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Interactive comment on "Revisiting Tropical Instability Wave Variability in the Atlantic Ocean using SODA reanalysis" *by* Hatsue Takanaca de Decco et al.

Hatsue Takanaca de Decco et al.

audalio.torres@gmail.com

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Dear Sir,

please look comments and new article text attached

Thank you

Interactive comment on Ocean Sci. Discuss., doi:10.5194/os-2016-84, 2016.

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Discussion paper

Universidade Federal do Rio de Janeiro (UFRJ) and National Institute for Space Research (INPE) Partnership

LAMCE/PEC/COPPE/UFRJ
Centro de Tecnologia – Bloco I – Sala 214
Av. Athos da Silveira Ramos, 149. Cidade Universitária, Rio de Janeiro – RJ. Brazil
ZIP Code: 21941-999
Phone: +55 21 25628419, Fax: +55 21 25628414

Rio de Janeiro, 10 January 2017.

Response letter to Editor and Anonymous Reviewer of the article entitled REVISITING TROPICAL INSTABILITY WAVE VARIABILITY IN THE ATLANTIC OCEAN USING SODA REANALYSIS, Ocean Science Discussion, ref. paper #os-2016-84.

Dear Editorial Board,

We would like to thank you for considering our manuscript entitled: "REVISITING TROPICAL INSTABILITY WAVE VARIABILITY IN THE ATLANTIC OCEAN USING SODA REANALYSIS", for publication in Ocean Science. Please, find in the following our detailed response to the comments and suggestions of Reviewers, point by point.

The most important change in this version was the modification of figures 2, 9 and 11. This change was a recommendation made by Reviewer #2, which we agreed that would improve the comprehension of the discussion in the text. Minor changes were made in the Introduction.

We are very glad with the revision process of Ocean Science and we thank you for this opportunity!

Please, find attached the letter for the Reviewers.

All of our best,

The authors.

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Fig. 1.

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Discussion paper

Revisiting Tropical Instability Wave Variability in the Atlantic Ocean using SODA reanalysis

Hatsue Takanaca de Decco[1], Audalio Rebelo Torres Junior[2] , Luciano Ponzi Pezzi[3], Luiz Landau[1]

[1]Laboratório de Métodos Computacionais em Engenharia (LAMCE), Instituto Alberto Luiz Coimbra de Pós-Graduação e Pesquisa em Engenharia, Universidade Federal do Rio de Janeiro, Postal Code 68.55, Rio de Janeiro – RJ, Brazil, 21941-972
[2]Laboratório de Modelagem de processos Marinhos e Atmosféricos (LAMMA), Departamento de Meteorologia , Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil,ZIP Code: 21949-900
[3]Instituto Nacional de Pesquisas Espaciais (INPE), SERE II – OBT, Instituto Nacional de Pesquisas Espaciais – INPE, Av. dos Astronautas, 1758, São José dos Campos – SP, ZIP Code: 12227-010

Correspondence to: Audalio Rebelo Torres Junior (audalio.torres@gmail.com)

ABSTRACT. The spatial and temporal variability of energy exchange in Tropical Instability Waves (TIWs) in the Atlantic Ocean were investigated. A spectral analysis was used to filter the 5-day mean results from Simple Ocean Data Assimilation reanalysis spanning from 1958 to 2008. TIWs were filtered over periods of 15 to 60 days and between wavelengths of 4 and 20 longitude degrees. The main approach of this study was the use of bidirectionally filtered TIW time series as the perturbation fields, and the difference in these time series from the SODA total results was considered to be the basic state for energetics analysis. The main result was that the annual cycle (period of ~360 days) was the main source of variability of the waves, and the semi-annual cycle (period of ~180 days) was a secondary variation, which indicated that TIWs occurred throughout the year but with intensity that varies seasonally. Barotropic instability acts as the mechanism that feeds and extracts energy to/from TIWs as alternate zonal bands at equatorial Atlantic. Baroclinic instability is the main mechanism that extracts energy from TIWs to the equatorial circulation north of Equator. All TIW patterns of variability were observed at west of ~10ºW. The present study reveals new evidence regarding TIW variability and suggests that future investigations should include a detailed description of TIW dynamics as part of Atlantic Ocean equatorial circulation.

1 Introduction

A Tropical Instability Wave (TIW) is defined as a cusp-shaped oscillation of the equatorial thermal front that propagates westward. These waves are associated with the seasonal variability of the equatorial current system, and they are observed when the cold tongue (Figure 1) is well established (Chelton et al., 2000; Jochum et al., 2004a, Legeckis and Reverdin, 1987; Philander et al., 1986; Steger and Carton, 1991; Weisberg and Horigan, 1981). These westward waves have wavelengths ranging from 600 km to 2600 km and periods varying between 15 and 37 days in the Atlantic Ocean (Caltabiano et al., 2005; Chelton et al., 2000; Düing et al., 1975; Jochum et al., 2004b; Legeckis and Reverdin, 1987; Pezzi and Richards, 2003; Weisberg, 1984), and Athie and Marin (Athie and Marin, 2008) describes a wider range (periods of 15- 50 days). The formation process is the naturally generated instability of the equatorial zonal current system with alternating bands of eastward and westward flows

Fig. 2.