Geophysical Research Abstracts
Vol. 14, EGU2012-7789, 2012
EGU General Assembly 2012

Intraseasonal to interannual oscillations of Antarctic climate as recorded at Neumayer polar station

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Possible oscillations in the Antarctic climate are investigated through statistical analysis of meteorological variables recorded at Neumayer polar station, located at Ekström Shelf Ice, Atka Bay, northeast Weddell Sea (70°39'S, 08°15'W). Meteorological variables recorded at this station cover the period 1982 to 2011 with a 3 hours time resolution. At intraseasonal time scales spectral analysis reveals a strong diurnal cycle in the temperature and wind records. A wavelet analysis reveals that diurnal cycle is relatively strong (weak) during the warm (cold) Antarctic season. A persistent oscillation with a period of 35-40 days, with highest amplitude during the cold Antarctic season, was identified also in the temperature record. These oscillations dominate also intraseasonal variability of the wind record. Singular spectrum analysis reveals strong annual and semiannual cycles in the temperature and wind records. The amplitude of semiannual cycle shows decadal variations. Interannual variability of temperature record is dominated by a 5-6 year oscillation. A persistent cycle with a period of about 2 years was identified in the wind record. The origin of intraseasonal to interannual oscillations mentioned above are discussed in connection with the relevant modes of climate variability at these time scales: the Madden-Julian Oscillation, the Antarctic Oscillation, the Quasi-biennial Oscillation and the El Nino-Southern Oscillation. The seasonal variability in the strength of diurnal and 35-40 days cycles as well as decadal variability in the amplitude of semiannual and annual cycles are analyzed based both on internal and external forcing with focus on the role of the solar forcing. Possible implications of these results in the interpretation of climatic signal in the Antarctic ice cores are also presented.