

Influence of the sea-ice and cloudiness on the reflectivity over the Southern Ocean

*Alessandro Damiani¹, Raul R. Cordero²

1. Chiba University, 2. Santiago de Chile University

The influence of the cloud cover and sea ice concentration (SIC) on the Ultraviolet (UV) Lambertian equivalent reflectivity (LER) at the top of atmosphere over the Southern Ocean has been evaluated for the 1979-2012 period. Despite the high cloud fraction for most of this period, the influence of sea ice was found to be larger than that of cloud cover and it was the main driver of the reflectivity variability. Overall, an increment of the SIC from 0% to 100% resulted in a LER increase of 44 reflectivity units. This value is about twice of the corresponding sea ice-induced reflectivity increase calculated for the observed and modeled shortwave albedo, which is the variable of interest for climate change. On the other hand, cloudiness was found to enhance the UV-LER mostly for low SIC levels. Nevertheless, the analysis was constrained by the difficulty of the passive satellite instruments in identifying cloudiness over high SIC and by the short time series from additional active sensors. Overall, the distribution of the reflectivity for different regions and months shows a marked seasonal-dependent double peak. The reflectivity of the grid-cells characterized by a SIC larger than 30% showed statistically significant negative trends in particularly for the Bellingshausen/Amundsen sea sector. In contrast, the trend of the ice-free grid-cells of the whole Southern Ocean was generally positive.

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