

# Supplementary Materials: Comparison between Puff and Lagrangian Particle Dispersion Models at a Complex and Coastal Site

Alessandro Nanni <sup>1,\*</sup>, Gianni Tinarelli <sup>1</sup>, Carlo Solisio <sup>2</sup> and Cristina Pozzi <sup>1</sup>

<sup>1</sup> ARIANET Srl, Via Gilino, 9, 20128 Milan, Italy; g.tinarelli@aria-net.it (G.T.); c.pozzi@aria-net.it (C.P.)

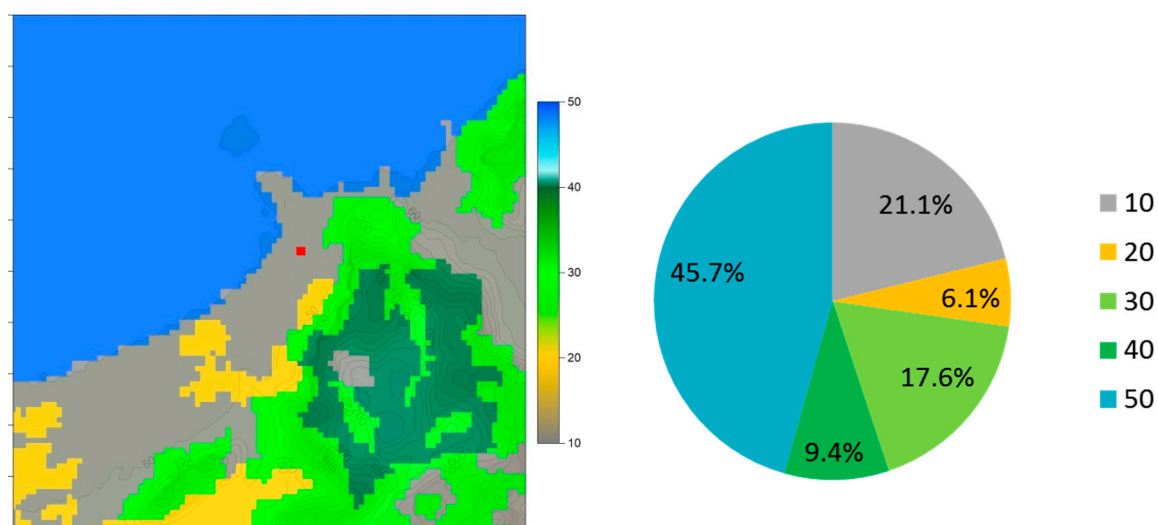
<sup>2</sup> Dipartimento di Ingegneria Civile, Chimica ed Ambientale, Università Degli Studi Di Genova, Via Montallegro, 1, 16145 Genova, Italy; solisiocarlo@gmail.com

\* Correspondence: a.nanni@aria-net.it; Tel.: +39-02-2700-7255, fax: +39-02-2570-8084

