# *Supplement of*
# Large-eddy simulation and stochastic modelling of Lagrangian particles for footprint determination in stable boundary layer: *Description of attached LES data*

Andrey Glazunov[1], Üllar Rannik[2], Victor Stepanenko[3], Vasily Lykosov[1,3], Mikko Auvinen[2], Timo Vesala[2], and Ivan Mammarella[2]

[1]Institute of Numerical Mathematics RAS , GSP-1, 119991, Gubkina str., 8, Moscow, Russia
[2]Department of Physics, P.O. Box 64, University of Helsinki, 00014 Helsinki, Finland
[3]Moscow State University, Research Computing Center, GSP-1, 119234, Leninskie Gory, 1, bld. 4, Moscow, Russia

*Correspondence to:* A. Glazunov (and.glas@gmail.com)

**1)** Folder **Supl-data/LES-corr-stat**: data from LES for Lagrangian stochastic models and random displacement models

The data are prepared as discussed in Sect. 5.1 and shown in Fig. 2a and Fig. 9.

Attached ASCII files contain the following variables (first columns) interpolated to a finer grid with steps 0.02 m (second columns):

– **uafine.dat** and **vafine.dat** - mean velocity components $\langle u \rangle$ and $\langle v \rangle$ (m/s);

– **uufine.dat**, **vvfine.dat** and **wwfine.dat** - estimated variances of velocity components $\langle u'^2 \rangle$, $\langle v'^2 \rangle$ and $\langle w'^2 \rangle$ (m$^2$/s$^2$);

– **uvfine.dat**, **uwfine.dat** and **vwfine.dat** - turbulent momentum fluxes $\langle u'^2 v'^2 \rangle$, $\langle u'^2 w'^2 \rangle$ and $\langle v'^2 w'^2 \rangle$ (m$^2$/s$^2$);

– **disfine.dat** - turbulent kinetic energy dissipation rate $\epsilon$ (m$^2$/s$^3$);

– **khfine.dat** - coefficient of turbulent diffusion in vertical direction $K_s^{ww}$ (m$^2$/s).

**lobsrf.dat** - Obukhov length $L$ (second column), computed as:

$$L = -\frac{U_*^3 \Theta_0}{\kappa g Q_0},$$

where $U_*$ is surface friction velocity; $Q_0$ is surface potential temperature flux; $\Theta_0$=263.5 K is reference temperature; $g$=9.81 m/s and $\kappa$= 0.4 is von Karman constant. First column - time $t$ (seconds) starting from seventh hour of LES run.

**lob.dat** - time-averaged Obukhov length (second column):

$$\Lambda(z) = -\frac{|\tau|^{3/2}\Theta_0}{\kappa g Q},$$

determined using values of fluxes of momentum $|\tau|$ and potential temperature $Q$ at the given height $z$ (first column).

**2)** Folder **Supl-data/LES-footprints**: crosswind-integrated and two-dimensional footprints obtained in LES ($\Delta_g = 2$ m).

**fx1001.dat, fx1002.dat ..., fx1006.dat** - crosswind-integrated averaged scalar flux footprint functions $f_s^y(x_M - x, z_M)$ for sensor heights $z_M$ = 10, 20, 30, 40, 50 and 60 m (see, Fig.12 a,c,e, bold lines).
First column: $x_M - x$ (m); second column: $f_s^y$ (m$^{-1}$).

**ix1001.dat, ix1002.dat ..., ix1006.dat** - cumulated crosswind-integrated scalar flux footprints $F(x_M - x, z_M)$ for sensor heights $z_M$ = 10, 20, 30, 40, 50 and 60 m (see Fig.12 b,d,f, bold lines).
First column: $x_M - x$ (m); second column: $F$.

**foot10.dat, foot20.dat ..., foot60.dat** - two-dimensional footprints $f_s(x - x_M, y - y_M, z_M)$ for sensor heights $z_M$ = 10, 20, 30, 40, 50 and 60 m (see Fig.8 a,b).
First column: $x - x_M$ (m);
second column: $y - y_M$ (m);
third column: $f_s(x - x_M, y - y_M, z_M)\times 10^6$ (m$^{-2}$).