Response to Referee #1

We thank Referee #1 for continued interest and the perceptive comment.

In short, what we have done is what the reviewer is asking for but with a slight twist. The slight twist arises because R1 is asking, for example, to randomly choose (say) 5 consecutive days out of a season. What we did is use all possible periods of five consecutive days.

To elaborate, we refer to Figure B (reprinted below) from our earlier response.

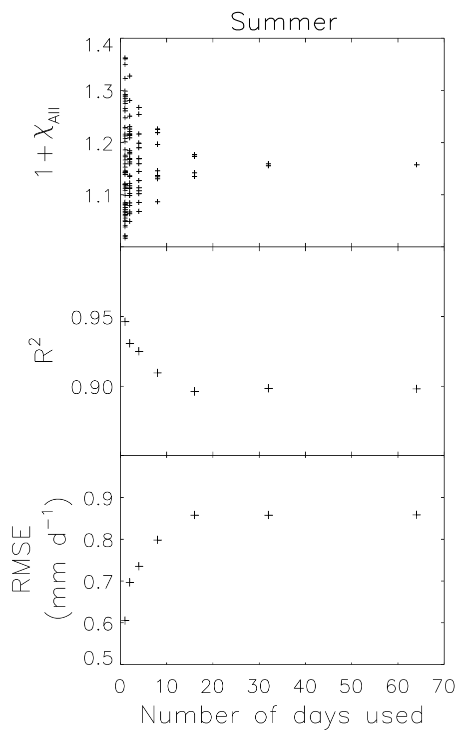

Fig. B. Accuracy of the total correction factor ($1+\chi_{All}$) versus the number of days used to calculate the mean diurnal cycle. (Data are for summer only.)

We began with the 64 summer days in our database and the calculated total correction factor for each day. The resulting range spans from ~ 1.02 to ~ 1.37 as can be seen in the top panel (at X = 1 day used). As the reviewer noted, this is the base case. Now we lump the 64 days into 32 consecutive periods having two days each. In that case, the total correction factor now varies from ~ 1.05 to ~ 1.27. Again we lump the 64 days into 16 consecutive periods (of 4 days each) and the correction factor varies in the range ~1.09 to ~ 1.23, and so on. When all data are lumped into a single period the total correction factor (here using 64 days we get ~ 1.16) will be close to the mean total correction factor using the single days (i.e., the base case).

By thinking through the reviewers comments we realize that the two points of view can be reconciled by considering general sampling theory. In general, the standard error of the mean is the standard deviation divided by square root of n. Our results for the one day case show a range of values (~ 1.02 to ~ 1.37) with mean 1.16 (± 1sd = ± 0.10). This sets the base case noted by the reviewer. Assuming data from consecutive periods are independent, then if we were to sample 4 periods each having 16 consecutive days, the standard error of the mean would be 0.10 / (square root of 16) ~ 0.03. By inspection of figure B, the mean derived from sampling any of those periods would be a reasonable estimate of the mean from a 64 day field campaign. When that total correction factor (= 1.16) is applied, we will underestimate Epan on around the half the days and overestimate it on the other. But the total seasonal integral should still be a reasonable estimate.

The key to reconciling the approach suggested by R1 and our earlier response is to recognize that the daily statistics of the total correction factor can be used to estimate how many days need to be sampled to get a reliable seasonal correction.