Supplementary materials

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1. General results

Table 1: Performance indicators of Polyphemus, the HV formulation with the "urban" option with Cergy-Pontoise background concentrations.

Performance indicator	Summer campaign		Winter campaign	
	HV	Polyphemus	HV	Polyphemus
Measured mean value ($\mu g\,m^{-3}$)	26.0		40.5	
Modeled mean value ($\mu g\,m^{-3}$)	17.2	17.3	26.1	26.2
Correlation	0.75	0.75	0.79	0.79
RMSE ($\mu g\,m^{-3}$)	14.1	14.0	18.0	17.9
MNE	0.32	0.32	0.33	0.33
MNB	−0.22	−0.22	−0.31	−0.31
NME	0.37	0.37	0.37	0.36
NMB	−0.34	−0.34	−0.36	−0.36
MFE	0.38	0.38	0.41	0.40
MFB	−0.30	−0.30	−0.39	−0.39

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Table 2: Performance indicators of Polyphemus, the HV formulation with the "rural" option with Mantes-la-Jolie background concentrations.

Performance indicator	Summer campaign		Winter campaign	
	HV	Polyphemus	HV	Polyphemus
Measured mean value ($\mu g\,m^{-3}$)	26.0		40.5	
Modeled mean value ($\mu g\,m^{-3}$)	22.5	22.6	25.6	25.7
Correlation	0.74	0.74	0.78	0.79
RMSE ($\mu g\,m^{-3}$)	11.2	11.1	17.8	17.7
MNE	0.31	0.30	0.34	0.34
MNB	0.02	0.02	−0.33	−0.33
NME	0.30	0.29	0.37	0.37
NMB	−0.13	−0.13	−0.37	−0.37
MFE	0.30	0.30	0.42	0.42
MFB	−0.05	−0.05	−0.42	−0.41

Table 3: Performance indicators of Polyphemus, the HV formulation with the "urban" option with Mantes-la-Jolie background concentrations.

Performance indicator	Summer campaign		Winter campaign	
	HV	Polyphemus	HV	Polyphemus
Measured mean value ($\mu g\,m^{-3}$)	26.0		40.5	
Modeled mean value ($\mu g\,m^{-3}$)	16.0	16.0	22.0	22.0
Correlation	0.75	0.75	0.79	0.79
RMSE ($\mu g\,m^{-3}$)	14.9	14.8	21.3	21.2
MNE	0.34	0.34	0.42	0.42
MNB	−0.28	−0.28	−0.42	−0.42
NME	0.40	0.40	0.46	0.46
NMB	−0.38	−0.38	−0.46	−0.46
MFE	0.43	0.43	0.56	0.55
MFB	−0.38	−0.38	−0.55	−0.55

2. Comparison to the HV formultation

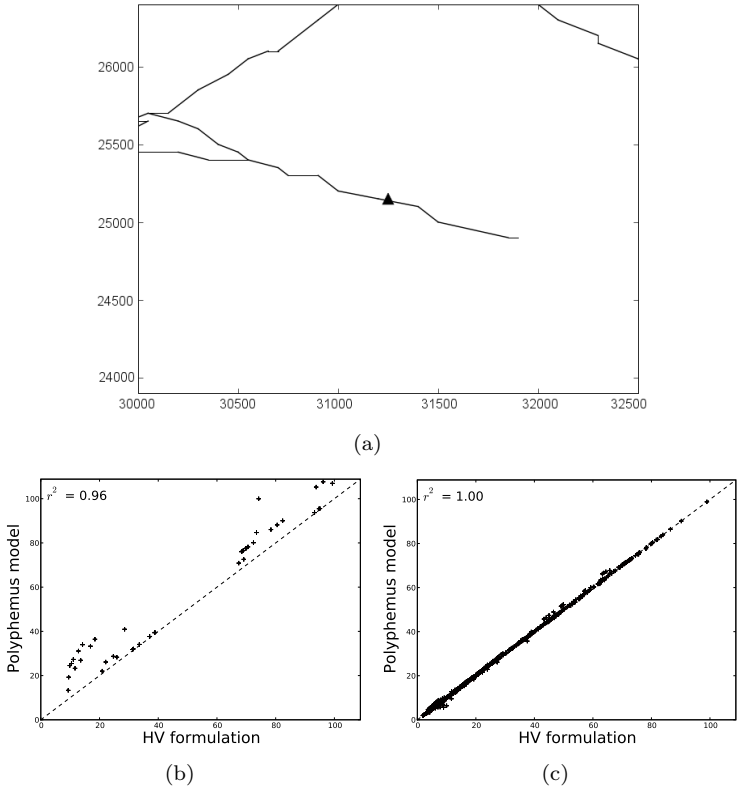

Figure 1: Comparison between the HV and Polyphemus models of simulated NO_2 hourly concentrations ($\mu g\, m^{-3}$). (a) : Map of the passive diffusion tube location with respect to the roads (coordinates are in meter). (b) : situations when the wind is parallel to the road ($\pm 10°$). (c) : situations when the wind is not parallel to the road (summer campaign). The road direction is 111° (0° represent a wind coming from the north and 90° a wind coming from the east).

