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MarkovEinstein coherence lengtha new meaning for the Taylor length in turbulence JOACHIM PEINKE, STEPHAN LUECK, CHRISTOPH RENNER, Carl von Ossietzky University Oldenburg, RUDOLF FRIEDRICH, University Muenster — Small scale velocity statistics are measured in different turbulent flows with Reynolds numbers up to 10^6. The stochastic features of the turbulent signals are investigated by means of Markov processes for the velocity increments evolving along the cascade. The analysis of the validity of the Markovian properties yields to a new small scale coherence length. This coherence length can be seen as analogue to the mean free path length of a Brownian Motion as pointed out in A. Einstein, Ann. Phys.**17**, 549 (1905). For length scales larger than this coherence length the complexity of turbulence can be treated as a Markov process. We present experimental evidence that this Markov- Einstein coherence length scales with $Re^{1/2}$ and show that it is closely related to the Taylor micro-scale and not to the Kolmogorov dissipation length.

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