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Simulation of postfrontal heavy snowfall over the Australian Snowy Mountains

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Heavy snowfall associated with the passage of a cold front was observed over the Australian Snowy Mountains (ASM) from 05 to 07 Aug, 2018, producing more than 60 mm of snow at some mountain gauges. The snowfall was mainly observed after the passage of the cold front (in postfrontal period) when north-westerly and westerly cross-barrier winds were observed in the lower and mid troposphere. According to the observations of Cabramurra parsivel located at windward slopes of northern part of the ASM snow intensities exceeded 20 mm h^{-1} during short time episodes. Furthermore, Himawari-8 observations show convective clouds over the ASM with isolated cold cloud top temperatures varying from -45 to -40 ^{o}C. The Weather Research and Forecasting (WRF) model version 4.2 was used to further investigate this event. The WRF model was run at 1 km spatial resolution using Thompson, Morrison, NSSL and WDM7 microphysical schemes. Overall, Thompson scheme (our CONTROL run) successfully simulated the precipitation and cloud pattern over the ASM, but showing underestimation of upwind and near top precipitation amount. Morrison and NSSL schemes produce more snow over highly elevated parts of the ASM leading to overestimation of observed snow at top and leeward gauges. The WDM7 simulates unrealistically high amount of precipitation over entire ASM due to strong glaciation processes produced by this scheme. The evaluation of simulated water vapor and cloud water paths against radiometer observations at Cabramurra location show that all sensitivity runs consistently underestimate water vapor path (WVP) despite strong relationship in the simulated and observed WVP time-variations throughout the event. The underestimation of supercooled liquid water (SLW) path is strongest in the WDM7 scheme, while the overestimation of SLW content is greatest in the Thompson scheme.