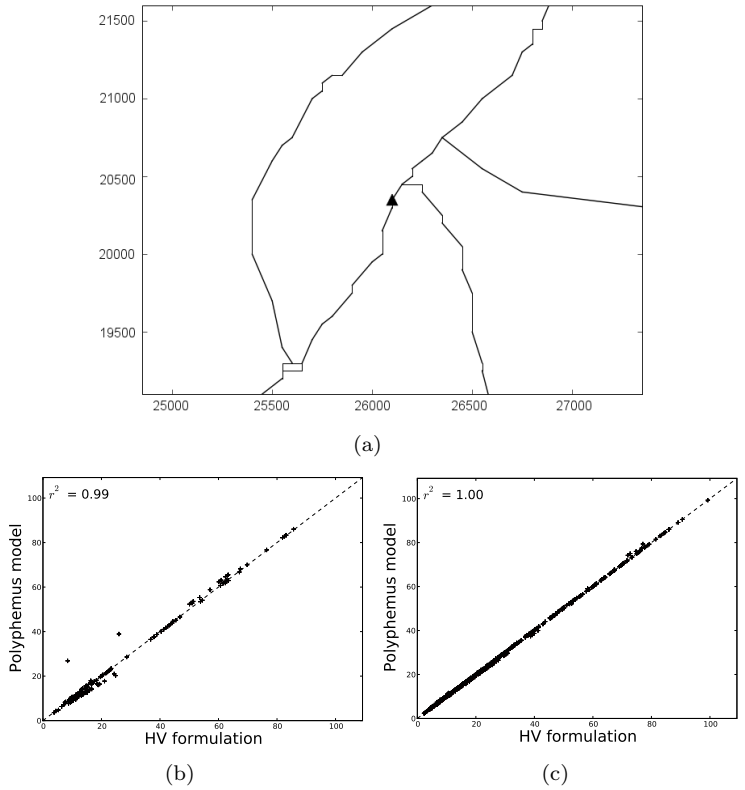

Figure 2: Comparison between the HV and Polyphemus models of simulated NO_2 hourly concentrations ($\mu g\, m^{-3}$). (a) : Map of the passive diffusion tube location with respect to the roads (coordinates are in meter). (b) : situations when the wind is parallel to the road ($\pm 10°$). (c) : situations when the wind is not parallel to the road (summer campaign). The road direction is 16° (0° represent a wind coming from the north and 90° a wind coming from the east).

3. Sensitivity to input data

Table 4: Performance indicators of Polyphemus using the "rural" option. In the Monin-Obukhov length column stability classes are based on Monin-Obukhov length, in the GENEMIS column the GENEMIS temporal profile was used and in the NO_2 fraction column a 15% NO_2 fraction was used.

Summer campaign	Monin-Obukhov length	GENEMIS	NO_2 fraction
Measured mean value ($\mu g\,m^{-3}$)		26.0	
Modeled mean value ($\mu g\,m^{-3}$)	26.5	21.03	24.0
Correlation	0.74	0.74	0.74
RMSE ($\mu g\,m^{-3}$)	10.28	11.67	10.67
MNE	0.35	0.29	0.33
MNB	0.19	−0.05	0.09
NME	0.29	0.30	0.29
NMB	0.02	−0.19	−0.07
MFE	0.31	0.31	0.30
MFB	0.10	−0.12	0.02
Winter campaign	Monin-Obukhov length	GENEMIS	NO_2 fraction
Measured mean value ($\mu g\,m^{-3}$)		40.5	
Modeled mean value ($\mu g\,m^{-3}$)	31.5	28.4	29.9
Correlation	0.76	0.79	0.79
RMSE ($\mu g\,m^{-3}$)	13.3	15.79	14.4
MNE	0.22	0.28	0.25
MNB	−0.18	−0.25	−0.22
NME	0.25	0.31	0.28
NMB	−0.22	−0.30	−0.26
MFE	0.25	0.33	0.29
MFB	−0.21	−0.31	−0.26