

# Assessment of Environmental Behavior of PCDD/F using Mathematical Models

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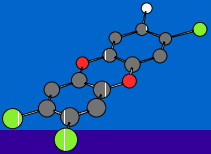
Kikuo Yoshida<sup>1,2,3</sup>

Ruriko Sakurazawa<sup>3</sup>

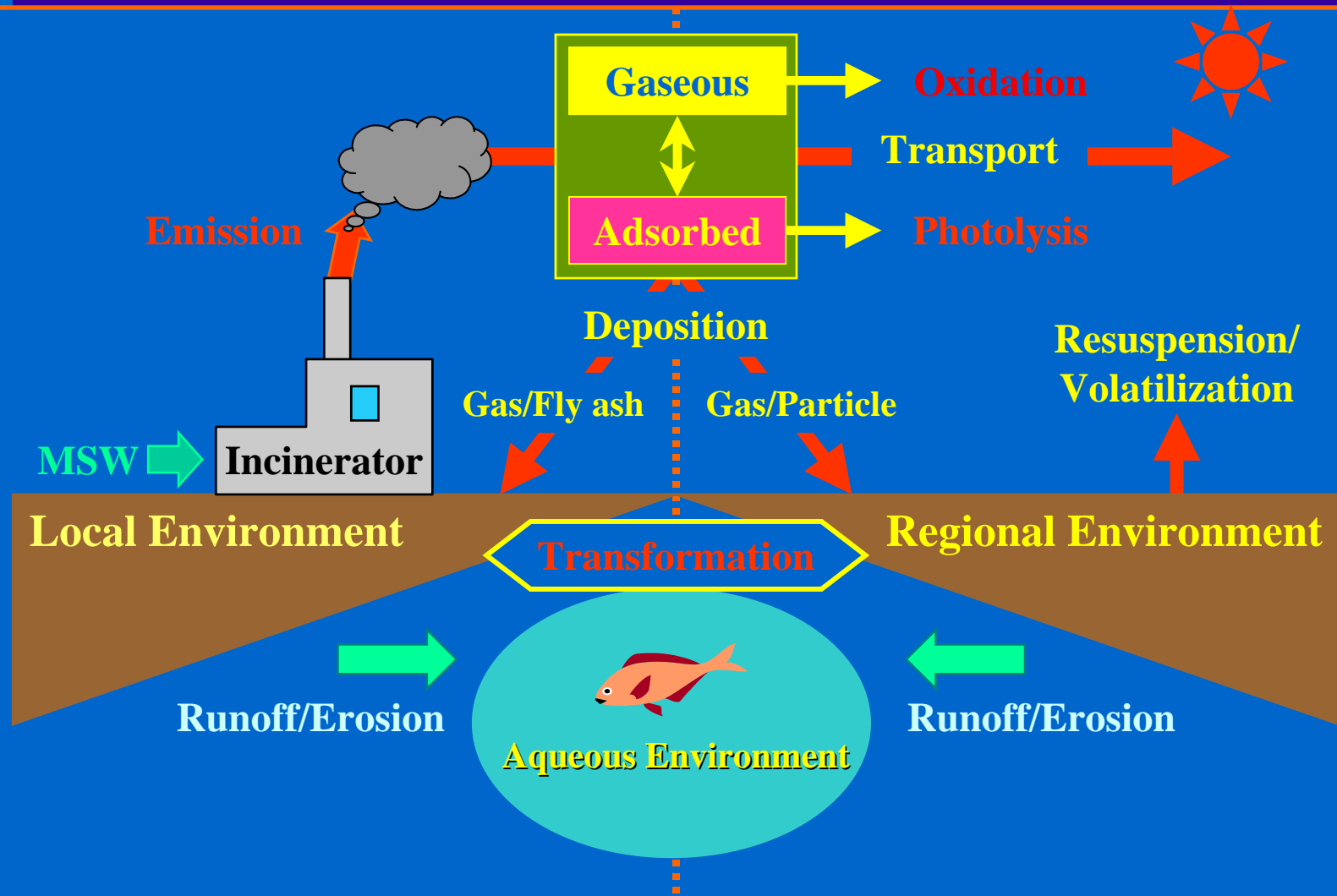
1 Yokohama National University

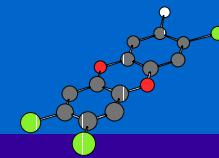
2 CREST, Japan Science and Technology Corporation

3 Mitsubishi Chemical Safety Institute Ltd.



# Source and Environmental Behavior of PCDD/F



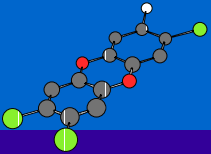


## Partition and Reactivity of PCDD/F in Atmosphere

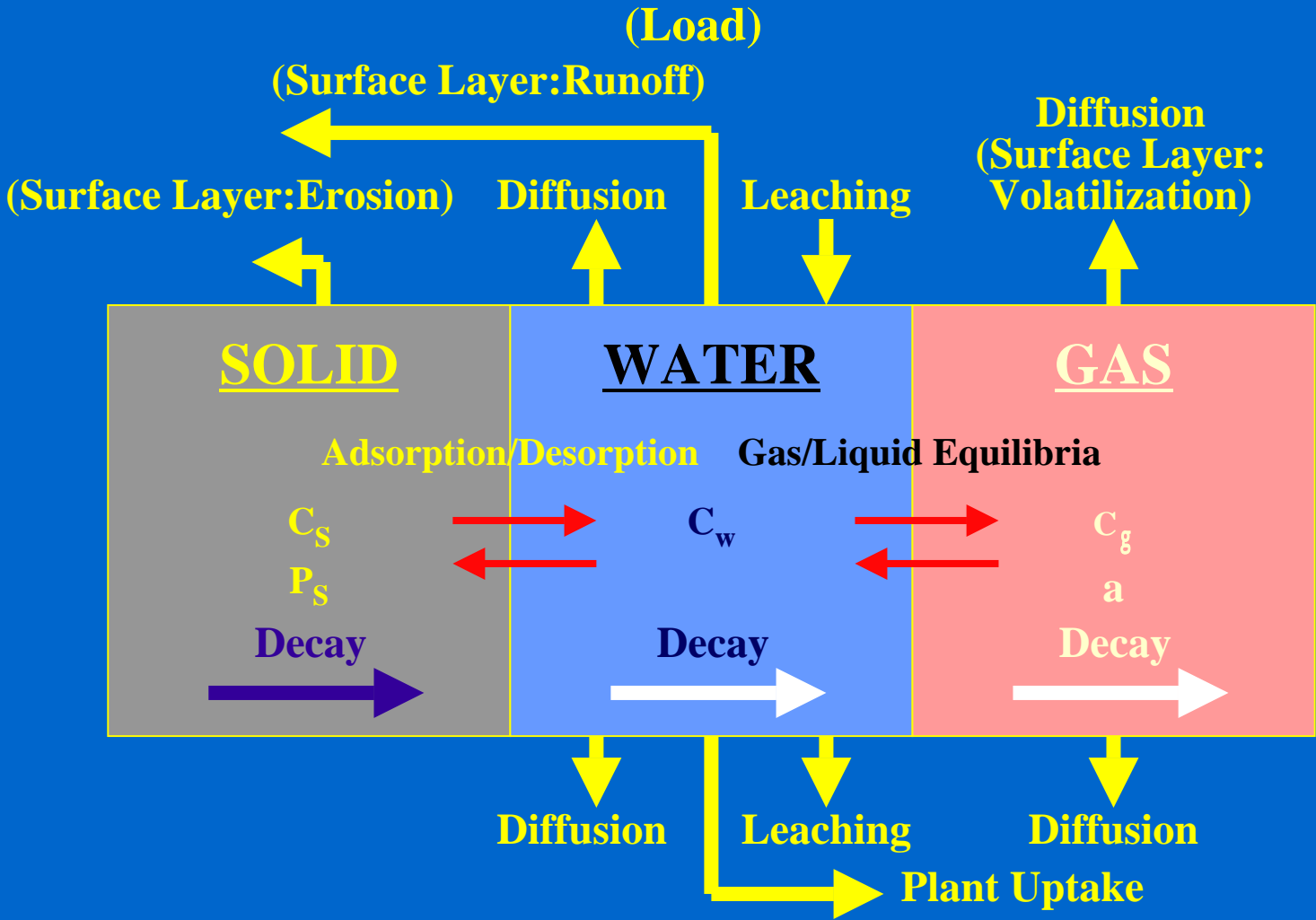
	Particle/gas ratio*	$k_{OH}$ , $10^{-13}$ cm <sup>3</sup> /molecule/sec**
2,3,7,8-TCDD	0.15	28.74
2,3,7,8-TCDF	0.17	11.67
1,2,3,7,8-PeCDD	1.25	24.45
1,2,3,7,8-PeCDF	0.55	7.87
1,2,3,4,7,8-HxCDD	4.00	17.29
1,2,3,6,7,8-HxCDD	4.48	20.16
1,2,3,4,7,8-HxCDF	2.83	3.63
1,2,3,6,7,8-HxCDF	2.86	3.23
1,2,3,4,6,7,8-HpCDD	39.22	13.00
1,2,3,4,6,7,8-HpCDF	10.00	1.08
OCDD	143.9	5.83
OCDF	19.29	0.99

