

Global Precipitation Variations and Long-term Changes Derived from the GPCP Monthly Product

Robert F. Adler¹, Guojun Gu², George Huffman³, and Scott Curtis⁴

- 1) NASA Goddard Space Flight Center
- 2) NASA Goddard Space Flight Center/GEST/UMBC
- 3) NASA Goddard Space Flight Center/SSAI
- 4) East Carolina Univ.

Abstract

Global and large regional rainfall variations and possible long-term changes are examined using the 25-year (1979-2004) monthly dataset from the Global Precipitation Climatology Project (GPCP). The emphasis is to discriminate among the variations due to ENSO, volcanic events and possible long-term changes. Although the global change of precipitation in the data set is near zero, the data set does indicate an upward trend (0.13 mm/day/25yr) and a downward trend (-0.06 mm/day/25yr) over tropical oceans and lands (25S-25N), respectively. This corresponds to a 4% increase (ocean) and 2% decrease (land) during this time period. Techniques are applied to attempt to eliminate variations due to ENSO and major volcanic eruptions. The impact of the two major volcanic eruptions over the past 25 years is estimated to be about a 5% reduction in tropical rainfall. The modified data set (with ENSO and volcano effect removed) retains the same approximate change slopes, but with reduced variance leading to significance tests with results in the 90-95% range. Inter-comparisons between the GPCP, SSM/I (1988-2004), and TRMM (1998-2004) rainfall products are made to increase or decrease confidence in the changes seen in the GPCP analysis.

Robert Adler
Mail Code 613.1
NASA Goddard Space Flight Center
Greenbelt, MD 20771

Robert.F.Adler@nasa.gov
301-614-6290
FAX: 301-614-5492

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