Geophysical Research Abstracts, Vol. 7, 06462, 2005
SRef-ID: 1607-7962/gra/EGU05-A-06462

LEO sensors data analysis to investigate the characteristics of Antarctica precipitating clouds: focus on May 14-16, 2004 Ross Ice Shelf storm

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Atmospheric circulation, cloud cover, and especially precipitation are not well known for Antarctica because of limited analysis, and uncertainties in the interpretation of new data sources. The purpose of this study is to analyze signals related to these atmospheric parameters by using the most advanced satellite remotely-sensed data presently available over Antarctica. In particular, AQUA satellite sensors provide a lot of VIS-IR (MODIS - Moderate Resolution Imaging Spectroradiometer) derived products and many brightness temperatures at different microwave frequencies (AMSU-A - Advanced Microwave Sounding Unit - and AMSR-E Advanced Microwave Scanning Radiometer for EOS). We believe that those instruments are able to provide new information on the microphysical properties of clouds and precipitation also over Antarctica, but they need the help of a physical support to correctly interpret the measurements: in this work we have used a detailed 3D numerical simulation of the event from the UW-NMS (University of Wisconsin - Nonhydrostatic Modeling System) as input for radiative transfer calculations. The May 14-16, 2004 storm occurred over the Ross Ice Shelf, with topographically enhanced precipitation near McMurdo Station on Ross Island and Terra Nova Bay (now called Mario Zucchelli). This case involves a strong synoptic-scale cyclone, with a central pressure of less than 950mb, that moved from the Ross Sea onto the Ross Ice Shelf. The 3km tall Transantarctic Mountains blocked the cyclone from propagating into East Antarctica, keeping the cyclone over the Ross Ice Shelf for several days. The role of the Transantarctic Mountains in creating a barrier wind, cold air damning, and other localized effects is typical of precipitation events over the Ross Ice Shelf.