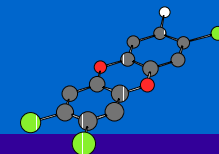
\* Eitzer, B.D. and R.H. Hites (1989) Environ. Sci. Technol. 23 1389

\*\* Atmospheric Oxidation Program version 1.43 Syracuse Research Co., 1992



# Behavior of PCDD/F in the Soil

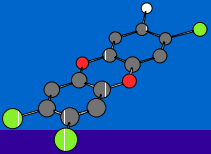




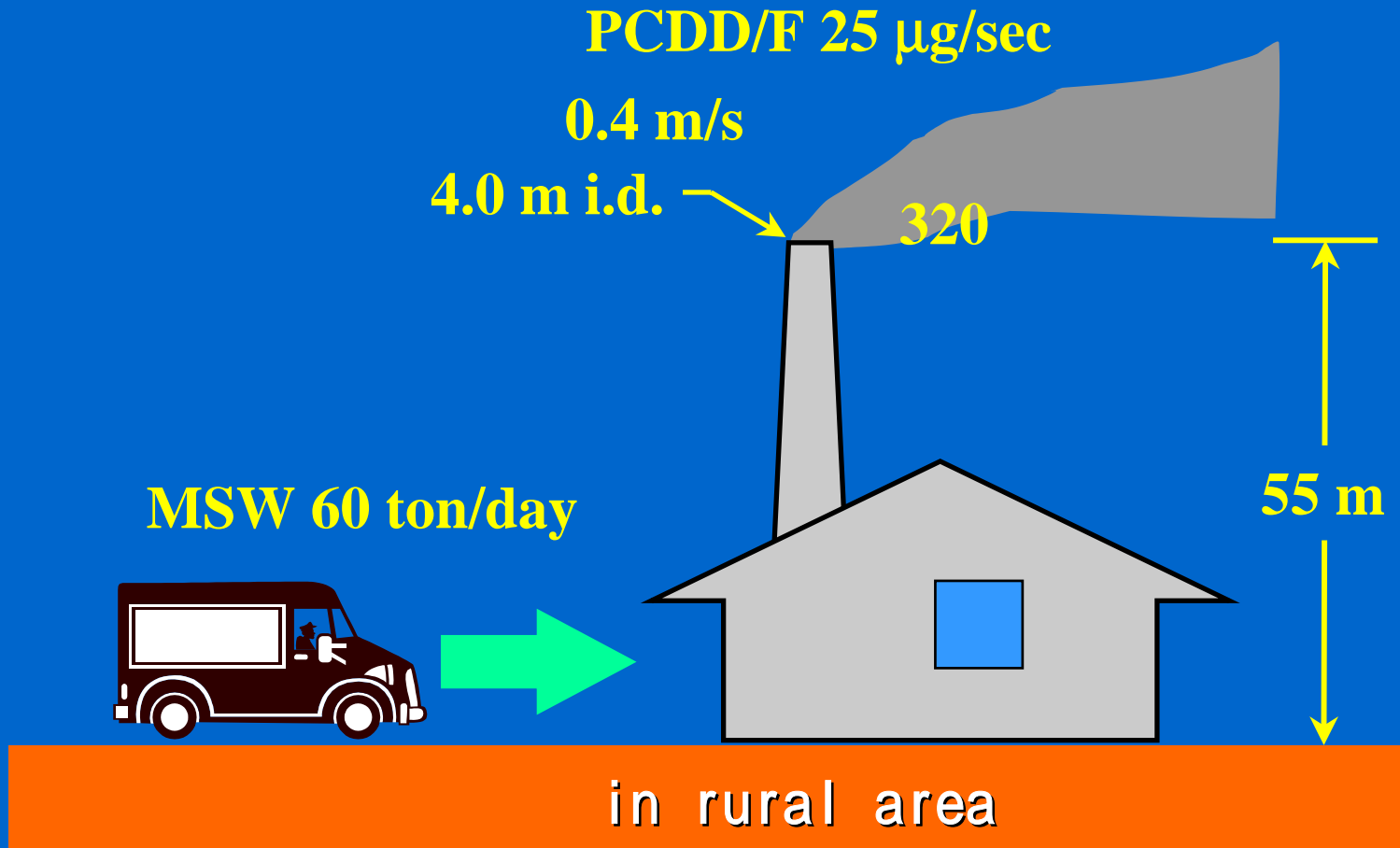
## Equilibrium Constant and DT50 of PCDD/F

	Henry's constant	log K <sub>oc</sub>	DT50, days
2,3,7,8-TCDD	$1.4 \times 10^{-3}$	6.07	710
2,3,7,8-TCDF	$6.0 \times 10^{-4}$	5.70	710
1,2,3,4,7-PeCDD	$1.1 \times 10^{-4}$	6.05	710
2,3,4,7,8-PeCDF	$2.1 \times 10^{-4}$	6.50	710
1,2,3,4,7,8-HxCDD	$1.9 \times 10^{-4}$	6.22	2290
1,2,3,6,7,8-HxCDF	$3.0 \times 10^{-4}$	6.60	2290
1,2,3,4,6,7,8-HpCDD	$5.5 \times 10^{-5}$	6.69	2290
1,2,3,4,6,7,8-HpCDF	$5.9 \times 10^{-4}$	6.76	2290
OCDD	$2.8 \times 10^{-4}$	7.08	2290
OCDF	$7.9 \times 10^{-5}$	6.72	2290

