In Search of the Elusive True Surface Wind Field

David Halpern
Jet Propulsion Laboratory, MS 300-323
California Institute of Technology
Pasadena, CA 91109

Telephone: 818-354-5327
Fax: 818-393-1734
Email: david.halpern@jpl.nasa.gov

Many surface wind data products purport to represent the true 10-m height (i. e., surface) wind field. Five surface wind data products (QuikScat, ERS, ECMWF, and NCEP ocean vector winds and SSMI wind speeds) are compared in the Arabian Sea and equatorial Pacific Ocean, where upper-ocean circulation is primarily wind driven. In the Arabian Sea during the summer monsoon, the 15-day (5-9 and 12-16 and 27-31 July 2000) averaged QuikScat, ERS, ECMWF, NCEP, and SSMI maximum scalar wind speeds were 14, 13, 13, 12, and 11 m s^{-1}, respectively. A difference of 1 m s^{-1} is considered significant because its effect on net surface heat flux is about 10 W m^{-2}, which is the precision required for studies of climate variability. Locations of the QuikScat, ERS, and SSMI maximum wind speed were about 465 km towards the northeast of the locations of the ECMWF and NCEP maximum speeds, which were close to Somalia. Mean surface wind divergence over the Arabian Sea ranged from a high of 2.6×10^{-6} s^{-1} for QuikScat to a low of 0.8×10^{-6} s^{-1} for NCEP. The range of southward Ekman transports across the southern boundary of the Arabian Sea was small; similarly, the range of vertical transports into the Ekman layer over the Arabian Sea was small. Wave number spectral estimates for 1400- to 100-km spatial scales showed (i) QuikScat and ERS u-spectra were similar, and also for v-spectra, (ii) ECMWF had higher v-spectral values compared to NCEP, and ECMWF and NCEP u-spectral values were similar, and (iii) NCEP had the smallest kinetic energy spectral levels. Along the Pacific equator where the zonal wind component plays an important role in upper ocean dynamics, analysis of NSCAT, ERS, NCEP, and ECMWF winds has begun, and preliminary results will be discussed.