Climate dynamics of the Antarctic Peninsula: regional and global aspects

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Recent and current processes in the climate system of the Antarctic Peninsula region show significant changes, first of all because of marked warming trend in the lower troposphere. In particular, multi-years' growth of air temperatures at stations of western coast of the Peninsula has exceeded 2degC per 25 years that is faster than the global average. In general, time limits of this regional warming are in correspondence to global warming in extratropical regions of the Northern Hemisphere (Alaska, Central Siberia, most of Europe). Growth of air temperatures during winter months is mainly contributed to total warming; summer warming is much less intensive but is of greater significance for glaciers ablation, because of exceeding a freezing point. Climate warming at the Antarctic Peninsula region is accompanied by multi-years' increase of precipitation (statistically insignificant), and strengthening of winds on regional stations, agreed by intensification of zonal winds by the Reanalysis data. Recession of local glaciers and other changes in sea-ice and ecosystems are also first-order environmental aftereffects of warming. We also sought whether inter-decadal changes in atmospheric circulation are consistent to variability of climate at this region, specifically between colder (1950s) and warmer (1980s and 1990s) decades. Steady decrease of barometric pressure within the Southern Hemisphere's cyclonic belt with intensification of westerlies was found to be the most important change between the two above-mentioned periods. Cyclogenesis became dominant in south-east sector of Pacific, with rare anticyclonic blocking episodes between the Antarctic continent and austral extratropics. As a result cold air inflows from the Antarctic interior are significantly less intensive during the last two decades so climate at the Antarctic Peninsula became warmer. This conclusion is supported by the change of typical regional circulation patterns found for each decade and individual anomalous years via statistical treatment of pressure fields. Therefore interdecadal changes in tropospheric circulation can explain main climate variability in this region, including shift towards warming, and changes in meteorological conditions. During the recent years much attention was paid to Southern Annular Mode (SAM) as a main climatic index in the Southern Hemisphere and integral index of the intensity of westerlies between 40 and 65 degS. We found that SAM does not adequately reflected changes in regional tropospheric circulation and suggested to use a set of additional indexes in regions of main climatic depressions around Antarctica.