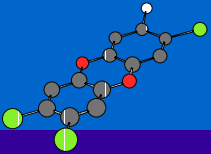
(Mackay, D. et al. 1992)



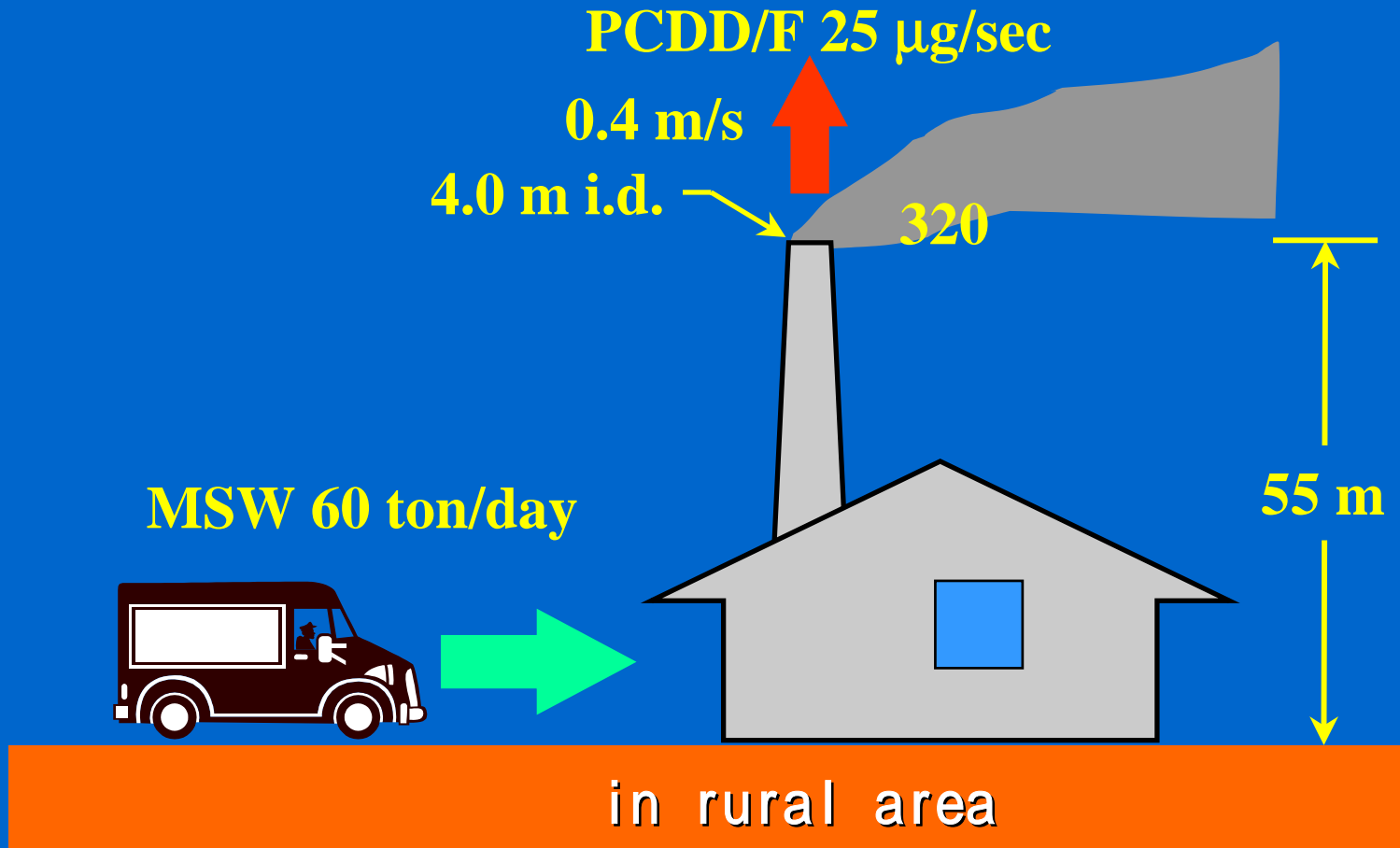
# Source and Emission of PCDD/F



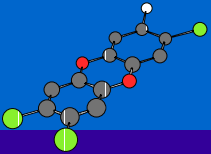
(Nakanishi, J and T. Watanabe, 1997)



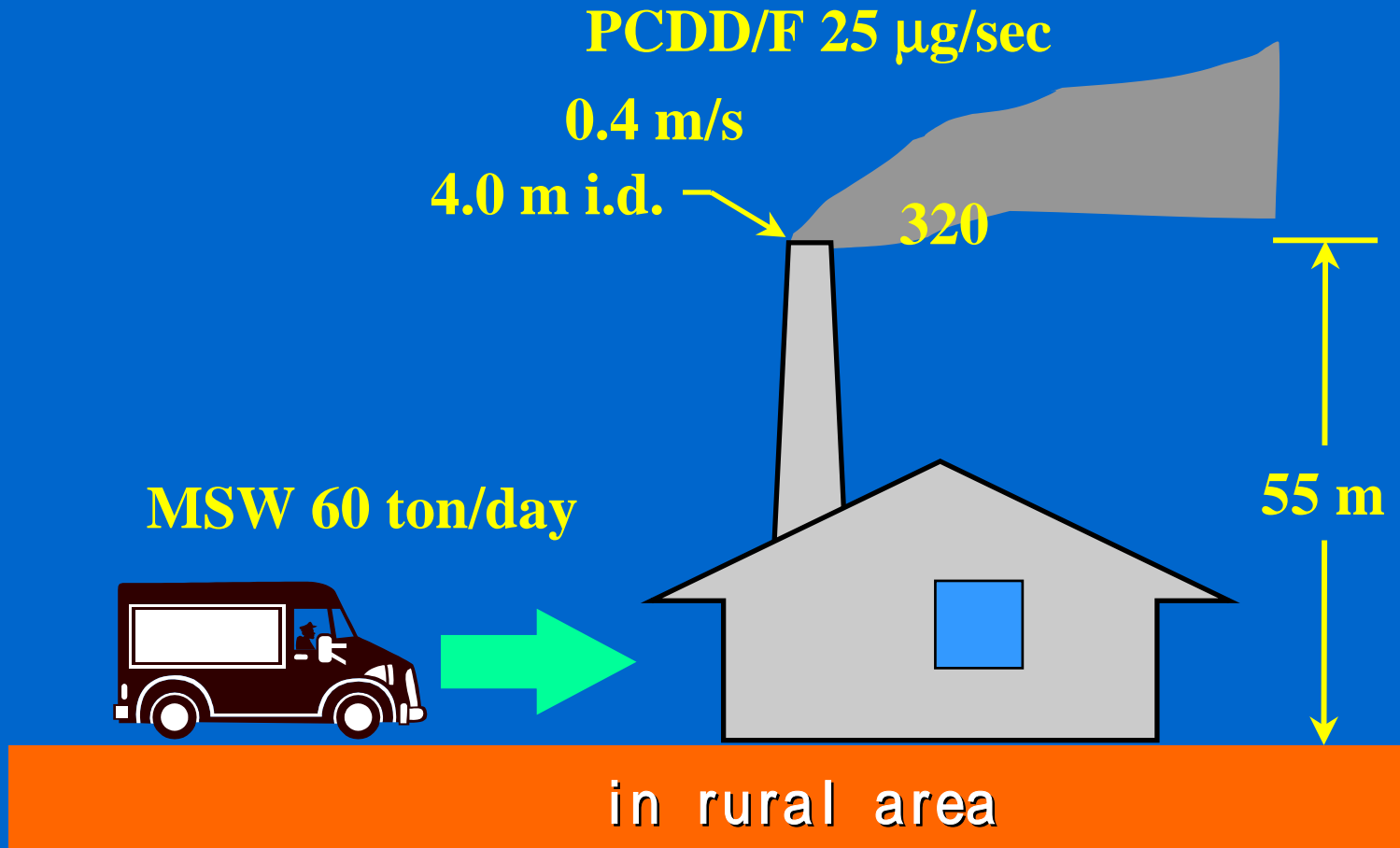
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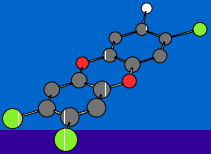


