Journal of Water and Soil
Vol. 30, No. 3, Jul.-Agu. 2017, p. 969-984

نشریه آب و خاک (علوم و صنایع کشاورزی)
جلد ۳۰، شماره ۳، مرداد – شهریور ۱۳۹۶، ص. ۹۸۴-۹۶۹

# Providing Monthly Composite APHRODITE-Observed Precipitation Data over Iran's Southwest Watersheds

**I. Babaeian[1]*- M. Karimian[2]- H. Ashouri[3]- R. Modirian[2]- L. Khazanedari[4]- Sh. Malbusi[2]- M. Kuhi[5]- A. Mohamadian[4]- E. Fattahi[6]**

Received: 30-04-2016
Accepted: 29-01-2017

**Introduction:** Southeast watersheds of Iran including Great Karoon, Karkheh, Jarrahi and Zohreh have the most significant contribution in the water supply of the agriculture, industry, drinking water and hydroelectric power plants over Iran. 25 percent of the country's electricity is produced from hydroelectric power plants located in this region. The existence of a monthly relatively high resolution gridded precipitation dataset is of the most important needs of water resources management for such as deciding on the suitable time of dewatering and discharge of dams, calibration of dynamical monthly forecasting models and drought early warning. Even considering all observation stations governed by Meteorological Administration and Ministry of Power, the density of stations is not so enough to use them for calibration of hydro-climate model outputs. To overcome this deficiency, one way to fill the gap is using bias corrected global gridded precipitation dataset such as APHRODITE, CMORPH, PRESIANN and other newly generated data.

**Material and Methods:** Watershed of Karkheh, great Karoon, Jarrahi and Zohreh are the area of study which covers southwest provinces of Khuzestan, Kermanshah, Ilam, Chaharmohal-Bakhtiari, Kohkiluyeh and Buyerahmad, Isfahan, Hamadan, Fars and Lorestan, which is shown in figure 2. There are 135 observation station in the area of study which governs by Iran Meteorological Organization and Ministry of Power. Area of study covers by 75 grids of 0.5×0.5 degree latitude and longitude. For each grid there is an APHRODITE precipitation data. In the 34% of grids, there is no observation station. The main goal of this study is to attribute a reliable monthly precipitation data to all grids without any observation station. Period of APHRODITE data set is 1987-2007, which is same to observation period. Firstly regional bias of APHRODITE data set has been computed by comparing observed precipitation with APHRODITE one. Then bias corrected APHRODITE precipitation (Composite APHRODITE Observation dataset) has been placed in non-observation grids. Efficiency of composite precipitation data has been determined by statistical parameters of bias, correlation and Nash-Sutcliff indices.

**Results and Discussion:** In this research the results have been evaluated at monthly and seasonal time scales. In the case of seasonal time scale, we found that the minimum APHRODITE's bias of 1.2 mm has been occurring in summer, while the maximum bias has been occurring in winter by 40.9mm. It means that the bias is high in the rainy season. Seasonal correlations were statistically acceptable in 0.05 significant levels, showing same seasonal fluctuations in APHRODITE and rain gage data. To provide seasonal composite APHRODITE-Observed precipitation gridded data set, mean seasonal bias of APHRODITE has been removed, while preserving seasonal fluctuation. The highest spatial correlation of 0.8 was detected in autumn, while it was about 0.7 for spring and winter. The minimum seasonal correlation was in summer by 0.5. There were also a good agreement between area averaged observation and APHRODITE data, when considering statistical indices of bias, Nash-Sutcliff and relative percentage errors. Results show the cumulative distribution function of APRODITE data is behind of the observed cumulative distribution function data, meaning that APHRODITE reaches its maximum earlier than observation data. This implies that APHRODITE cannot capture well the extreme monthly precipitation. Monthly correlations are approximately greater than 0.9, but the only exception is September with a correlation coefficient of 0.52. All correlations are significant in 0.05 levels. The highest

1- Assistant Professor, Climate Change Research Group, Climatological Research Institute, Mashhad, Iran
(*- Corresponding Author Email: ibabaeian@yahoo.com)
2- Researcher, Climate Change Research Group, Climatological Research Institute, Mashhad, Iran
3- Center for Hysrometeorology and Remote Sensing, Department of Civil and Environment Engineering, University of California-Irvine
4- Researcher, Atmospheric and Climatic Disaster Research Group, Climatological Research Institute, Mashhad, Iran
5- Researcher, Applied Climatology Research Group, Climatological Research Institute, Mashhad, Iran
6- Associate Professor, Atmospheric Science and Meteorological Research Center, Tehran, Iran

spatial correlation was occurred in Novembers. Monthly Nash-Sutcliff was 0.96 in monthly time series. The categorical percentage score was 94.1%. These results strongly confirm that APHRODITE precipitation data is a good option for replacement in grid cells without observations. The number of observation stations per cell is varied from 1 to 7. We found that the maximum monthly correlations occur in grid cells of 0.5×0.5 degree latitude and longitude which having at least 3 observation stations. The three-station bias has been applied to APHRODITE data, then bias-removed data has been replaced with grid cells without observations. Spatial patterns of new composite APHRODITE-observation data set has good agreement with observation in the areas having intense observation stations. They also can capture well the spatial precipitation distribution of rainy areas located in the center of basin and low rainfall areas located in the southwest of the region. The results of this research can be used in calibration of dynamical seasonal forecasting outputs, drought early warning and rain-runoff simulation.

**Keywords:** APHRODITE, Calibration, Great Karoon Basin, Khuzestan, Precipitation