

Antarctica and the Southern Ocean

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Abstract

Antarctica experienced strong to record below-average pressure and stronger-than-average circumpolar westerlies to start (January) and close (December) 2023, marking the third and fourth consecutive summers with such conditions (2020/21, 2021/22, 2022/23, 2023/24). During austral autumn, winter, and spring, the atmospheric circulation over the South Pacific underwent a marked transition from the previous three years as the “triple dip” La Niña officially transitioned to El Niño during autumn 2023. Consistent with El Niño, positive pressure anomalies developed in the Ross and Amundsen Seas, and anomalous low pressure developed over the Antarctic Peninsula and western Weddell Sea. These two circulation anomalies produced two regions of persistent warm northerly flow and above-average atmospheric river activity: across the Weddell Sea and Dronning Maud Land (on the eastern side of the low) and in the Wilkes Land region (on the western side of the high). These two regions saw Antarctica’s most pronounced climate anomalies in 2023, including well-above average temperatures and surface mass balance. These anomalies were most pronounced in the Weddell Sea region where western Dronning Maud Land, Coates Land, and the Ronne-Filchner Ice Shelf saw Antarctica’s highest surface mass balance anomalies for the year, and temperatures for much of the year ranged from 2°C to 6°C above average over the Weddell Sea and along coastal Dronning Maud Land. The Antarctic Peninsula also experienced well-above-average temperatures and surface melting during the 2022/23 summer melt season, marking the fourth consecutive summer of anomalous high surface melt on the Peninsula.