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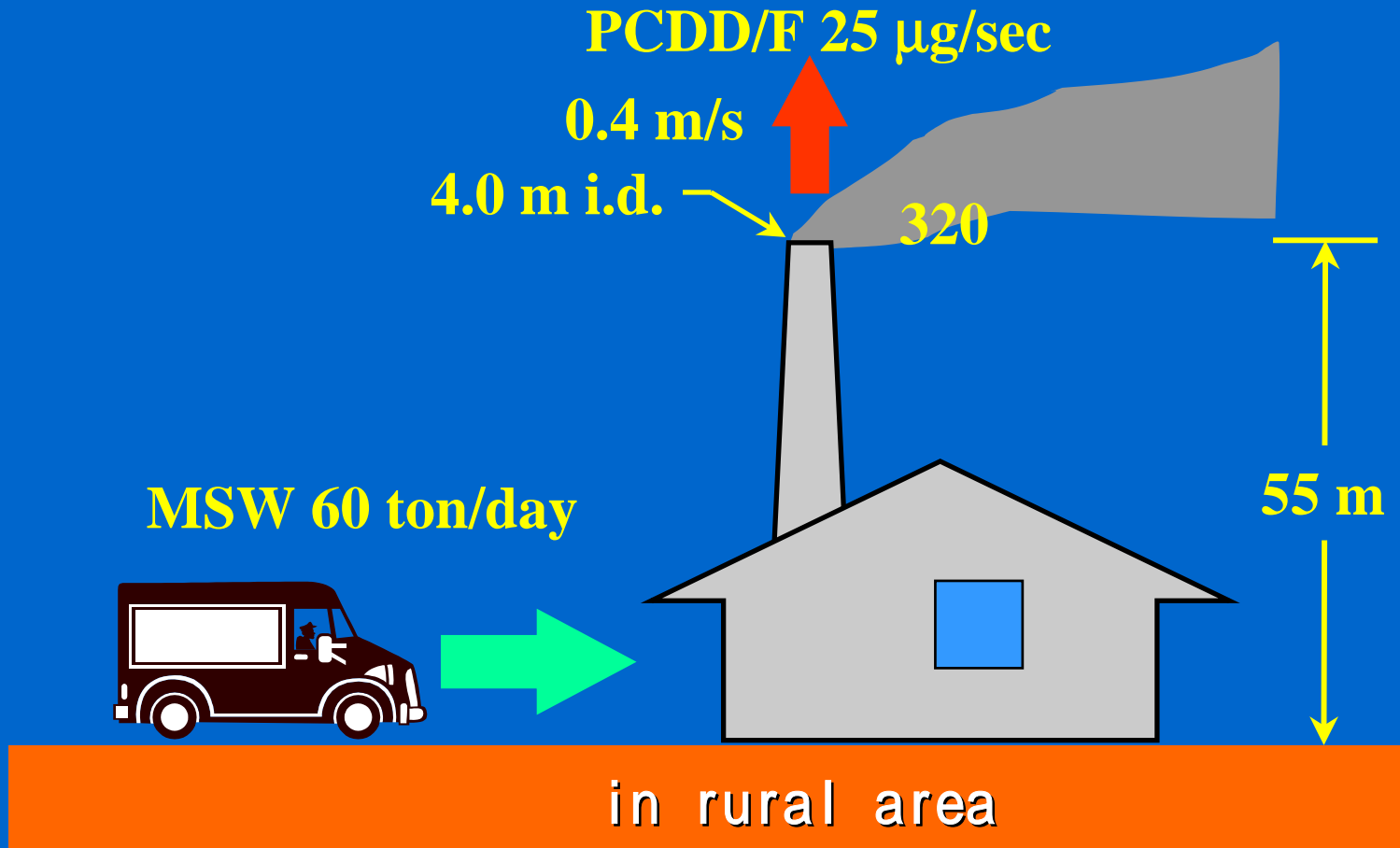


(Nakanishi, J and T. Watanabe, 1997)

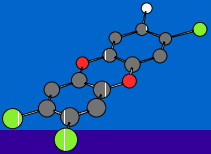




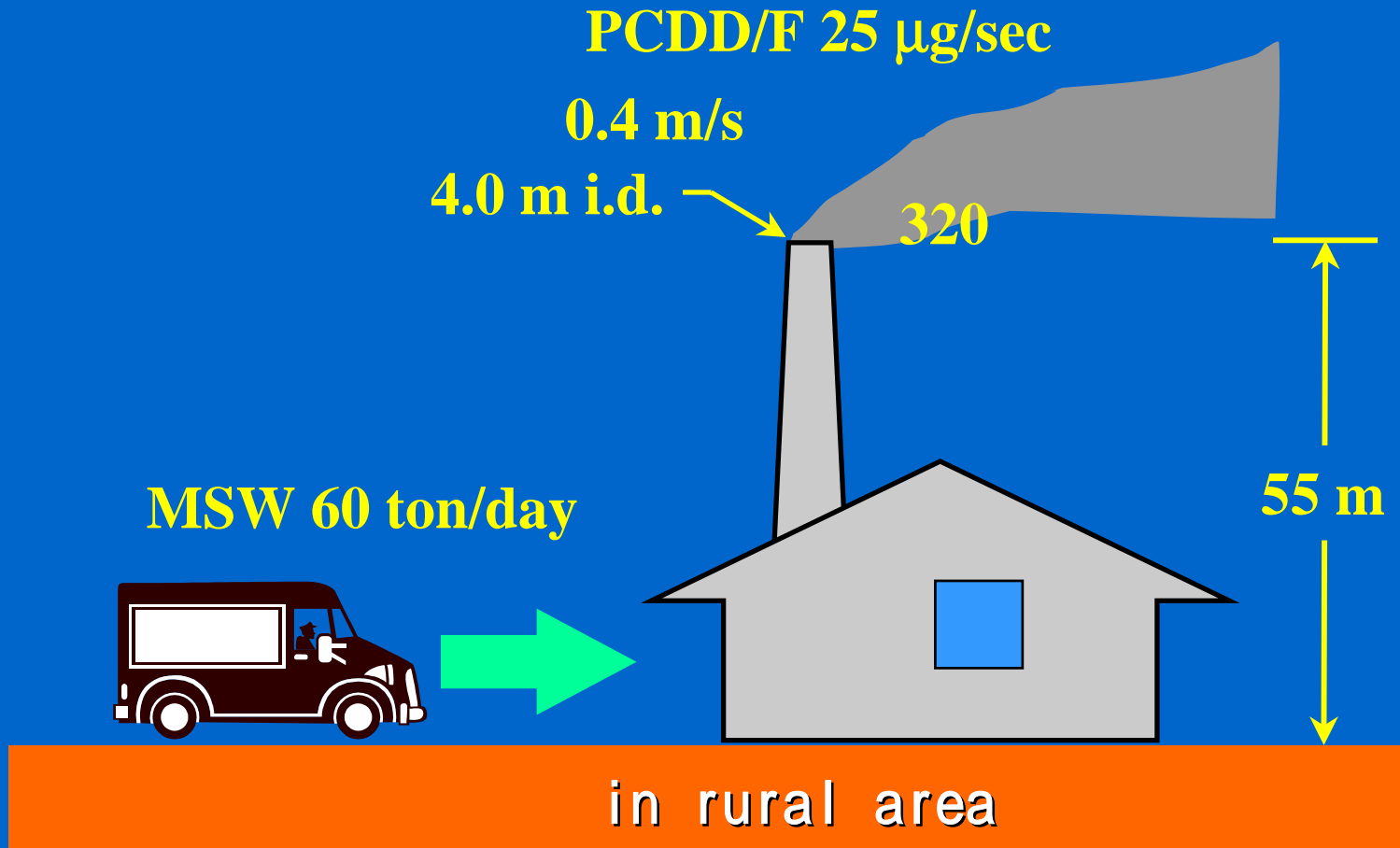
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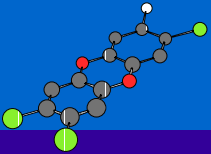
(Nakanishi, J and T. Watanabe, 1997)



