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Validation of regional precipitation-related indices dynamically downscaled from ERA-Interim Reanalysis Data by a Mesoscale Atmospheric Model

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Extreme precipitation events in central Alberta have overwhelmed hydraulic structures several times in recent years, and it is expected that rainfall intensity in this region will continue to increase over the next several decades. Accurate rainfall projections, which are communicated in the form of Intensity-Duration-Frequency (IDF) curves, are thus needed to design sufficient municipal structures. Such data may be obtained through the use of Regional Climate Models (RCMs), and one in particular, the fifth-generation NCAR/Penn State mesoscale atmospheric model (MM5), is investigated here. MM5 is used to dynamically downscale ECMWF ERA-Interim reanalysis data to evaluate its ability to accurately simulate rainfall characteristics in central Alberta over two consecutive summers that represent contrasting precipitation regimes. Precipitation simulated at the local scale is verified with Edmonton's local rain gauge network, while larger-scale precipitation is compared with the High Resolution Precipitation Product (HRPP), CMORPH. This particular HRPP was compared with rain gauge data and radar images which revealed that it can be reliably used to validate MM5 output in this region. MM5 output is also compared to data from a local sounding station and other reanalysis variables. Precipitation data generated by MM5 revealed that this RCM can indeed distinguish between wet (2010) and dry (2009) years, but that simulated rainfall totals are too high during both precipitation regimes. This bias is attributed to enhanced moisture advection associated with large-scale flow anomalies, and should be taken into consideration when making projections regarding possible changes to future precipitation conditions in central Alberta.