Comment on "Scaling of Atmosphere and Ocean Temperature Correlations in Observations and Climate Models"

In a recent Letter [1], Fraedrich and Blender (FB) studied the scaling of atmosphere and ocean temperature. They analyzed the fluctuation functions $F(s) \sim s^{\alpha}$ of monthly temperature records (mostly from grid data) by using the detrended fluctuation analysis (DFA2) and claim that the scaling exponent α over the inner continents is equal to 0.5, being characteristic of uncorrelated random sequences. Here we show that this statement (i) is not supported by their own analysis and (ii) disagrees with the analysis of the daily observational data from which the grid monthly data have been derived. We conclude that, also for the inner continents, the exponent is between 0.6 and 0.7, similar to the coastline stations.

(i) Figure 1(a) in [1] shows the representative results of FB for $F(s)$ for the inner continental site of Krasnojarsk (observational, grid, and model data). Close inspection of the curves shows that none of the observational data approaches the exponent 0.5, but rather yields exponents close to 0.6 or above.

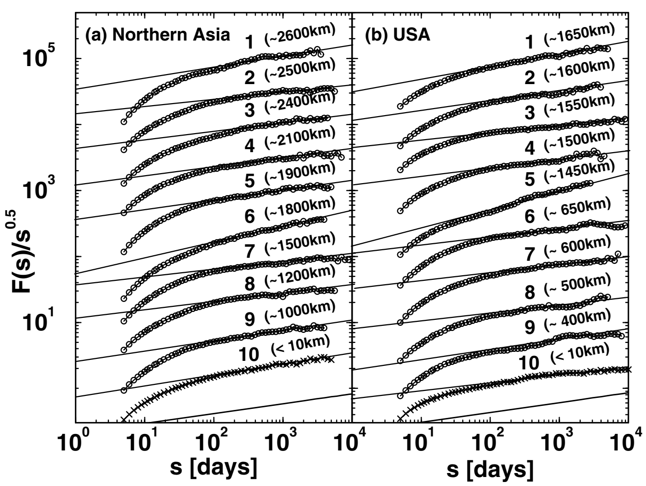

FIG. 1. Results of DFA2 for the daily maximum temperature records of 18 inner continental stations (○) and two coastline stations (×): (a) 1 Urumchi, 2 Tomsk, 3 Atbasar, 4 Chita, 5 Olekminsk, 6 Horog, 7 Swerdlowsk, 8 Surgut, 9 Jakutsk, 10 Aleksandrovsk; (b) 1 Huron, 2 Academy, 3 Cheyenne, 4 Gothenburg, 5 Gunnison, 6 Spokane, 7 Winnemucca, 8 Pendleton, 9 Tuscon, 10 New York. The estimated minimum distance to the oceans is written in parentheses. The scale of $F(s)$ is arbitrary. The straight lines in the curves represent the best fits between $s = 150$ and 2500. For each curve, the variance of the slope is about 0.01. The line at the bottom has a slope of 0.15, corresponding to $\alpha = 0.65$. The maximum s value in each curve is below one quarter of the length of the corresponding record.

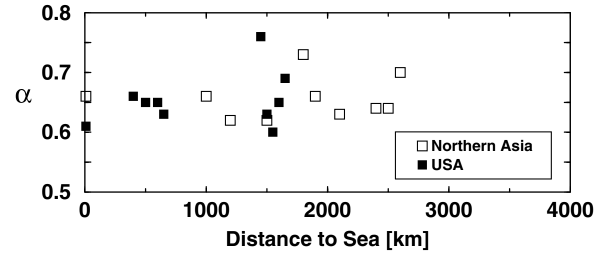

FIG. 2. The scaling exponent α (obtained from the slopes in Fig. 1) as a function of the distance to the oceans.

(ii) Figure 1 shows representative results of $F(s)$ (DFA2) obtained from daily observational records, for 18 inner continental sites in North America and Asia, that are between 400 and 2600 km away from the ocean. We also show the results for two coastline stations. To facilitate the evaluation of the data, we have divided $F(s)$ by $s^{0.5}$. A plateau now indicates loss of correlations. One can see clearly that none of the curves approaches a plateau; i.e., an exponent $\alpha = 0.5$ is never seen. All asymptotic slopes have values above 0.6. The mean value of α, averaged over all inner continental stations, is 0.65 ± 0.04. There is no notable difference between coastline and inner continental stations. Figure 2 shows the dependence of α on the shortest distance to the oceans. There is *no* tendency towards a lower exponent at larger distances.

Finally, we comment on the claim that $\alpha \simeq 1$ for sea surface temperatures. As has been shown in [2], there is a remarkable crossover at about one year in the sea surface temperatures: At small scales, the exponent is significantly larger than 1, $\alpha \simeq 1.3$, while at large time scales α is between 0.65 and 0.95, with an average at 0.8.

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[2] R. A. Monetti *et al.*, Physica (Amsterdam) **320A**, 581 (2003).