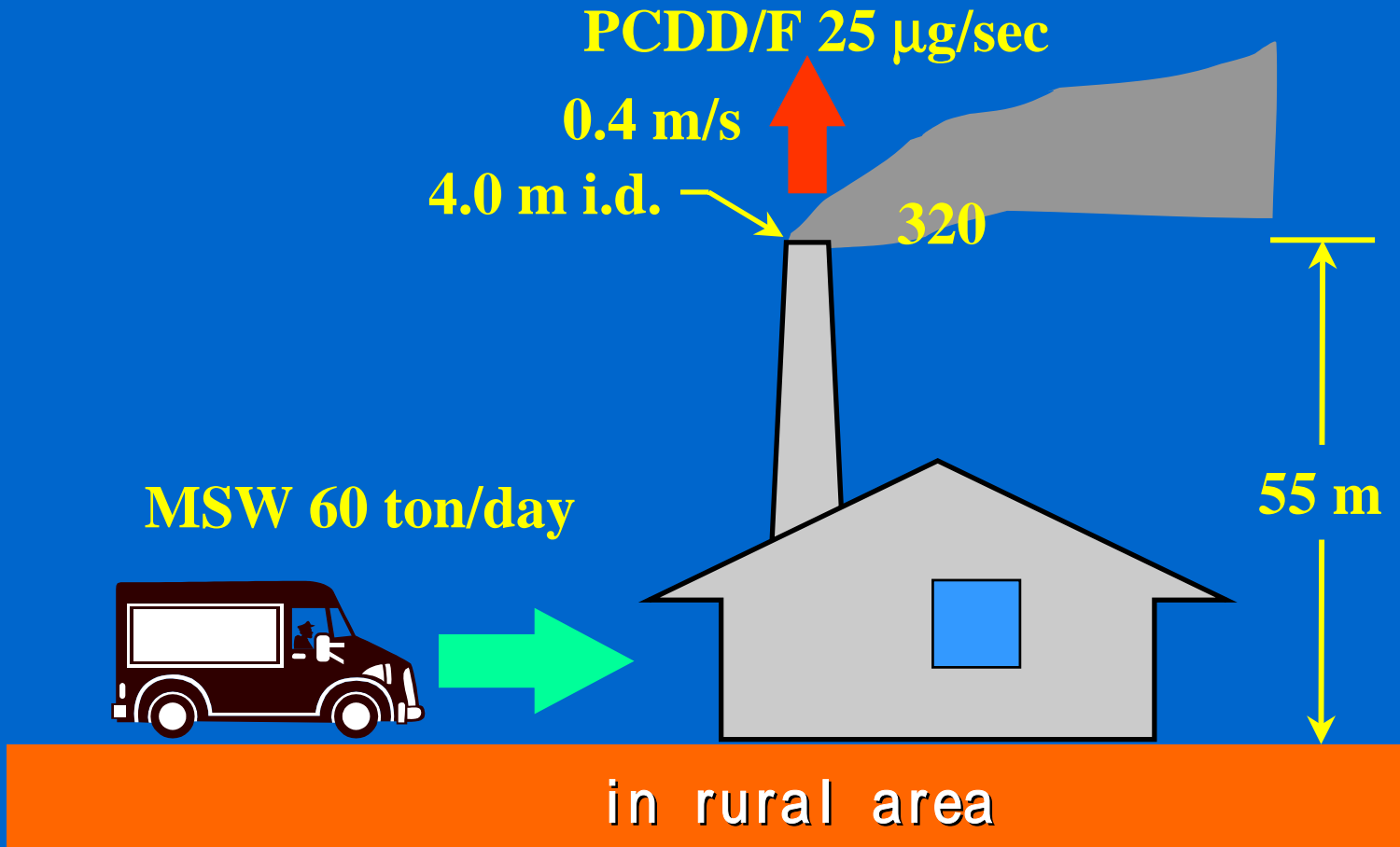
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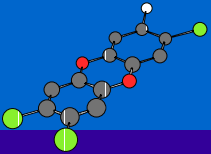
(Nakanishi, J and T. Watanabe, 1997)



