
March 2022 East Antarctic Heatwave Under Different Background Climate Conditions

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Abstract

East Antarctica experienced an extreme heatwave on March 18, 2022, driven by an unprecedented Atmospheric River (AR). This event led to mid-summer temperatures during the austral winter at Dome C and intense snowfall, contributing approximately 306 Gt of ice mass gain to the region. Although this event has been thoroughly investigated in previous studies, questions remain about whether similar events could intensify in a warmer future climate. Preliminary experimental model simulations indicate that reducing latent heat release during snowfall weakens the blocking high, redirects the atmospheric river away from the Antarctic continent, limits total inland precipitation, and mitigates the heatwave by 10°C (See Figure). Latent heat release, as one of the key components that intensified this extreme heatwave and facilitated AR intrusion, may be influenced by underlying background climate conditions. Thus, this study will conduct multiple Polar WRF model simulations to examine this heatwave event under conditions featuring a warmer, moister atmosphere and elevated sea surface temperatures. A process-based investigation will further illuminate the physical mechanisms driving the diverse surface impacts across various climate scenarios, ultimately enhancing our understanding of extreme weather behavior in Antarctica in the future.

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