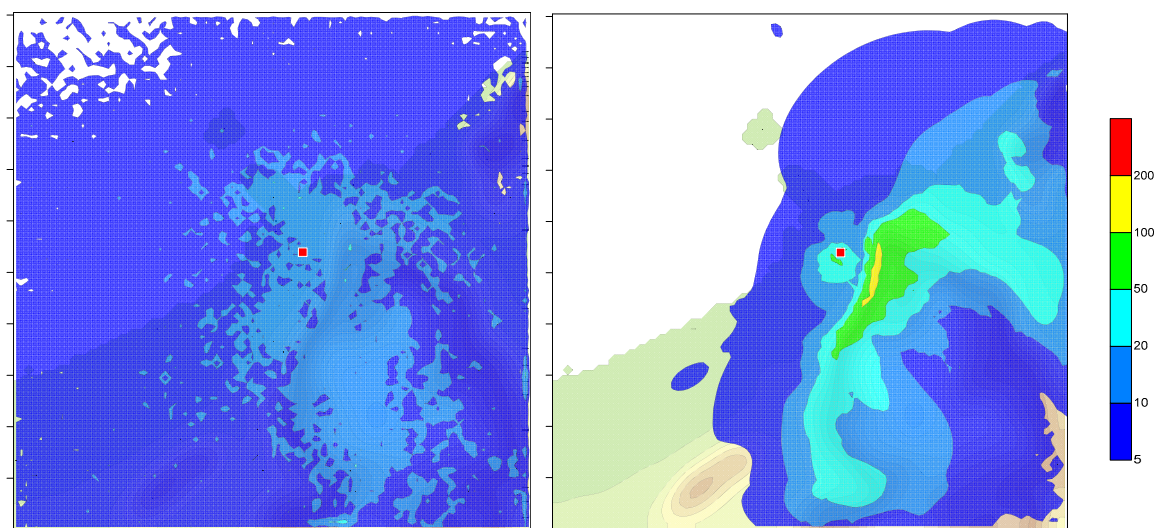
## SUPPORTING MATERIAL

### Table of contents

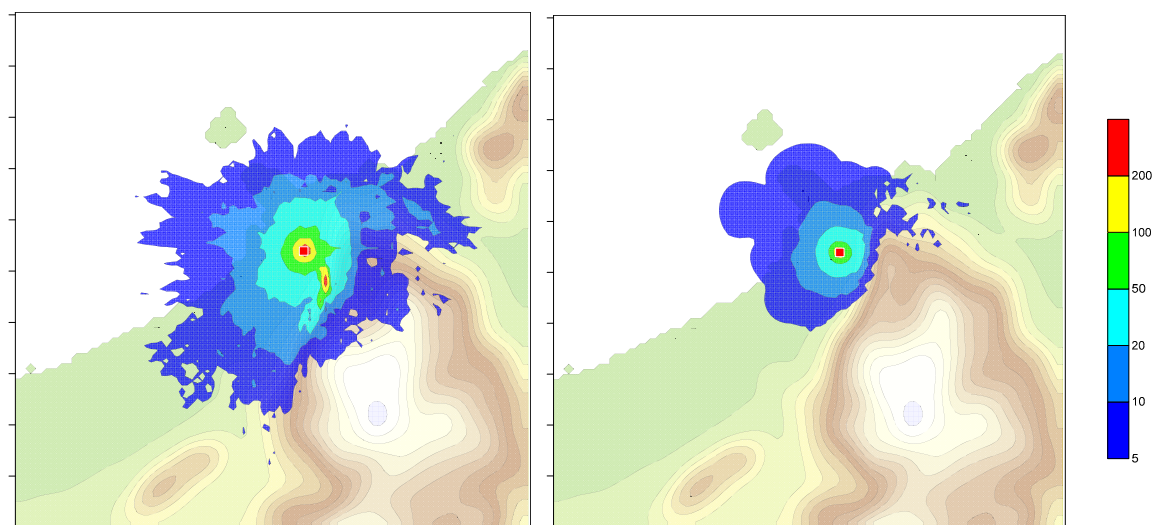
Figures
<b>Caption</b>
<b>Figure S1.</b> – Landuse map and distribution of the calculation domain (red square: position of the emissions) Legend: 10 - Urban or Built-up Land; 20 - Agricultural Land (Unirrigated); 30 - Rangeland; 40 - Forest Land; 50 – Water.
<b>Figure S2.</b> – Point source, annual maximum of normalized hourly concentration ( $\mu\text{g h m}^{-3} \text{ kg}^{-1}$ ). Left: LPM; right: PUM
<b>Figure S3.</b> – Volume source, annual maximum of normalized hourly concentration ( $\mu\text{g h m}^{-3} \text{ kg}^{-1}$ ). Left: LPM; right: PUM
<b>Figure S4.</b> – Annual average of normalized hourly concentration ( $\mu\text{g h m}^{-3} \text{ kg}^{-1}$ ) versus ground elevation above: point source; below: volume source; red: PUM; blue: LPM
Tables
<b>Table S1.</b> – Synthetic statistics of annual mean normalized concentrations calculated by PuM and LPM in $\mu\text{g h}/(\text{kg}\cdot\text{m}^3)$ except IA, dimensionless.
<b>Table S2.</b> – Volume source. Comparison of statistical indexes of calculated annual averages and maxima as a function of terrain elevation.
<b>Table S3.</b> – Volume source. Comparison of statistical indexes of calculated annual averages and maxima as a function of distance from the source.
<b>Table S4.</b> – Volume source. Comparison of statistical indexes of calculated annual averages and maxima as a function of landuse.
<b>Table S5.</b> – Point source. Comparison of statistical indexes of calculated annual averages and maxima as a function of terrain elevation.
<b>Table S6.</b> – Point source. Comparison of statistical indexes of calculated annual averages and maxima as a function of distance from the source.
<b>Table S7.</b> – Point source. Comparison of statistical indexes of calculated annual averages and maxima as a function of landuse.



**Figure S1.** Landuse map and distribution of the calculation domain (red square: position of the emissions)  
 Legend: 10 - Urban or Built-up Land; 20 - Agricultural Land (Unirrigated);  
 30 - Rangeland; 40 - Forest Land; 50 - Water.



**Figure S2** Point source, annual maximum of normalized hourly concentration ( $\mu\text{g h m}^{-3} \text{ kg}^{-1}$ ). Left: LPM; right: PUM.  
 Red square: source position.



