Two leading modes of Antarctic surface temperature and their contributions to Antarctic surface climate change

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Recent multi-decadal Antarctic surface climate change is clearly manifested by greater warming trends in the Antarctic Peninsula and West Antarctica, compared with East Antarctica. By using multiple observations and climate model simulations, we propose two leading modes of Antarctic surface temperature mainly contribute to the east-west asymmetric surface climate change. The first mode shows the surface temperature increase of the whole Antarctic continent, while the second mode displays the opposite temperatures between west and east Antarctica divided by the Transantarctic Mountains. The corresponding principle components from recent Antarctic surface temperature reconstruction dataset indicate that both modes become stronger during recent multi-decades, resulting in substantial warming over Antarctic Peninsular and West Antarctica and weak surface temperature change over east Antarctica. Additionally, long-term datasets show that global scale forcing factors have solid contribution to the first mode but little contribution to the second mode, suggesting that the current east-west asymmetry of Antarctic climate change can be natural origin.