

**Abstract:**

Rainfall is an important parameter in the hydrological cycle and deficiency of its data is the biggest problems in climatic and hydrological analyse. Therefore, the researchers used satellite remote sensing as one of the practical solutions proposed to estimate precipitation. The aim of this study is to assess and validate 3B43 V7 TRMM satellite precipitation data with gaged data and to assess the efficiency of using this data to map monthly rainfall over south and southeast of Iran through geostatistical and artificial intelligence based methods. The interpolation method used in this study were some univariate methods (i.e. OK, SK, UK, IDW), multivariate methods (i.e. COK and LR) and hybrid methods (NNRK and RKNNRK). The data were used includes monthly precipitation data obtained from TRMM (3B43) V7 in a 15-years period (1998-2012) with a spatial resolution of 0.25 in 0.25 grade and a long-term precipitation data (over 25 years) for 150 stations (rain gauge and Synoptic) in Sistan and Baluchestan, Kerman and Hormozgan provinces. Auxiliary data used includes digital elevation model, latitude and altitude and TRMM rainfall data. The consistency of satellite data with ground-based data as well as the performance of methods used were assessed through different statistical parameters such as root mean square error, mean error and coefficient of determination. The results showed the monthly satellite data has the highest correlation coefficient (0.64, 0.60 and 0.64) with gage data in June, December and December respectively for Sistan and Baluchestan, Kerman and Hormozgan provinces. The correlation between satellite and gage data was stronger in the rainy months than the months of low rainfall. Among interpolation methods, the highest accuracy achieved through multivariate and hybrid methods (i.e. RK, NNRK, RKNNRK). The highest accuracy was achieved through RKNNRK in rainy month of Farvardin ( $R^2=0.91$  and  $RMSE=3.21$  mm) and then through NNRK in Ordibehesht ( $R^2=0.88$  and  $RMSE=0.79$  mm).

**Keywords:** Precipitation, TRMM, Trend, Regression, Geo-statistics, Artificial neural network



University of Zabol  
Graduate school  
College of Water and Soil  
Department of Water Engineering

**The Thesis Submitted for the Degree of Master of Science  
(In the Field of Water Resources Engineering)**

**Calibration and Utilization of TRMM  
Satellite Data to Estimate Monthly and  
Annual Rainfall in South East of Iran**

**Supervisors:**  
Dr. M. Delbari

**Advisor:**  
M. Amiri  
J. Piri

**By:**  
M. Safavi

2017