**Figure S3** Volume source, annual maximum of normalized hourly concentration ( $\mu\text{g h m}^{-3} \text{ kg}^{-1}$ ). Left: LPM; right: PUM. Red square: source position.



**Figure S4** Annual average of normalized hourly concentration ( $\mu\text{g h m}^{-3} \text{kg}^{-1}$ ) versus ground elevation.

Above: point source; below: volume source.

Red: PUM; blue: LPM

## TABLES

**Table S1** Synthetic statistics of annual mean normalized concentrations calculated by PuM and LPM in  $\mu\text{g h}/(\text{kg}\cdot\text{m}^3)$  except IA, dimensionless.

Statistics	Volume Source		Point Source	
	LPM	PuM	LPM	PuM
Min	0.	0.002	0.	0.
Percentile 25	0.008	0.012	0.002	0.001
Median	0.015	0.026	0.003	0.003
Percentile 75	0.031	0.054	0.005	0.006
Max	13.600	10.897	0.013	0.100
Mean	0.054	0.069	0.004	0.006
IA	0.981		0.672	

**Table S2** Volume source. Comparison of statistical indexes of calculated annual averages and maxima as a function of terrain elevation.

Orography [m]	FAC1		IA	
	Average Conc.	Max Conc.	Average Conc.	Max Conc.
0-100	0.715	0.896	0.982	0.824
100-200	0.958	0.247	0.707	0.171
200-300	0.926	0.276	0.570	0.251
300-400	0.919	0.426	0.510	0.216
400-500	0.975	0.288	0.605	0.214
500-600	0.985	0.281	0.663	0.214
600-700	0.967	0.113	0.454	0.072
> 700	1.000	0.027	0.315	0.016
Global	0.797	0.680	0.981	0.734

**Table S3** Volume source. Comparison of statistical indexes of calculated annual averages and maxima as a function of distance from the source.

Distance From Source [km]	FAC1		IA	
	Average Conc.	Max Conc.	Average Conc.	Max Conc.
0.0-0.5	1.000	0.988	0.974	0.594
0.5-1.0	0.783	0.689	0.813	0.023
1.0-1.5	0.913	0.714	0.765	0.122
1.5-2.0	0.882	0.747	0.677	0.110
2.0-3.0	0.809	0.712	0.613	0.301
> 3.0	0.781	0.663	0.567	0.470

**Table S4** Volume source. Comparison of statistical indexes of calculated annual averages and maxima as a function of landuse.

Land Use	FAC1		IA	
	Average Conc.	Max Conc.	Average Conc.	Max Conc.
Urban Land	0.970	0.665	0.985	0.817
Agricultural Land	0.943	0.482	0.731	0.126
Rangeland	0.954	0.299	0.703	0.456
Forest Land	0.986	0.297	0.567	0.264
Large Water Body	0.606	0.971	0.876	0.885
Barren Land	0.869	0.150	0.695	0.417

**Table S5** Point source. Comparison of statistical indexes of calculated annual averages and maxima as a function of terrain elevation.

Orography [m]	FAC1		IA	
	Average Conc.	Max Conc.	Average Conc.	Max Conc.
0-100	0.680	0.808	0.432	0.475
100-200	0.728	0.684	0.194	0.217
200-300	0.737	0.596	0.169	0.183
300-400	0.778	0.718	0.200	0.220
400-500	0.779	0.820	0.186	0.260
500-600	0.954	0.991	0.416	0.440
600-700	1.000	0.994	0.760	0.556
> 700	1.000	1.000	0.744	0.471
Global	0.754	0.814	0.672	0.763

**Table S6** Point source. Comparison of statistical indexes of calculated annual averages and maxima as a function of distance from the source.

Distance From Source [km]	FAC1		IA	
	Average Conc.	Max Conc.	Average Conc.	Max Conc.
0-0.5	0.617	0.840	0.141	0.123
0.5-1	0.477	0.774	0.155	0.164
1-1.5	0.425	0.679	0.162	0.176
1.5-2	0.313	0.756	0.164	0.187
2-3	0.457	0.797	0.198	0.233
> 3	0.556	0.743	0.336	0.324

**Table S7** Point source. Comparison of statistical indexes of calculated annual averages and maxima as a function of landuse.

Land Use	FAC1		IA	
	Average Conc.	Max Conc.	Average Conc.	Max Conc.
Urban Land	0.716	0.710	0.243	0.346
Agricultural Land	0.949	0.770	0.394	0.295
Rangeland	0.806	0.783	0.215	0.265
Forest Land	0.919	0.947	0.241	0.351
Large Water Body	0.678	0.853	0.524	0.408
Barren Land	0.830	0.820	0.227	0.196