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Offshore wind profiles with a multifractal approach to thermal stratification.

Allan Morales and Joachim Peinke
University of Oldenburg, Insitute of Physics, Germany (allan.morales@uni-oldenburg.de)

Motivated by the works of Lovejoy and Schertzer concerning multifractal behaviour in the atmosphere, we have been working on the fine structure of the atmospheric thermal stratification. Based on high frequency data (from an offshore measuring campaign) we estimate the spatial thermal structure of the atmosphere in terms of the Richardson number Ri. Duration time statistics have been analyzed in terms of fractality. We conclude that for the common 10 minute mean wind speed profiles $u(h)$, a fine small scale structure has to be considered, since we observe fluctuations of thermal stratification at all temporal scales. From these findings we propose to model offshore 10 minute wind profiles as a superposition of different thermal states as follows,

$$u(h) = \int u(h, Ri)p(Ri)dRi. \tag{1}$$

Here, h represents height and $p(Ri)$ the probability of having the thermal state defined by an estimation of the Richardson Number Ri. The wind profiles follow power laws which depend explicitly on the thermal state of the atmosphere, $u(h, Ri) \sim (h/z)^{\alpha(Ri)}$. This superposition model explains deviations from pure power or logarithmic laws and does not need the addition of other correction thermal dependent parameters.