ABSTRACT

DIURNAL PRECIPITATION AND EXTREME EVENTS OVER CAGAYAN VALLEY, PHILIPPINES

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Understanding the diurnal behavior of precipitation will aid in the understanding not only of the mechanisms involved in rain formation but also the mechanism of the local climate. It is also a crucial aspect for disaster risk reduction, hazard mitigation, water resource management, and policy making. This study aimed to examine the climatology of precipitation with higher spatial and temporal scale along Cagayan Valley, Philippines using hourly Automated Weather Station (AWS) data and Advanced Research – Weather Research and Forecasting (AR-WRF) model simulations from July 2013 to June 2017. Specifically, it aimed to describe the characteristics of the amplitude and phase of the diurnal and semidiurnal cycles of precipitation; explain and elucidate the physical mechanisms involved in the diurnal and semidiurnal cycles; and analyze trends of extreme precipitation events.

Strong diurnal cycle signals are observed along the mountainous areas in Cordillera and Caraballo, while weaker signals are observed along the coasts and small islands of Batanes. Afternoon-to-evening (14 – 22 LST) precipitation predominates along the valley throughout the year, with relatively higher amplitudes during the April-May-June (AMJ) season and lower amplitudes during the October-November-December (OND) season. Furthermore, early morning (23 – 10 LST) precipitation predominates on the boundary between Cordillera and Caraballo during the January-February-March (JFM) season, northern coastal areas during the JFM and OND seasons, and the small islands in Batanes. These characteristics suggest a strong implication of diurnal rainfall to the hydrological cycle and agriculture. The phase of the diurnal cycle is closely related to the duration of precipitation. The afternoon-to-evening maxima were more prevailing in the short-term precipitation events lasting 1-3 hours, while the early morning maxima were more prevailing in the long-term precipitation events which persisted for more than three hours. Spatial analysis of wind

vectors suggests that mesoscale weather systems such as the sea breeze mechanism, mountain-valley breeze, and propagating mesoscale convective systems, have a greater effect on the diurnal cycle observed, particularly during the AMJ season.

Finally, overall positive to increasing trends in daily total precipitation (PRCPTOT) during the JFM, AMJ, and OND seasons were observed along Cagayan Valley while this is reversed during the JAS season. Also, overall positive to increasing trends in hourly maximum during the JFM and AMJ seasons were observed, while this is reversed during the JAS and OND seasons. Along the northern coastal Cagayan province, there is an overall decreasing trend in PRCPTOT and hourly maximum throughout the year. In case of the frequency and total amount >90th percentile, overall insignificant trends were observed during the dry season. Cordillera exhibits positive trends while the Cagayan Valley has negative trends. Coastal Cagayan province, on the other hand, exhibits a decreasing trend. There is also an overall insignificant trend during the wet season. However, due to incoherency on the spatial characteristics of the trends, a general approach for the provinces cannot be established.

KEY WORDS: Precipitation, Diurnal Cycle, Duration, Extreme Events, Cagayan Valley