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How unexpected was the Spring 2022 South Asian Heatwave

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Persistent heatwaves cause severe impacts on the ecosystem and society, including increased mortality, and widespread snow and glacier melting. These impacts are expected to escalate in a warmer world, which is likely to witness more frequent and intense heatwaves. South Asia (SA), home to one-fifth of the global population and the largest freshwater resource on the earth, is a hotspot of extreme heatwaves and vulnerable to severe impacts. The region recently experienced its hottest March and April of the century in the year 2022. Here, we use high-resolution, long-term ERA5 (1959–2022) and CPC (1979–2022) data to show that the temperatures in Northwestern South Asia were about 5°C higher than the climatology, which corresponds to about 2.5 standard deviations above the mean. Using maximum temperature-based CTX90pct definition of heatwaves, we show the 42-day-long heatwave in the month of March and April 2022 ranked the most severe heatwave recorded in the available observation period of 65 years. The heatwave engulfed half of Northwest SA, approximately 1.6 million km², with an average intensity of 1.8°C. The high-temperature driven snow melting during the heatwave nearly vanished the year's snowpack, which normally lasts till June. With further analysis, we find that the heatwave was initiated by a persistent anticyclonic blocking associated with a sub-tropical Rossby wave, while it was exacerbated by strong positive land-atmosphere feedback due to lack of soil moisture and latent heat. Our findings provide valuable insights into understanding the changes and impacts of heatwaves in the mountainous areas of SA.