Climate Prediction Center Global Monsoon Monitoring Activity

Wassila M. Thiaw, Muthuvel Chelliah, Vernon Kousky, Wei Shi, Viviane Silva, and Song Yang
Climate Prediction Center, NOAA/NWS/NCEP

1. Introduction

Global climate fluctuations and their impacts on economic development have been a worldwide concern during the past several decades. The problem is even more acute in emerging countries of Africa, Asia, and Latin America, where alternating severe droughts and floods have been persistent causes of severe economic hardships. To help mitigate the impacts of extreme weather and climate fluctuations requires routine timely and accurate monitoring of the global monsoon to better understand the mechanisms for monsoon variability and to improve forecasts of monsoon at all time scales.

The following are highlights of the NOAA Climate Prediction Center (CPC) global monsoon monitoring activity presented at the Climate Diagnostics and Prediction Workshop in Lincoln, NE, October 2008. In this extended summary, we present the motivation for starting the global monsoon monitoring activity in section 2. In section 3, we present the global monsoon monitoring web site. Applications in climate risk assessments and outreach are presented in sections 4 and 5, respectively. Finally, we discuss future development and challenges in section 6.

2. Motivation

CPC's position as an international center with expertise in climate forecasting, monitoring, research, and diagnostic studies, along with product dissemination and cooperation with other agencies, makes it a unique source of a wide range of weather and climate products and services tailored to regional decision support systems worldwide. The objective of the global monsoon monitoring activity is to consolidate climate monitoring efforts at CPC to help advance our understanding of the global monsoon systems and to improve forecasts and early warning systems.

3. Global monsoon monitoring web portal

The global monsoon monitoring products are made available to the public through the CPC website: http://www.cpc.noaa.gov/products/Global_Monsoons/Global-Monsoon.shtml. The global monsoon monitoring website features recent anomalies of global scale climate information over the last 90 days, the last 30 days, and the last 7 days (Fig. 1). The parameters featured in the website include: sea surface temperatures, soil moisture, winds at 850 and 200 hPa, velocity potential, precipitation, outgoing longwave radiation, and 2-meter temperature. The global monsoon website is also parent to the regional monsoon websites.

The regional monsoons monitored include the African monsoon, the American monsoon (over North and South Americas), and the Asian-Australian monsoon. Each of the regional monsoon websites features the following:

---

Correspondence to: Wassila M. Thiaw, Climate Prediction Center, NOAA/NWS/NCEP;
E-mail: Wassila.Thiaw@noaa.gov
- Animation of weekly OLR, 200 hPa streamlines, and 850 hPa winds
- Recent evolutions (last 90, 30, and 7 days) of the following parameters:
  - Precipitation maps and time series (also for the past 180 days)
  - Temperature – 2 meter
  - SST and soil moisture
  - Winds and vertically-integrated water vapor flux
- Weekly monsoon updates in the form of PPT presentations are prepared and posted on the regional monsoon websites every Monday. The content of the regional monsoon presentations include: highlights of precipitation evolution over the last 7 days, spatial maps of total precipitation and anomalies over the last 180, 90, 30, and 7 days (Fig. 2). Also included are precipitation time series featuring the evolution of rainfall over the last 30 or 90 days for selected grid boxes, and 850 hPa and 200 hPa wind anomalies for the last 7 days. Additional information about the monsoon PPT presentations includes the NCEP global forecasts, week-1 and week-2 outlooks for the regional monsoons, and summary reports to describe the evolution of the monsoons. Seasonal monsoon summaries and annual reports have been or will be posted to the websites in the near future.

![U.S. & Mexico](image)
![Australia & Asia](image)
![South America](image)

![Africa](image)

**Fig. 2.** Ninety-day precipitation anomalies for the period 11 Jul – 9 Oct 2008 and 9 Jul – 7 Oct for the North American and South American monsoons, and the Asian-Australian monsoon, respectively. Daily precipitation time series for a grid box in West Africa for the period 11 Jul – 9 Oct 2008.

4. Global and regional climate risk assessments

The global monsoon monitoring products are direct input into the CPC US and global hazard assessments and the African regional climate risk assessments. The purpose is to provide emergency managers, planners, and the public advanced notice of potential hazards related to climate, weather, and hydrological events. The global tropical benefits/hazards (GTH) assessments are produced in collaboration with other NOAA centers including the Earth System Research Laboratory, the National Hurricane Center, and selected National Weather Service Weather Forecast Offices. In addition to the use of global monsoon monitoring products, the GTH synthesizes information and expert analysis from other CPC operational and routine monitoring products. The African weather and climate risk assessments are produced weekly in
collaboration with the US Agency for International Development (USAID) project, Famine Early Warning System (FEWSNET), including the USGS, NASA, and Chemonics. The objective is to assist USAID to develop mitigation strategies to help FEWSNET countries cope with food security vulnerability induced by extreme weather and climate events. The assessments are based on a wide range of products, including rain gauge data, satellite rainfall estimates (RFE), rainfall forecasts out to 7 and 14 days. Other inputs include river flow forecasts from the USGS, normalized difference vegetation index (NDVI), and field observations.

5. Domestic and international outreach

There is a strong demand for the global monsoon monitoring products. Weekly monsoon PPT updates are distributed to a list of 400 people. Potential users of the information in the US are: National Weather Forecasting Offices (WFOs), especially the southwestern region, NWS Climate Service Division, and the National Hurricane Center for early detection of Atlantic tropical storm activity operational meteorological services around the globe. Users also include National Meteorological and Hydrological Services around the world, government and academic institutions with interest on monsoons. Some of the global monsoon products are tailored to meet the US Agency for International Development (USAID) climate requirements to support Famine Early Warnings Systems Network (FEWSNET) activities for humanitarian assistance in Africa, Afghanistan, and Central America. The products can also be used in the Asian flood network project with USAID Office of Foreign Disaster Assistance (OFDA) focusing on the Mekong river Basin.

6. Future development

The global monsoon monitoring effort at CPC started in 2006 and it has provided a unique opportunity for advanced understanding of the global monsoon systems and how the information can be used to improve climate services. The CPC Global monsoon team is working towards improving the quality of the monitoring products and tailoring the information to meet user demands. In particular, in the near future, the team plans to work with research institutions to develop monsoon indices to better track the onset and demise of the monsoons as well as dry and wet spells in all monsoon regions. The team also plans to develop a seasonal and week-1 and week-2 forecast forums for all the regions. The challenges that the monsoon team faces include the limited predictability on both subseasonal and seasonal time scales, limited resources for research at CPC, and sometimes inconsistency in the precipitations data sets. The Global monsoon team will work to meet those challenges by reaching out to the research community and by engaging national meteorological services around the world to provide the data that is required to enhance the quality of the monsoon products.

Global Monsoon Team Members

Global Monsoon Team Lead: Song Yang
Regional Monsoon Group Leads:
  Africa: Wassila Thiaw
  Asia-Australia: Muthuvel Chelliah
  North America: Wei Shi
  South America: Viviane Silva
Other Global Monsoon Team Members: Yun Fan, Jon Gottschalck, Wayne Higgins, Vernon Kousky, Vadlamani Kumar, Kingtse Mo, Jae Schemm, Wanqiu Wang, Pingping Xie, Soo-Hyun Yoom, and Qin Zhang