Atlantic follows the seasonal insolation. However, other modes of variability such as the interannual mode that it is related to teleconnection patterns (Moura and Shukla, 1981) and the dynamics and thermodynamics of the Tropical Atlantic itself may influence the SST.

It is worth noting that the western tropical South Atlantic circulation is the main route for the interhemispheric transport of warm waters, favored by the South Equatorial Current (SEC) (Figure 2) (Schott et al., 1998). Recently, Hounsou-gbo et al. (2015) indicated that the warm water transport increased SST near Northeast Brazil coast and this was associated with an extreme rainfall event in Recife, Brazil. Besides, the increase in Agulhas Leakage (~1 Sv) during the last decades was related to the increase in heat flux in the South Atlantic and rainfall in North and Northeast of Brazilian coast (Castellanos et al., 2017).

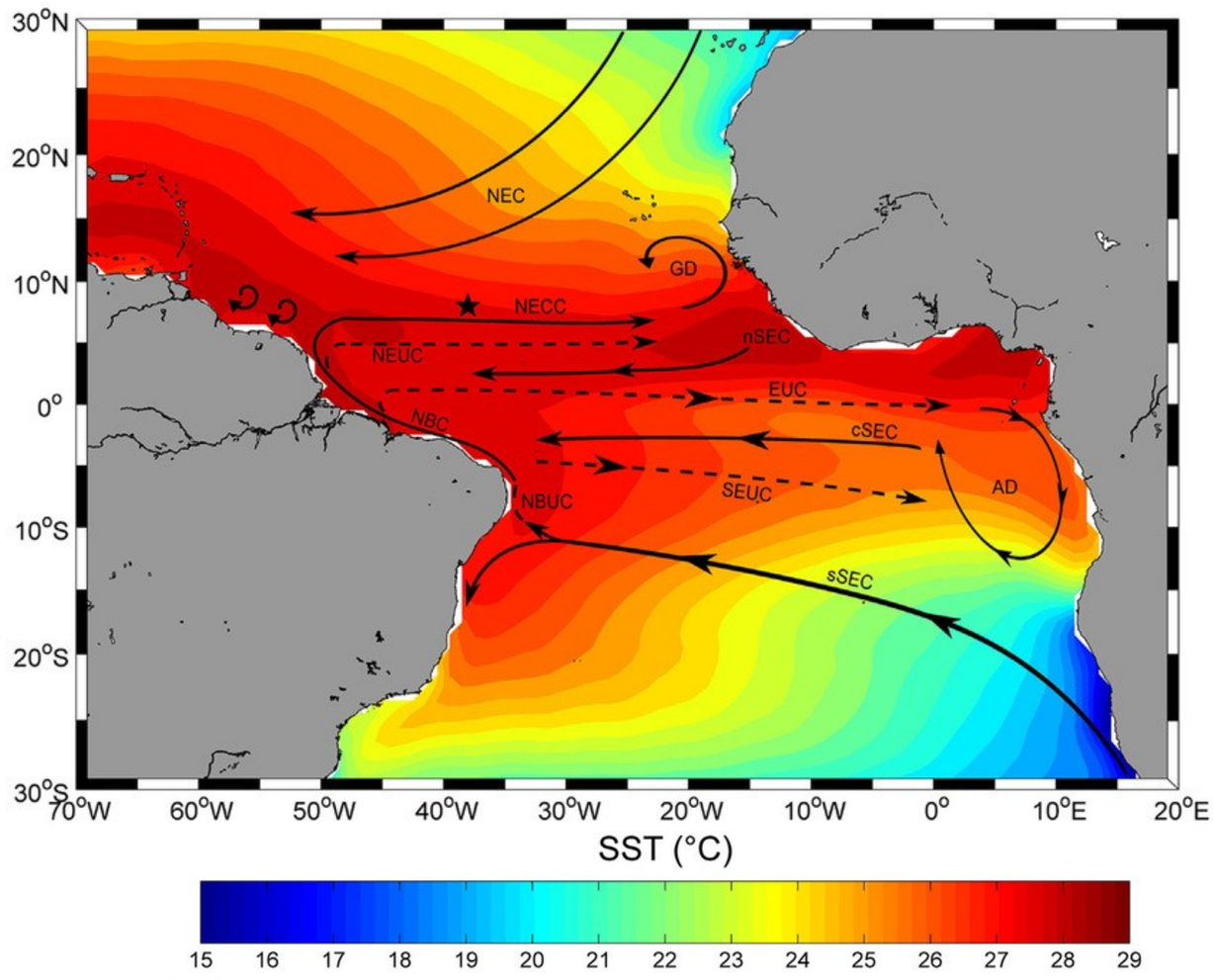

Figure 2: Schematic of surface (solid) and subsurface (dashed) tropical Atlantic Ocean currents. North Equatorial Current (NEC), North Equatorial Countercurrent and Undercurrent (NECC, NEUC), South Equatorial Current with northern, central and southern branches, and Undercurrent (nSEC, cSEC, sSEC, SEUC), Equatorial Undercurrent (EUC), North Brazil Current and Undercurrent (NBC, NBUC), GD, AD = Guinea and Angola domes. Color bar (15–29 ◦C) indicates the average SST (OA Flux (http://oaflux.whoi.edu/) – 1998–2011). The black star represents the 8°N–38°W a buoy of the PIRATA project.. From: Bruto et al. (2017).

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