

March 2022 East Antarctic Heatwave Under Different Background Climate Conditions

Xun (Jerry) Zou, Penny M. Rowe, Irina V. Gorodetskaya, Zhenhai Zhang, Dan Lubin, Jason M. Cordeira, and F. Martin Ralph

Scripps Institution of Oceanography, University of California San Diego, La Jolla, CA, USA

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. This event was thoroughly investigated in previous studies; however, questions remain as to whether similar events might intensify in a warmer future climate. Preliminary results 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. Latent heat release, as one of the key components that intensified this extreme heatwave and facilitate AR intrusion, may be influenced by underlying background climate conditions. Thus, this study will conduct multiple experimental 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.