

Authors

İbrahim Sönmez, Ondokuz Mayıs University, Department of Meteorology,
Meral Demirtaş, Ondokuz Mayıs University, Department of Meteorology,
Ozan Mert Göktürk, Ondokuz Mayıs University, Department of Meteorology,
Sema Arıman, Ondokuz Mayıs University, Department of Meteorology,

Ground observation sites with different types of sensors are operated worldwide to observe and measure meteorological parameters. The instantaneous and/or total rainfall amounts in these sites are commonly measured either by using tipping bucket or weighing precipitation gauges. However, observation sites are sparsely distributed because of the topographical constraints or limited in number due to the budget issues. Such complications reveal vulnerability especially in spatial variation of precipitation parameter. The number of observation sites is so inadequate when the study area is reduced to a small basin scale. On the other hand, meteorological radar observation systems are potential alternatives for such purposes since they are capable of fulfilling the aforementioned gaps with precipitation estimation capabilities both in spatial and temporal domain.

Samsun, which is located in the northern part of Turkey and has a coast to the Black Sea, is subject to strong convective weather events during spring, summer and autumn seasons. In this study, the 3 July 2012 convective event of İncirli Stream basin is analyzed as it is considered as one of the most destructive flash flood events in Samsun. The area of İncirli Stream Basin is approximately 4.8km^2 where no settlement is present in there, but a big shopping mall is located at the exit of the basin. When the strong convective system with heavy rainfall hit the area at 21:00 UTC, fortunately did not caused any loss of life, but gave harmful damage for the shopping mall where almost all the stores are flooded. The rainfall measurements from nearby (15 km and 13.3 km) meteorological sites reported daily accumulated precipitation of 29.8 kg/m^2 and 68.4 kg/m^2 respectively without any sign of a convective system. The precipitation recurrence analysis from these sites for variety of time periods (from 5 minutes to 2 days) also indicated that such precipitation amounts are likely to be observed in every year or in 4 years time at most. Since no ground observation was available at the basin site, it was difficult to detect the actual rainfall amount but single polarization Samsun meteorological radar detected strong reflectivity signals for the same time period. In order to determine a reliable rainfall amount over the basin, various Z-R relationships are analyzed in this study and compared with available ground measurements. Among the Z-R relationships studied, the $Z=300R^{1.4}$ relationship is found to be the most convenient one with the lowest error statistic amounts. Using this relationship, the hourly rainfall amounts in the basin is estimated for four different points in the basin, and three of them are found to be higher than the climatological daily total record (238.2 kg/m^2) for Samsun.