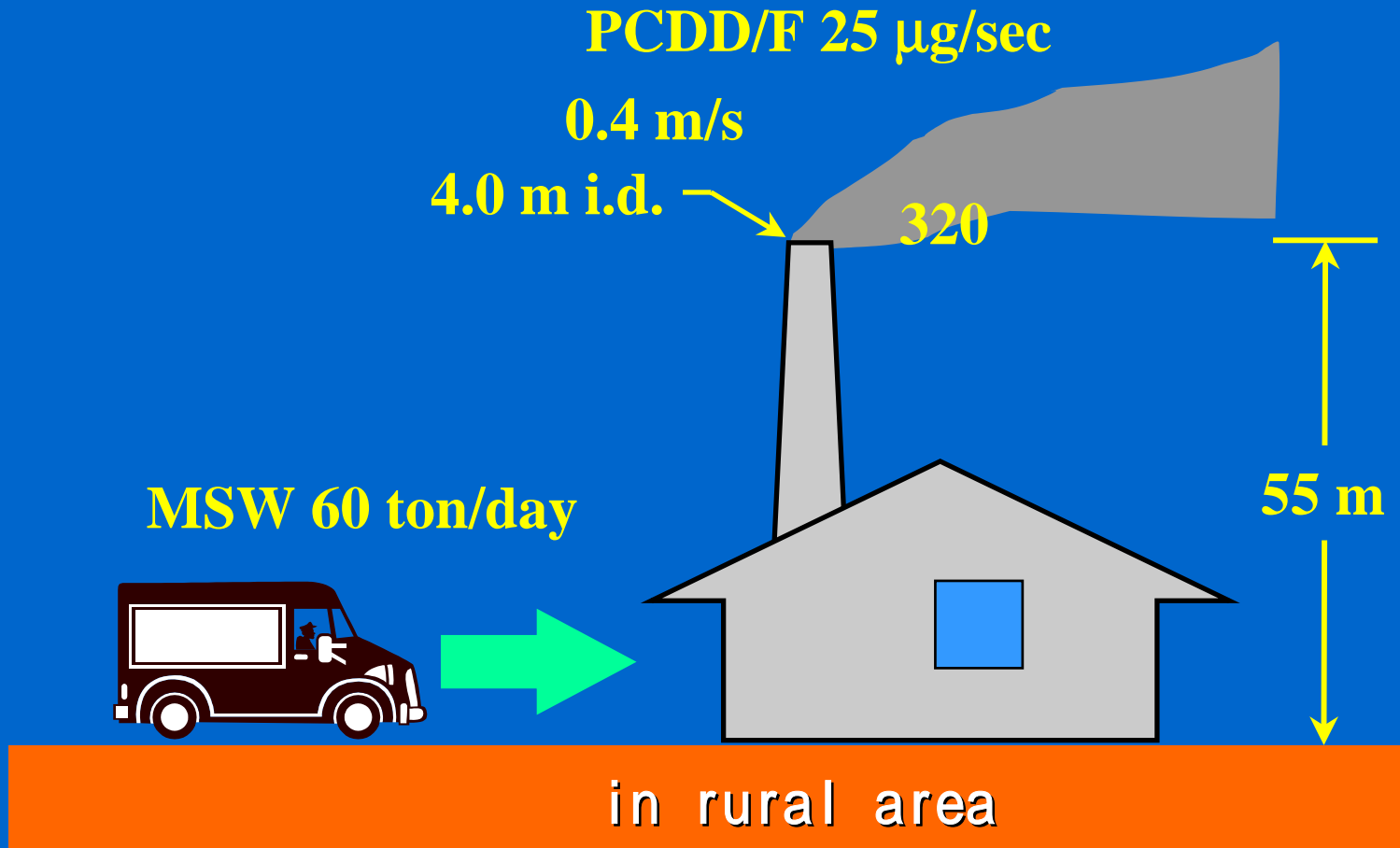
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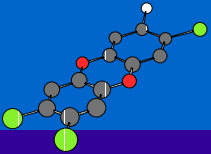
(Nakanishi, J and T. Watanabe, 1997)



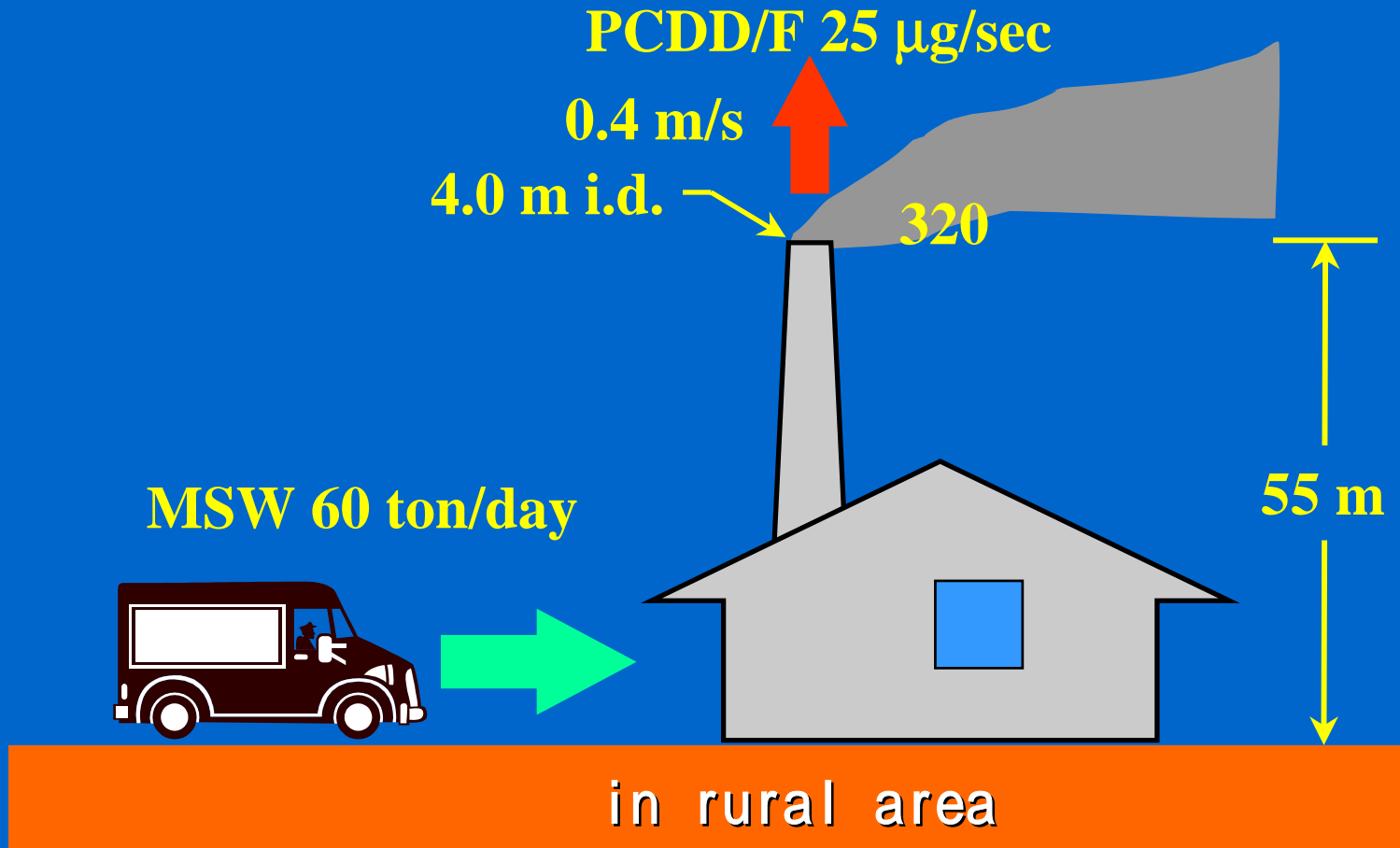
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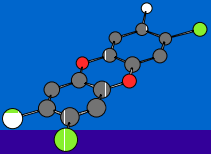
(Nakanishi, J and T. Watanabe, 1997)



