A possible forming mechanism of large scale spot-like pollution structure of the underlying surface under intense aerosol injections into the atmospheric boundary layer

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In order to make quick estimates of the average pollution distribution under gas and aerosol escape into the lower layer of the atmosphere one needs to use well founded mathematical models that describe the propagation of contaminants in the natural environment correctly and account for basic forming mechanisms of pollution of the underlying surface. It is known that the pollution field of the underlying surface, which takes place under intense atmospheric escapes, has very distinct spot-like structure. The mechanisms responsible for small scale pollution are known in general. The situation is not completely clear in the case of large scale pollution, however. It is believed that the main reason for the large scale spot-like structure is the convective cloud activity, $i.e.$ "damp" aerosol scavenging with convective clouds and atmospheric precipitates. In our opinion, there exists one more physical mechanism forming large scale pollution structure. It is a periodic onset and damping of the convective turbulence in the lower layer of the atmosphere, that is a periodic change (diurnal variation) of the turbulent state of the environment. Basing on analytical solutions of the diffusion problems that model some simple cases we show the consistency of the suggested hypothesis. The formation of distinct spot-like structures in the underlying surface pollution appears very clearly when we deal with a large aerosol cloud. For more general cases we obtained numerical solution of the turbulent diffusion equation. The results of these simulations confirm our conclusions.