

Spatial distribution of air origin to the Antarctic and its relationship with SAM in 1990-2009

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Antarctica is a huge ice sheet and surrounded by the ocean, so it is natural to suppose that the several substances came from the outside of Antarctica by the atmospheric circulation from the mid-low latitudes. Several ice core analysis data showed the differences and similarities between the several substances transports among the drilling sites. To better understand these data, we would indicate the spatial distributions of air parcel origins and their seasonal variations. The final goals of this study are to determine the boundary between the interior (has few influences from the ocean) and the coastal (has many influences from the ocean) regions and to capture its seasonal change on the basis of atmospheric transport. Our calculation for air transport is made by using the NITRAM trajectory model (Tomikawa and Sato, 2005) and ERA-Interim meteorological data set in 1990-2009. The time duration is 5 days and we suppose the origin of air parcel is the point of trajectory at 5 days ago. The starting points are distributed on 1 deg. x 1 deg. grids over Antarctica and its altitude is 1,300m above the surface. We indicate the spatial distributions of air parcel origins to Antarctica and its seasonal variation. The "Spatial-Seasonal" variations included three parts: in summer (December-January), the most of air parcels originated over the continent except the West Antarctica, in transition terms (February-March, October-November), the ocean origins were dominant in the coastal regions, and in winter (April-September), the continent origins distributed around Ross, Weddell and Amery seas. Around the sharp slope area, there were high concentrations of the ocean origins through the year. Moreover, a relationship between air transport to the Antarctic and a Southern Annular Mode (SAM) was suggested by the annual variations of distributions of air parcel origins. The interannual variability of observed annual accumulation of snow over the East Antarctica by JARE (Japanese Antarctic Research Expedition) shows a correlation with the SAM mode. We discuss about how the snowfall influenced by the SAM mode from the point of the spatial distribution of air transport.