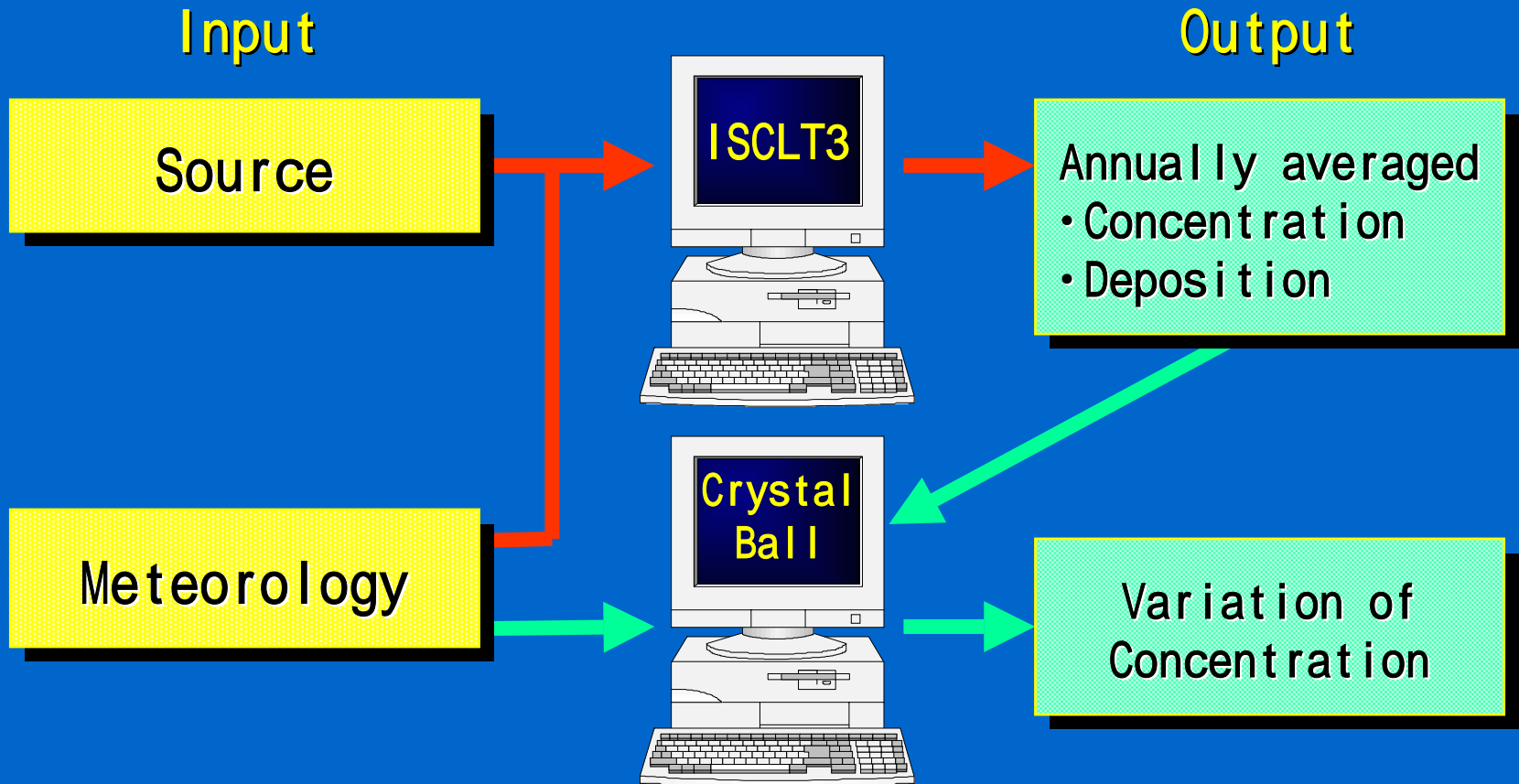
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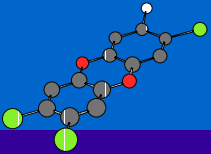
(Nakanishi, J and T. Watanabe, 1997)



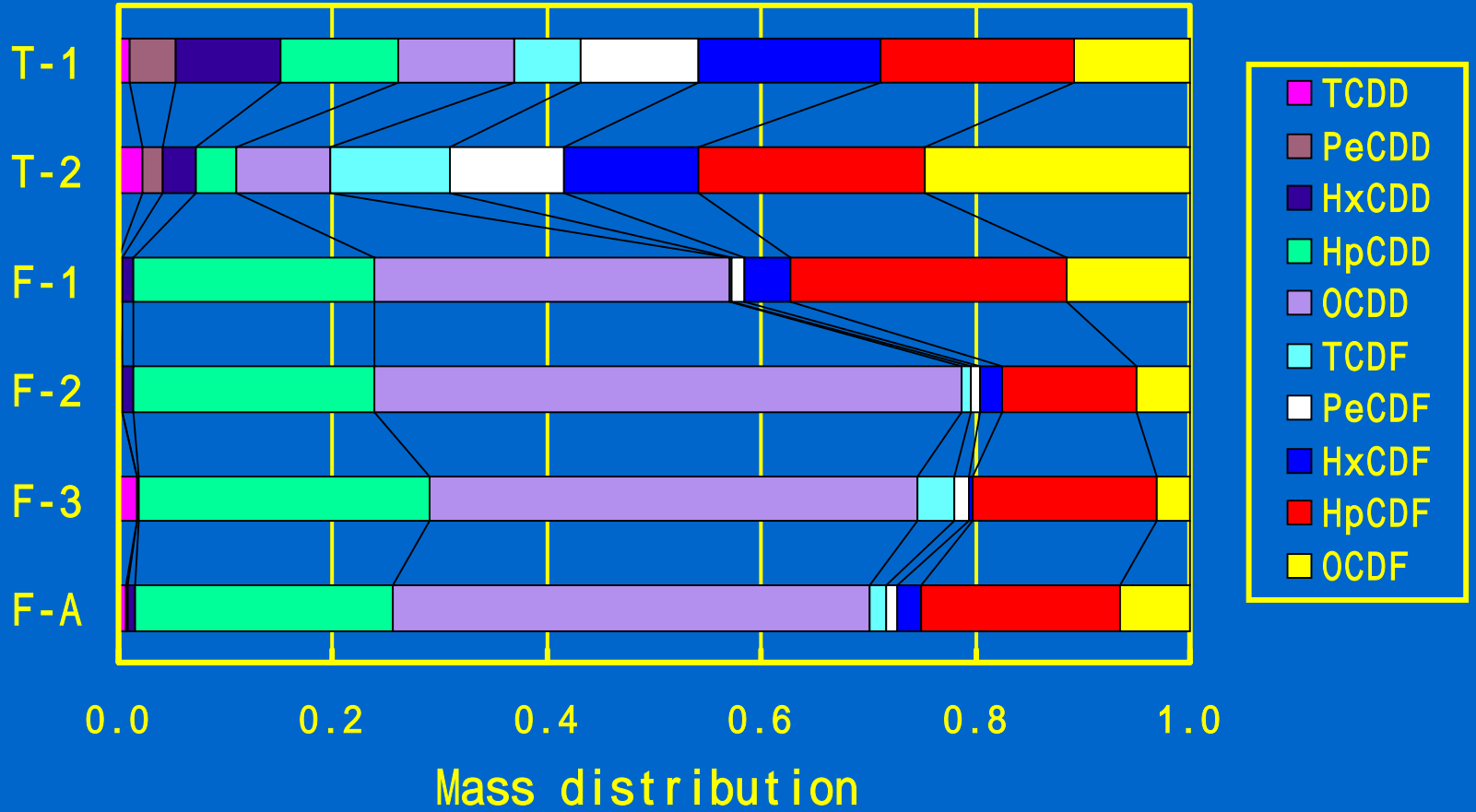
# Calculation of Atmospheric Concentration and Deposition of PCDD/F



