Answer to referee comment by Larry Mahrt:

General comment:

We were delighted to read LM's general positive comments of the study. We also agree with LM's opinion that it is hard to avoid flux sites in fetch-limited terrain. However, this study is not applicable to sites with fetch-limitations (for example a small forest in agricultural landscape) only, but also deals with clearings within the forest. Large-scale surface inhomogeneities such as lakes, mires, plantations and clearings are typical in the natural forested landscape, and all these features will have implications for the locally measured W.

8175 *The assumptions behind equation 2 often break down including inability to define the integral scale (or sensitivity to method of calculation).* We agree that the integral scale determination is method-dependent, but that for the vertical wind velocity it is somewhat better defined than for the horizontal wind component, since the vertical wind fluctuation usually has limited horizontal extent. We will improve the length scale estimation (see below).

The assumption that the integral scale can be estimated as Lw/U assumes that convection is not important. Obviously, this equation breaks down as U -> 0 during a convective situation, but that is never the case at our latitudes. This information will be added to the text.

If I understand Section 2.2 correctly, the integral scale is finally computed as (z_m - d)/U? While this estimate is probably not very general, (z_m - d)/U has the calculation advantage of independence from the turbulence calculation. However, it can yield very small values. For example, z-d = 10 m and U=5 m/s yields an integral scale of only 2 s.

We agree that the estimate of the integral time scale as (z-d)/U is crude and we will investigate the actual integral scale based on the measured time series and include how it depends on stability.

8186L22: It is hard to positively exclude that there is influence from individual roughness elements especially for the lowermost anemometer, but since the mean response of W to wind direction similar at the two measurement heights during the summer, we have assumed that deviations from zero in the vertical wind speed is dominantly caused by larger-scale terrain features (upwind or downwind forest edges).

8189L22 For the mean vertical velocity there could be additional instrumental error sources aside from the flow distortion. For example, the transducers could be temperature dependent in their response time. Maybe 0.1m/s is too pessimistic after corrections have been applied, but 0.01m/s is probably too optimistic. Therefore, we wrote that the uncertainty is somewhere in between these two values, but – as is also stated in the text – it is hard to estimate. Newer sonic anemometers, or sonic anemometers of a different brand, may be better than this. As the Solent R2/R3 is the most widely used sonic in the published advection studies, we found it worthwhile to mention its limited precision. We will make this paragraph clearer and also harmonize the estimates regarding flow angles precision and vertical velocity.

8184-8185 *How common was negative shear and how common was U<1 m/s? Some continental sites, these conditions are common at night in summer. I suppose uncertainties would be even greater for these conditions.* U(43m) < 1m/s occurred about 2% of the time both for the summer and the winter datasets. Negative shear with U(43m) > 1m/s occurred for 10 samples during the summer (0.2% of the time) and was associated with low-wind instationary flow. The winter dataset contained 53 cases of negative shear. These cases are associated with instrumental errors of the Metek sonic, which may have been caused by snow/rain. This information will be added to the text.

Since we study the influence of the surface cover inhomogeneities on the flow angles, it does not make sense to look at data where the flow direction is not (at all) well-defined. Aside from this, the statistical error for W would indeed be problematic under very low wind conditions.

P8186L5: The mean angles were computed by first averaging U and W. This information will be added to the text.

P8187L7: Is this the correlation between 30 minute flow angles? Yes.
The low R^2 could use commenting. Heinesch et al. 2007 reported a correlation of 0.55 for two sonics located at the same height. The low R2 in this study could be caused by the different measurement heights, where the vertical fluctuation may not be fully correlated. The relatively high correlation in the Heinesch et al study could also be biased by flow distortion/flow distortion corrections, which was the same for the two sonics, whereas we have used two different brands of sonics and therefore different flow distortion corrections. We will add this information to the text and add the different measurement heights in the captions or titles of Figures 6, 7 and 10.

P8190L20. How would computing mean flow angles reduce the vertical velocity error? We have written: “A more robust alternative to using measured *W* for each half hour average, could be to calculate a mean flow angle for the wind direction of interest, which was based on an ensemble of the single-run flow angles. This would reduce the scatter significantly.”

This relates to the issue of including the advection term on a half-hourly basis and we simply mean that sector averaging could reduce the scatter due to the limited sampling time. It is not very well written, and we will remove the sentence.

P8191L24: I assume you are referring to flexing of support brackets, which requires very strong winds? We wrote that this was a speculation, and it is indeed a speculation. There could be other explanations: for example temperature effects or that somebody by mistake nudged the boom/instrument. For the westerly directions, W turned less negative at high wind speeds during winter time. However, after some discussion, we agree that this would not cause a sinusoidal shift and we will remove this speculation. Since we have no reason to assume that the Solent R2 was nudged exactly between the winter and the summer period, the supposed one degree misalignment will be added both for the summer and the winter periods (Figure 10).