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Development of global 0.5 degree hourly land surface air temperature data from 1948-2009 based on CRU in situ data as well as MERRA, ERA-40, ERA-Interim, and NCEP reanalysis data

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Global 0.5 degree monthly averaged data of daily maximum (Ta_max), minimum (Ta_min), and mean [Ta_m = (Ta_max + Ta_min)/2] land surface air temperature are one of the most important observational datasets in climate study. For a variety of applications, the Ta diurnal cycle and day-to-day variation are also needed, and three-hourly Ta data have been developed by adjusting the six-hourly reanalysis Ta data with the in situ monthly Ta_m data in several previous efforts. However, the diurnal cycle of the reanalysis data is unrealistic and the in situ monthly Ta_max and Ta_min data were not used for reanalysis six-hourly data adjustment. Based on our recent evaluation of various reanalysis data, we have come up with a new idea to develop a global 0.5 degree hourly Ta data from 1948-2009 based onthe CRU TS3.1 in situ data as well as MERRA, ERA-40, ERA-Interim, and NCEP reanalysis data. Each of these reanalysis products have strengths and weaknesses. MERRA provides hourly data for a relatively short period; ERA-40 and NCEP provide 6-hourly data with the former more realistic and the latter providing the longest period of data; and ERA-Interim, representing the most recent product from ECMWF, provides three-hourly data. ERA-Interim also performs well compared with other reanalysis products in our evaluations (Decker et al. 2011). In our new product, the data priority follows the order of ERA-Interim, ERA-40, and NCEP. Therefore we use the ERA-Interim data from 1989-2009, the ERA-40 data from 1958-1988, and the NCEP data from 1948-1957. Our data development involves six steps (Wang and Zeng 2011), including obtaining the hourly values in the ERA-40 and NCEP data based on the MERRA hourly data, and adjusting these hourly values using the CRU monthly Ta_max and Ta_min data. In this way the monthly Ta_max, Ta_min, and Ta_m values from our final product are eaxctly the same as those from CRU at each grid cell, while our product also provides the consistent hourly Ta data. In this talk, I will present the details of our data development, compare our new product with prior efforts using the CRU Ta_m alone for adjustment, and discuss additional results from the analysis of the new product, such as the continuity or discontinuity of the new product between the three periods using different reanalysis data. Decker, M., M. Brunke, Z. Wang, K. Sakaguchi, X. Zeng, and M. Bosilovich, 2011: Evaluation of the reanalysis products from GSFC, NCEP, and ECMWF using flux tower observations. J. Climate, submitted. Wang, A., X. Zeng, and M. Brunke, 2011: Development of global 0.5 degree hourly land surface air temperature data from 1948-2009 based on in situ and multiple reanalysis data. J. Climate, in preparation.