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Statistical analysis of non-stationary atmospheric boundary layer turbulence

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We study the statistics of the horizontal component of atmospheric boundary layer wind speed. Motivated by its non-stationarity, we introduce statistical methods to investigate which parameters remain constant or can be regarded as being piece-wise constant and describe tools to estimate them.

The first focus is put on the fluctuation [1] of wind speed around its mean behaviour. We describe a method estimating the proportionality factor between the standard deviation of the fluctuation and the mean wind speed and analyse its time dependence. The second focus is put on the wind speed increments. We investigate the increment distribution [2] and use an algorithm based on superstatistics [3] to quantify the time dependence of the parameters describing the distribution.

Using this methods, we can verify the picture of natural atmospheric boundary layer turbulence to be composed of successively occurring close to ideal turbulence phases with different parameters.

References

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