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On the outer scale of turbulence in the atmospheric surface layer

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The well-known Kolmogorov and Tatarskii similarity relations for spectra in the atmospheric surface layer are derived for an eddy-size region between the outer and inner scale (L0 and l0 respectively). Remarkably few studies are devoted to the outer scale L0. Tatarski (1992) defined it through the ratio of twice the variance and the structure parameter of temperature to the power 3/2.

In most studies L0 is assumed to be proportional to the height z (Wheelon, 2001, pag. 79). In our study we will introduce an alternative definition for L0.. Next, its behavior will be investigated analyzing different data sets gathered under a wide range of conditions and observations height. During daytime, L0 appears to vary with z indeed, but with lot of scatter and systematic differences. The consequences of these findings for different remote sensing techniques such a scintillometry will be discussed.

Tatarskii, V.I., 1992: Review of scintillation phenomena, in: Tatarskii et al. (Eds.): Wave Propagation in Random Media (Scintillation), Spie Press, 2-16.

Wheelon, A.D., 2001: Electromagnetic Scintillation, part I Geometrical Optics, Cambridge University Press, 455 pp