Reply

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Our paper (Sampe and Xie 2007) documented large variations in the frequency at which the Quick Scatterometer (QuikSCAT) neutral wind speed exceeds 20 m s^{-1} and related them to SST fronts and their meanders. In his comment, Monahan (2008) suggested that

1) QuikSCAT does not measure wind velocity directly; and
2) its measurements contain a) the atmospheric stability effect and b) SST effects on capillary waves and whitecap bubbles.

We agree with the first statement and in fact acknowledged it in the paper. Effect a is involved in the difference between the actual 10-m wind and the QuikSCAT neutral wind that is based on wind stress. Our paper concluded that the stability effect a is small under high winds (paragraph 1, right column, p. 1967). This conclusion was based on a calculation using the Fairall et al. (1996) algorithm. The calculation shows a significant stability effect only for weak winds, while our paper focuses on high winds. For example, when SST is 5°C higher than 2-m air temperature, the stability effect on neutral wind is no more than 0.2 m s^{-1} for an actual wind of 20 m s^{-1}. The SST frontal effect on wind speed is clearly observed in Comprehensive Ocean–Atmosphere Data Set (COADS) ship reports as illustrated in Fig. 2b of our paper.

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Effect b affects the inference of wind stress from radar backscatter. While effect b exists, we are not experts on wind waves to judge its quantitative importance. Liu (1984) suggested that the SST-induced difference between ship and scatterometer wind measurements is small at wind speeds higher than 8 m s^{-1}. More calibration experiments against in situ wind observations for a broad range of SST, air temperature, and wind speed are desirable. In our paper, "thermal effects" refer to the effects on the actual wind resulting from spatial variability in SST on the ocean mesoscale (several hundred kilometers), instead of the absolute value of SST. Vertical momentum mixing depends on stability, not on SST itself. Thus, SST variability on a scale smaller than that of the atmosphere induces variations in atmospheric stability and hence the thermal effects. In fact, the occurrence of high winds often varies considerably along a meandering isotherm in the Gulf Stream front (Fig. 2a of our paper). Obviously such along-isotherm variations are not due to the dependence of seawater properties on SST.

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