Advanced School and Workshop on American Monsoons

CLIVAR/GEWEX Monsoons Panel American Monsoons Working Group



Organizers: Alice Grimm -

Iracema Cavalcanti -Manoel Gan - Universidade Federal do Paraná, Department of Physics Instituto Nacional de Pesquisas Espaciais, CPTEC Instituto Nacional de Pesquisas Espaciais, CPTEC

Membership American Monsoons Working Group

• Dr Alice M. Grimm

Federal University of Parana, Brazil, Co-Chair

- Dr Iracema F. A. Cavalcanti CPTEC/INPE, Brazil, Co-Chair
- **Dr Francina Dominguez** University of Illinois at Urbana, USA
- Dr. Leila M.V. Carvalho
 University of California at Santa Barbara, USA
- **Dr Manoel A. Gan** CPTEC/INPE, Brazil
- Dr Marcelo Barreiro

Universidad de la Republica, Uruguay

- Dr Pedro L. da Silva Dias University of São Paulo, Brazil
- Dr Rong Fu

University of Texas at Austin, USA

• Dr Tereza Cavazos

Centro de Investigacion Científica y de Educacion Superior de Ensenada (CICESE), Mexico



The list of priority scientific regional issues include:

a) Exploiting the S2S database for the South American monsoon, in order to assess its possibilities for subseasonal prediction of several aspects of the American monsoons. In this regard, assess the skill of S2S participating models in:

a.1) simulating the MJO impacts on the American monsoons, regarding precipitation anomalies and associated teleconnections;

a.2) predicting the onset and demise of the monsoons;

a.3) predicting active and break periods of the monsoons;

a.3) predicting extreme events in densely populated regions during the monsoon season.

* Already started



The list of priority scientific regional issues also includes:

b) Development of metrics (indices) for active/break periods onset/demise of the monsoon, which are more skilfully predicted by the models and which provide dynamical linkages, so as to give some insight into model error.

c) Provision of some demonstration forecast products.

d) Assessment and attribution of climate variability and predictability on intraseasonal, interannual and interdecadal time scales, analysing the large-scale influence with its teleconnections, as well as local forcing mechanisms; evaluation of CMIP5 and/or future CMIP6 models in this regard on interannual and interdecadal time scales. Assessment of the relationship between climate variability and extreme events.

* Already started



Other activities of the WG include:

a) Collate existing knowledge and evidence of past monsoon activities in the region (e.g. relevant VAMOS work and CLIVAR Exchanges articles, white papers etc.);

- b) Organize meetings of the WG during certain key congresses;
- c) Organize sessions on American monsoons in these congresses;
- d) Propose and/or contribute to training workshops;
- e) Contribute to regional climate forecasts;
- f) Review of the advances in the monsoon studies.
- * Already started

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- ICTP South American Institute for Fundamental Research (ICTP-SAIFR)
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Are there American monsoons? (1)

- The fundamental monsoon characteristics such as their basic definition and geographic range has undergone some changes.
- The modern definition of monsoon climate is based on both the annual reversal of surface winds and the contrast between rainy summer and dry winter seasons (e.g., Webster, 1987), in contrast to the classical definition of monsoon regime since the early 20th century, which was based on the annual reversal of surface winds (e.g., Ramage, 1971).

Are there American monsoons? (2)

- Classical criteria for a monsoon as specified by Ramage (1971):
- Prevailing wind shifts 120° between January and July
- Average frequency of prevailing wind > 40%
- Speed of mean wind exceeds 3 m s-1
- Pressure patterns satisfy a steadiness criterion.



Are there American monsoons? (3)

- Modern criteria for a monsoon as specified by Wang and Ding (2008):
- Summer-minus-winter precipitation difference exceeds 300mm
- Summer precipitation threshold exceeds 55% of the annual total. (Summer: May through September for the NH and November through March for the SH)



Yellow: dry regions, where the summer precipitation is less than 150 mm. Blue (red) lines: **ITCZ** position for August (February). Solid lines: monsoon trough. Dashed lines: trade wind convergence. The ITCZ is defined by maximum monthly mean precipitation. Black lines: tropical monsoon wind domains, where the 850 hPa zonal winds show reversal (westerlies in the summer and easterlies in the winter), with summer minus winter exceeding 50% of the annual mean.

Precipitation Climatology in SA Monsoon region



(Grimm 2011, Stochastic Envir. Res. Risk

Are there American monsoons? (4)

July–August

January–February



Mean precipitation distributions



Mean winds at 925 hPa

Are there American monsoons? (5)

The modern definition of monsoon climate is based on both the annual reversal of surface winds and the contrast between rainy summer and dry winter seasons (Webster, 1987), in contrast to the classical delineation of monsoon regimes since the early 20th century, which was based solely on the annual reversal of surface winds (e.g., Ramage, 1971). The classical definition confines monsoons to the eastern hemisphere and includes the Asian, Australian, tropical African, and Indian Ocean monsoon systems. It also includes some mid-latitude areas, which exhibit winter precipitation maxima and belong to Mediterranean climate regimes, in contrast to the modern definition. The modern definition is motivated in part by the considerable socio-economic and scientific importance of monsoon rainfall, and thus delineating monsoon domains based on precipitation is imperative and advantageous. These domains extend across both the eastern and western hemispheres and include the North and South American, and southern African monsoons. (Wang et al. 2017)

There are American monsoons! How strong are they?



From Vera et al. 2006

Enjoy the Advanced School and Workshop on American Monsoons!