

A 1987 - 1993 Composite SSMI Surface Wind Speed Data Set Created From Two Satellites

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Development of decade-long time series of global surface wind measurements for studies of seasonal-to-interannual climate variability presents unique challenges for space-borne instrumentation because of the necessity to combine data sets of 3- to 5-year lifetimes. Before the first Special Sensor Microwave Imager (SSMI), which was launched on the Defence Meteorological Satellite Program (DMSP) F8 spacecraft in July 1987, stopped recording wind speed in December 1991, another SSMI was launched on DMSP F10 in December 1991. Interpretation of the 1987 - 1993 composite time series is dependent upon the space and time characteristics of the differences between concurrent F8 and F10 SSMI measurements. This paper emphasizes large geographical regions and 1-month time scale. The F8-F10 area-weighted difference between 60°S and 60°S during 305 days of 1991 (-0.12 m s^{-1}) was comparable to the year-to-year wind speed variations during 1988 - 1991. The 10° -zonal averaged monthly mean F8-F10 difference was negative (positive) for wind speeds less (greater) than 7.9 m s^{-1} , reaching -0.43 (0.32) m s^{-1} at 5 (10) m s^{-1} . The 10° -zonal averaged monthly mean F8-F10 bias had considerable variations throughout the year and between 60°S - 60°N , with the largest temporal variation (1.4 m s^{-1}) in the 50° - 60°N region from February to April. The 1991 average value of the monthly mean root-mean-square (rms) difference between F8 and F10 daily wind speeds in 10° -longitudinal bands was 2.0 m s^{-1} over 60°S - 60°N , the amplitude of the annual cycle of the rms difference was largest in the northern hemisphere middle latitudes, and the rms difference was related to the wind speed (e. g., at 6 and 10 m s^{-1} , the rms difference was 1.7 and 2.7 m s^{-1} , respectively). The relationship between monthly mean $1/3^{\circ} \times 1/3^{\circ}$ F8-F10 SSMI wind speed differences and integrated water vapor and liquid water content in the atmosphere is discussed.