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Mechanisms of Antarctic net precipitation climate change signals

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This study investigates mechanisms leading to climate change signals of Antarctic net precipitation (E-P) simulated by three members of one CMIP3 coupled atmosphere-ocean general circulation model (AOGCM). Net precipitation is calculated with the divergence of the vertically integrated moisture flux. Generally, moisture flux changes are dominated by increased humidity in the atmosphere due to temperature increase in the future climate projections. This contribution presents an approach to distinguish between thermodynamical and dynamical influences on moisture flux. A physical interpretation of the changing flux signal due to dynamics is given by decomposing atmospheric waves into different length scales and temporal variations. Climate change of moisture transport is compared with fluctuations of geopotential height fields as well as climate signals of extra-tropical cyclones. Synoptic length scale moisture flux variability with temporal variations between 2.5 and 8 days can be assigned to the SH stormtrack, which shows a distinctive poleward shift in the future projection. This signal can also be found for extra-tropical cyclones, whereas changing wave activity can be better understood if strong cyclones separately are taken into account, which intensify especially on the Eastern Hemisphere. Changing moisture transport towards Antarctica leads to climate change signals of net precipitation inside a spherical cap around the continent. Generally, an increasing signal of net precipitation can be found whereas the dynamical part decreases. This is due to the low variability component of synoptic scale waves, which show a decreasing climate change signal, especially off-coast of West Antarctica. This is discussed to be connected to changing variability of the Amundsen-Bellingshausen Sea Low.