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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Mineral dust variability in central West Antarctica associated with ozone depletion" *by* M. Cataldo et al.

Anonymous Referee #1

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This research focuses on the variability of mineral dust transport to central West Antarctica (Mount Johns (MJ) ice core) with respect to long-term trends (decades) in atmospheric circulation and cyclone dynamics triggered by Antarctic ozone depletion. Ground-based meteorological and NCEP reanalysis data were applied during this study to evaluate atmospheric conditions when compared to mineral dust deposition trends to central West Antarctica. This is a well written manuscript which investigates an important scientific topic as it attempts to assess the impact of an anthropogenic influence (i.e., ozone depletion) on Southern Hemispheric meteorological conditions and aerosol transport. I believe with some minor alterations and clarifications this manuscript should be published as it will contribute to overall science.

General remarks:

1. Pg. 12690. During this portion of the manuscript the authors fully discuss Patagonian dust transport and deposition to Antarctica. While I agree that Patagonian dust transport is a dominant source of dust deposited to Antarctica, from the study by Li et al. [2008] (Fig. 10) it can be seen that Australian dust can contribute an equal fraction (or even a majority fraction) of dust deposited to West Antarctica. While this will not change the results of this study, I feel the authors should add a short discussion, similar to the one focused on Patagonia, about Australian dust transport to Antarctica.

2. Pg. 12695. The authors state that ozone data was obtained from the Halley Bay Antarctic station. Can you explain why this station's data was chosen for evaluation? Is this station the most representative (i.e., closest in proximity) to the MJ ice core? The Halley Bay station seems to be located on the coast of East Antarctica which may not be representative of central West Antarctica. Please provide information that would convince the readers that the ozone data obtained from Halley Bay is representative of all Antarctica and most importantly central West Antarctica.

3. Pg. 12697. When evaluating the magnitudes of mineral dust deposited on Antarctica, which has experienced long-range transport, wet deposition fluxes are likely to be important (at least comparable to dry deposition fluxes). During the period of decreasing dust deposition to West Antarctica (coinciding with the positive phase of the AAO) were precipitation/snowfall rates decreasing? Li et al. [2010] uses an ice accumulation rate to understand dust deposition in ice cores and these authors state: "The dust concentration in the ice cores mentioned above would depend on the amount of dust removed from the atmosphere by local precipitation and the ice accumulation rate". Specifically, I would like to understand if precipitation/wet deposition rates are decreasing, does this always mean dust concentrations transported to the region are also decreasing? Could the authors please expand on the availability of precipitation data and if decreasing precipitation rates could produce the correlation of the concentration of dust in the ice core and ozone concentration.

4. Pg. 12698. Table 1 shows data of wind speed variations at meteorological stations

in Antarctica. The concerning aspect of the data presented is that all of the stations which indicate increasing wind speeds over Antarctica display increasing wind speeds that are well within the factor of uncertainty presented in Table 1.

5. Could the authors add a couple sentences to the conclusion section of the manuscript that focuses on the anthropogenic influence on ozone depletion and the possible impact this could have on dust transport to Antarctica? Past studies have shown that increased desertification in Patagonia and Australia can increase the amount of mineral dust transported to Antarctica, however, to the best of my knowledge, I have never read/heard about the possible connection between anthropogenic emissions, ozone depletion, and mineral dust transport to Antarctica. This could be a very interesting conclusion from this work.

Specific remarks:

Overall, the manuscript is very well written and my only specific suggestion (besides the one listed below) is to consider expanding each acronym the first time it is used in the text.

1. The latitude and longitude of the MJ ice core location is provided (79.55 °S, 94.23 °W), however, I feel it would be beneficial to illustrate the location either on a new figure or one of the existing figures.

References

Li, F., Ginoux, P., and Ramaswamy, V.: Distribution, transport, and deposition of mineral dust in the Southern Ocean and Antarctica: Contribution of major sources, J. Geophys. Res., 113, D10207, doi:10.1029/2007JD009190, 2008.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 12685, 2012.