

Evaluation of the Hydro-Estimator satellite rainfall algorithm and its utility in hydrological prediction in a mountainous region

ISMAIL YUCEL¹, ROBERT J. KULIGOWSKI² & DAVID GOCHIS³

¹ *Civil Engineering Department, Middle East Technical University, Ankara 06531, Turkey*
iyucel@metu.edu.tr

² *NOAA/NESDIS Center for Satellite Applications and Research (STAR), Camp Springs, Maryland 20746, USA*

³ *Research Applications Laboratory, National Center for Atmospheric Research, Boulder, Colorado 80305, USA*

Abstract The performance of the NOAA/NESDIS operational rainfall estimation algorithm, the Hydro-Estimator (HE), is investigated with and without its orographic correction method, to assess its depiction of the timing, intensity and duration of convective rainfall, in general, and of the topography–rainfall relationship, in particular. With a few exceptions, validation of satellite rainfall estimates in complex terrain has been lacking to date, due to the paucity of pre-existing dense observation networks in mountainous areas. An event rainfall observation network in northwestern Mexico, established as part of the North American Monsoon Experiment (NAME), provides gauge-based precipitation measurements with sufficient temporal and spatial sampling characteristics to examine the climatological structure of diurnal convective activity over northwest Mexico. While the HE with orographic correction captures the spatial distribution and timing of diurnal convective events to some extent, elevation-dependent biases exist, which are characterized by underestimation of the occurrence of light precipitation at high elevations and overestimation of the occurrence of precipitation at low elevations. The potential of the HE to provide high spatial- and temporal-resolution data is tested in a hydrological application over the NAM region. The findings suggest that continued improvement of the HE orographic correction scheme is warranted, in order to advance quantitative precipitation estimation in complex terrain regions, and for use in hydrological applications.

Key words rainfall algorithm; topography; satellite; observation; Hydro-Estimator (HE)