A PRIMITIVE EQUATIONS MODEL STUDY OF THE EFFECT OF HEAT SOURCES OVER TROPICAL SOUTH AMERICA AND ATLANTIC

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INTRODUCTION

- Monsoon region associated with latitudinal displacement of 10° of ITCZ, among other mechanisms (Asnani, 1993);

- Relationship between ITCZ and SAMS has not been well investigated (Garcia and Kayano, 2010).
OBJECTIVE

- Simulate and analyze the impact of heat sources associated with SACZ and ITCZ on vertical motion in tropical atmosphere.
**METHODOLOGY - MODEL**

- **Tropical Dynamic Model** (Gandu, 1993; Gandu and Silva Dias, 1998):
  - Non-linear primitive equations;
  - Arakawa C grid;
  - Horizontal spacing: $2.5^\circ \times 2.5^\circ$;
  - Tropical convection: heat sources.

[Diagram of the Arakawa C grid by Randall, 1994]
**METODOLOGY - HEAT SOURCES**

- OLR or precipitation data
- GPCP (2.5° x 2.5°) for DJF 1990-2009
  - Latent heat release (tropical deep convection)
  - Total diabatic heating
- Vertical structure: sine, maximum: 400 mb
METODOLOGY

- Experiments (30 days):
  - (f0) without SACZ and ITCZ
  - (f1) without SACZ
  - (f2) without ITCZ
  - (f12) control

- Factor separation (Stein and Alpert, 1993):

\[
\hat{f}_0 = f_0 \\
\hat{f}_1 = f_1 - f_0 \\
\hat{f}_2 = f_2 - f_0 \\
\hat{f}_{12} = f_{12} - (f_1 + f_2) + f_0
\]

Factor 1 on – ITCZ
Factor 2 on – SACZ
RESULTS

Diabatic heating (K/day)
400 mb

Simulated omega (mb/day)
400 mb - 48 h
$\hat{f}_0$

$\hat{f}_1$

$\hat{f}_2$

$\hat{f}_{12}$
CONCLUSIONS

- Upward motion in ITCZ is more intense without SACZ;

- Upward motion over SAMS region is affected when ITCZ is removed;

- Mechanism: compensatory subsidence;

- Combined effect SACZ+ITCZ impacts mainly ITCZ;

- SACZ and ITCZ excite a Gill-type response;

- ITCZ (faster Kelvin) X SACZ (faster Rossby).
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REFERENCES


THANK YOU!

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