

A 25 years record of surface air temperature at Dome Fuji

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Temperature changes over the East Antarctic plateau in recent decades remain uncertain due to the scarcity of the observations. This is because the long-term surface temperature observations in inland region are limited. As a part of JARE activity, the Automatic Weather Stations (AWSs) had installed on the way to the Dome Fuji during the Deep Ice Coring Project at Dome Fuji in 1995. However, the AWS system had replaced with a different type of the AWS system without calibration until recently. Moreover, observation data show artificial variability and systematic bias and has substantial gaps. In particular, summer warm bias by solar radiation is serious; a thermistor housed in the naturally ventilated shield is heated by solar radiation in case weak wind condition (Genthon et al., 2011). Here, we present 25-year record of surface air temperature at Dome Fuji, in which observations have been removed unrealistic values and corrected systematic bias, and the data gaps have been filled using global reanalysis product.

First, quality control of AWS data was performed using the software developed by the Antarctic Meteorological Research Center, University of Wisconsin. In the process of the software, we checked all individual raw data and then removed manually. The correlation method for warm bias was established by through a comparison between the natural air ventilation system and the forced air ventilation system equipped with a recently deployed AWS system by National Institute of Polar Research (NIPR) at NDF site. By using developed method, temperature data obtained by natural ventilation system converted to the values of forced ventilation system. To fill the gaps, we used the surface air temperature data of the fifth global reanalysis produced by the European Centre for Medium-Range Weather Forecasts (ERA5) (Hersbach et al., 2020). Through a careful comparison between corrected AWS and reanalysis data, we corrected ERA5 data to the observations. As shown in Figure 1, the newly corrected ERA5 temperature record well reproduces the CMOS (complementary metal oxide semiconductor) AWS data at Dome Fuji (1995-2010). The whole reconstructed record is shown in Figure 2. The data reveal no significant trend, but there is a clear decadal signal. In this presentation, we will discuss what factor controls the decadal temperature variability at Dome Fuji site.

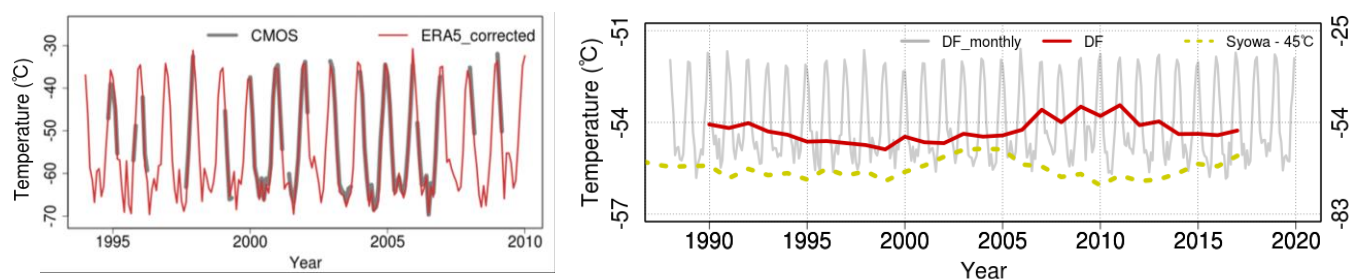


Figure 1 (left). Monthly mean temperature time series of CMOS (grey) and corrected ERA5 (red) at Dome Fuji.

Figure 2 (right). Reconstructed temperature time series of Monthly mean (grey solid line, right axis) and 5-year moving averaged annual mean (red solid line, left axis) at Dome Fuji. 5-year moving averaged annual mean temperature at Syowa station applied a offset (-45°C) (yellow dotted line, left axis) is also shown.

References

- Genthon, C., D. Six, V. Favier, M. Lazzara, and L. Keller, Atmospheric temperature measurements biases on the Antarctic plateau, *J. Atm. and Ocean Tech.*, 28(12), 1598–1605, 2011.
- Hersbach H, Bell B, Berrisford P, et al., The ERA5 global reanalysis, *Q. J. R. Meteorol. Soc.*, 146, 1999–2049, 2020.