Geophysical Research Abstracts
Vol. 13, EGU2011-2585-1, 2011
EGU General Assembly 2011

Recent Changes in the Wet and Dry Patterns Over the Tropics

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Extreme weather events are getting attention in recent years. The analysis of extreme weather events poses a greater challenge compared to that of climate mean values, as there are no sufficient homogeneous climate data record available for a long period of time. The Tropical Rainfall Measuring Mission (TRMM) daily precipitation data available from 1998, although covers a relatively short period of 12 years, is useful in analysing the extreme precipitation indices, especially because of the coverage of the entire tropics and the homogeneity of the data. Using twelve years of TRMM daily precipitation data, extreme precipitation indices are calculated and analysed. The ENSO signal, which is responsible for major natural variability is removed from the daily precipitation data using linear regression with respect to Nino3.4 index. The number of days with more than 10 mm precipitation (R10), number of days with more than 1 mm precipitation (RR1), consecutive dry days (CDD), and consecutive wet days (CWD) are the precipitation based climate indices derived from ENSO removed TRMM data. Trend maps of these extreme indices are made using poisson regression.

A significant decrease in R10 is found over northern part of south America, eastern part of central Africa, Bangladesh, and central and eastern parts of Australia. A similar decreasing trend in R10 is found over northern and southern tropical regions of central Pacific Ocean, eastern part of tropical south Indian Ocean and over western Pacific south of Japan. An increasing trend in R10 is seen over western and central Equatorial and subtropical Pacific, eastern and northwestern south America, western sub-Saharan Africa, western subtropical Indian Ocean and over Himalayas. The CDD is decreasing over most parts of the tropics. Significant decrease in CDD is visible over most of eastern Pacific, equatorial western Pacific, most parts of Africa, Arabian peninsula, India, eastern China, and northern and southern Indian Ocean. Significant increase in dry days are found over westrn and eastern south America, western north America, Atlantic Ocean, eastern tropical Indian Ocean, Bangladesh, eastern parts of Australia and southwestern Pacific east of Australia. However, there is no significant trend found in CWD index. The RR1 index roughly follows the pattern of R10. This analysis shows that some parts of the tropics are getting increased number of heavy precipitation days while some other regions, like Bangladesh, are experiencing a decrease in the number of heavy precipitation days. A major part of the tropical region does not show any significant trends in heavy precipitation. However, CDD shows significant positive and negative trends that is more widespread when compared to R10. The analysis of CDD indicates that majority of the tropical region is getting wetter recent years, while a significant area is getting drier also.