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Interactive comment on "A combined Terra and Aqua MODIS land surface temperature and meteorological station data product for China from 2003–2017" *by* Bing Zhao et al.

Bing Zhao et al.

maokebiao@caas.cn

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Many reports and research confirm that extreme floods, heat waves, droughts, and wildfires that have wrecked on a regional scale over the past decade have been exacerbated by climate change. For instance, the heat wave affecting Australia the summer of 2013 brought extreme heat to most of the Australian continent over a prolonged period. Climate change was a major driving force behind many extreme weather events that alternately scorched and soaked large sections of many countries in recent years. Many people have performed numerous studies in calculating global or regional temperature and usually obtained the surface temperature from meteorological stations. There are

four major global indices of temperatures that incorporate station data. These efforts are led respectively by NOAA's National Climate Data Center (NOAA NCDC), NASA's Goddard Institute of Space Sciences (NASA GISS), a collaboration between the University of East Anglia's Climatic Research Unit and the UK Met Office's Hadley Centre (CRU), and the Berkeley Earth Surface Temperature group. These groups individually utilize different averaging techniques, quality control procedures, homogenization techniques, and datasets, but they all primarily rely on the GHCN (Global Historical Climatology Network) for their input data. It is very difficult to determine the seasonal and annual mean of absolute temperature because temperature variations are different in different regions. The number of observation sites is insufficient, especially in mountainous region, ocean region, and the Polar region. NASS has two polar-orbiting Earth Observing System (EOS) satellites (Terra and Aqua) which are launched in 1999 and 2002 respectively. One satellite crosses the equator in the early morning (10:30) and early evening (22:30) and the other crosses the equator in the afternoon (13:30) and late evening (1:30). They have a sun-synchronous, near-polar orbit, which means that the satellite travels from North Pole to South Pole as the Earth rotates below it. The significance of a sun-synchronous orbit is that the satellite passes over the same part of Earth at approximately the same local time each day, ensuring comparable daylight conditions over time. MODIS instruments are on board these two satellites, and it has 36 bands which include 8 thermal infrared bands designed for retrievals of SST and LST. The surface temperature can be obtained in various times (1:30, 10:30, 13:30, 22:30) during the day in the same place. Together they provide four-daily global surface temperature coverage. Therefore we can calculate the global surface temperature from remote sensing data, and it will have better consistency for determining surface temperature. Since the observation time is symmetrical, the global mean surface temperature is more approximate to absolute mean surface temperature because of the high coverage of satellite data. However, thermal infrared remote sensing is greatly affected by the cloud, and there are still missing values in 60% of the area every day. In this paper, we use the ground observation network to overcome the defects of thermal infrared affected by the cloud, and use the advantages of thermal infrared remote sensing to obtain surface temperature over a large area, and use the reconstruction algorithm to generate a new set of surface temperature data sets in China. This is important implications for regional climate change studies such as agricultural drought monitoring.

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