The Challenge of Cloud Mass Transport in Antarctica

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The Antarctic succumbs to storm systems and cloud masses originating in the mid-latitudes which transport moisture, low cloud ceilings, poor visibilities, and likely precipitation. These events are known as cloud meridional mass transport (CMMT) events. They take place over a short (2-day) to nearly 2-week time frame (Staude, 2007). They impact science research missions, logistics activities, and are a source of moisture into the Antarctic interior. Despite anecdotal evidence that hints at a relationship, CMMTs are not well correlated with larger scale dynamical forcing mechanisms such as the Pacific South America (PSA) pattern and the El Niño Southern Oscillation (ENSO). These dual challenges are significant in both how we conduct logistical planning along with how we understand these sub-monthly phenomena.

Antarctic satellite composite imagery has been used to observe and track CMMT events from an aerial point of view. Efforts are underway to extend the dataset beyond the last research period ending in 2012. Additionally, recent work by O'Kane and others (2017) has revealed that some atmospheric events will not correlate well with large scale dynamical forcing due to a mismatch in the timescale of the phenomena. CMMTs fit this situation, as they have time scales of a week or less, so they should not be expected to have a one-to-one temporal relationship to PSA, ENSO or other large-scale phenomena. This presentation will review the current status of this work and invites discussion on this and other associated or related topics.

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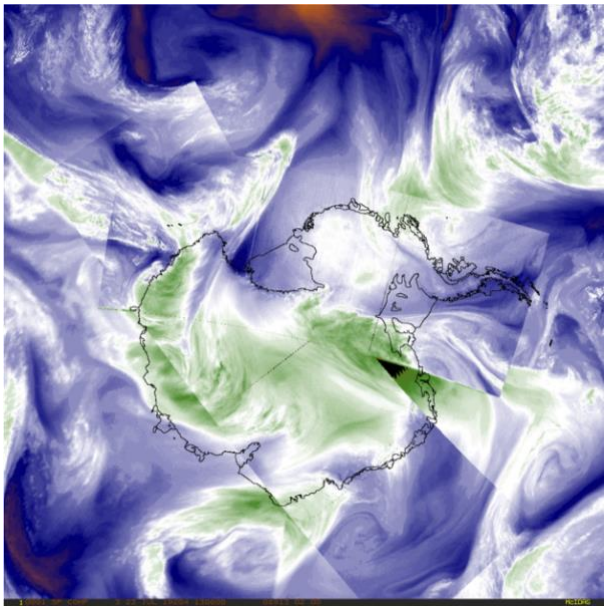

Figure 1. A sample water vapor composite satellite image showing a series of cloud masses advecting directly onto Marie Byrd Land and Ellsworth Land in West Antarctica.

References

O'Kane, T, D.P. Monselesan, and J.S. Risbey, A multiscale reexamination of the Pacific-South American Pattern, Mon. Wea. Rev., 145, pp. 379-402.

Staude, J. A.: Poleward propagating weather systems in Antarctica. M.S. thesis, Department of Atmospheric and Oceanic Sciences, University of Wisconsin-Madison, 87p, 2007