

Impact of COSMIC data on a synoptic-scale cyclone over the west Antarctica

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The West Antarctic Ice Sheet (WAIS) is a key location in the global climate change. Recent observation shows a dramatic warming and rapid reduction of ice mass over the area, alarming the scientific community with subsequent sea level rise and positive feedback to the warming. One of major sources of water mass that can counterbalance the recent ice loss is precipitation accompanied by synoptic-scale cyclones. However, the structure and developing mechanism of the synoptic-scale cyclones over the WAIS are little known compared to other areas on the globe. Improvements in the analysis and forecast of the synoptic-scale storms over the area are necessary to reduce the uncertainty in the future climate projection. The main difficulty in this direction is the scarcity of observation. This includes the fact that the performance of most satellite data over the region is relatively poor due to surface emission, cloudiness, and extreme coldness. There are also very little conventional data available, especially those that can represent atmospheric vertical structure.

Although the benefit of GPS radio occultation data over data sparse areas has been statistically fairly well demonstrated, practical data assimilation towards optimal use of the data is not straightforward. Our exhaustive tests show a large sensitivity of impact to the system parameters, implying that not only the true quality of the data but also the way the data are used in a particular data assimilation system is essential to properly assess the data's value. We will also present the detailed aspects of the way that the GPS RO data make changes in the structure and development of a major storm over the WAIS.