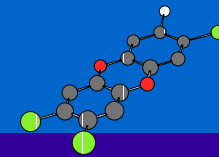
ISCLT3: Industrial Source Complex Long Term Model version 3



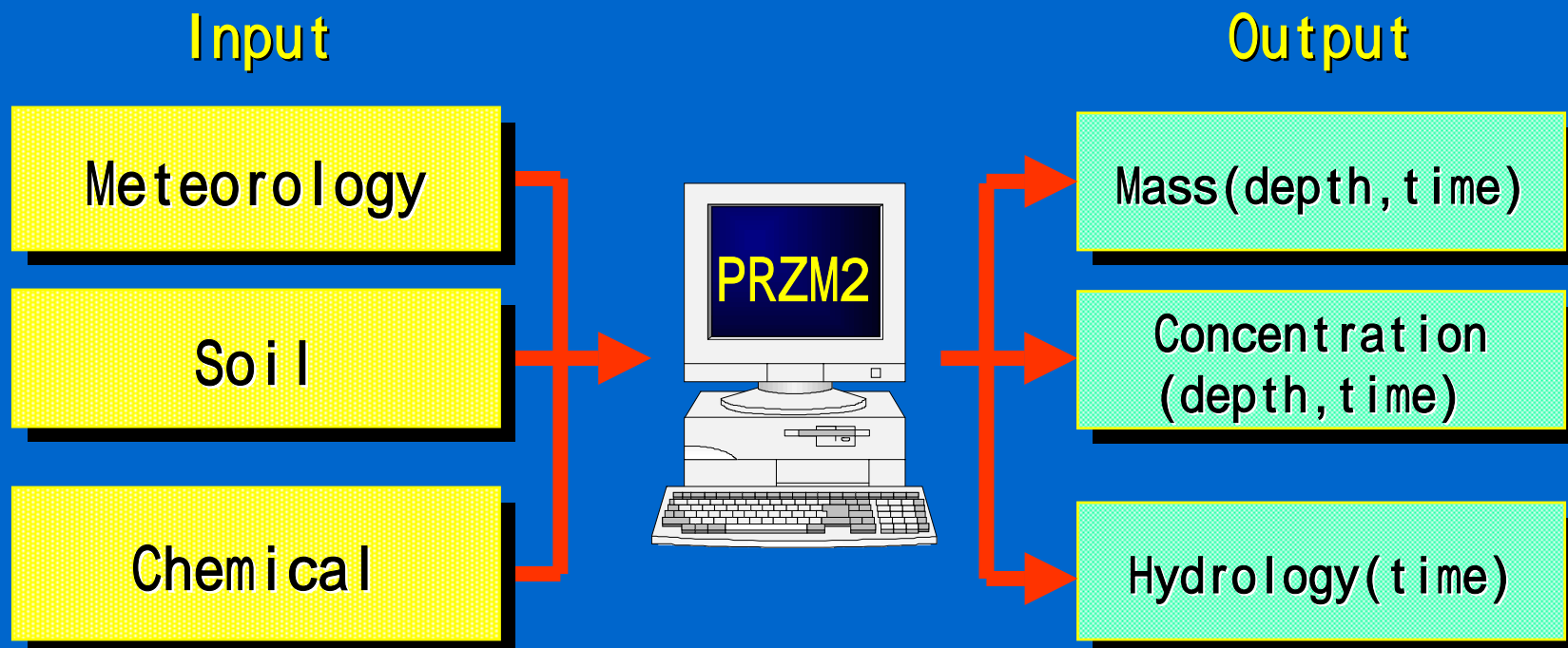
# PCDD/F in total flue gas and fly ash of MSW incinerators



(R. De Fré, 1986 and Yasuhara et al., 1987)

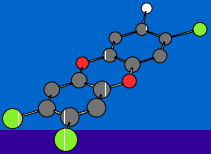


# Calculation of Mass and Concentration of PCDD/F in Soil

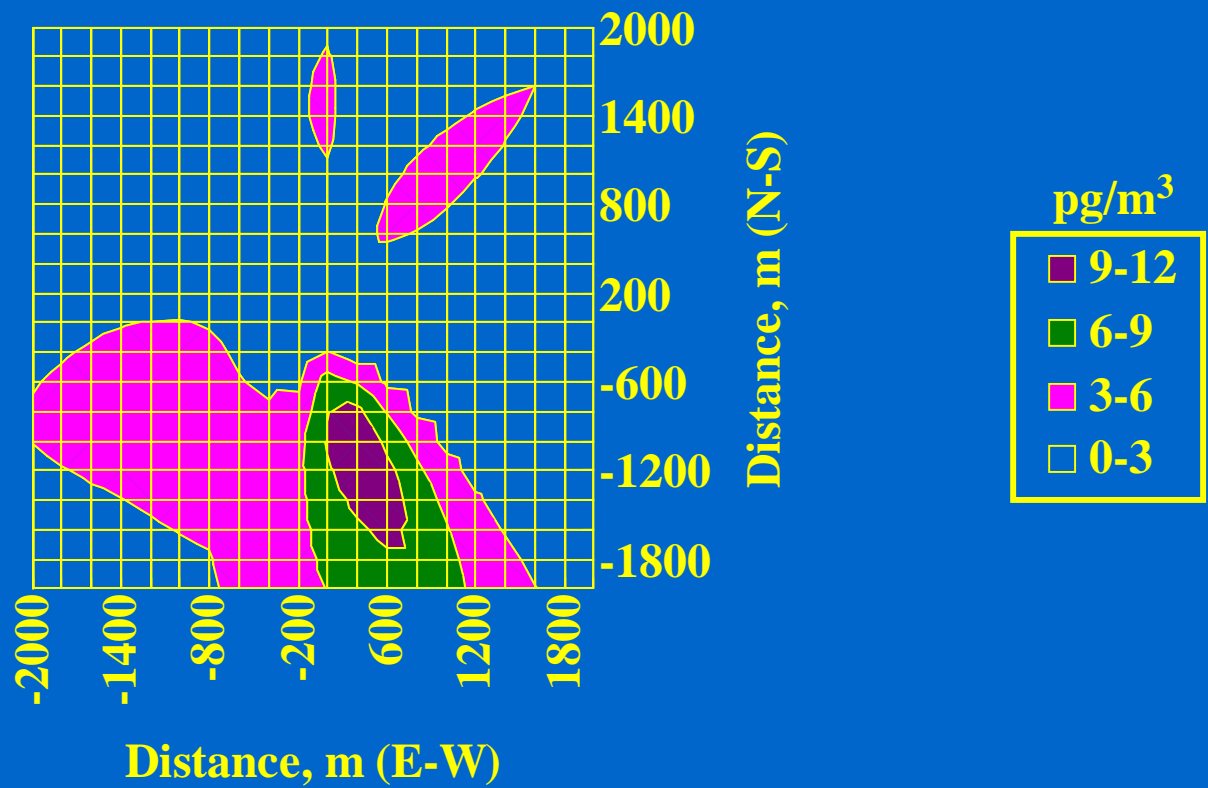


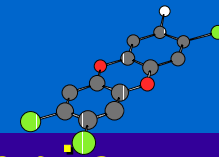
PRZM2: Pesticide Root Zone Model version 2



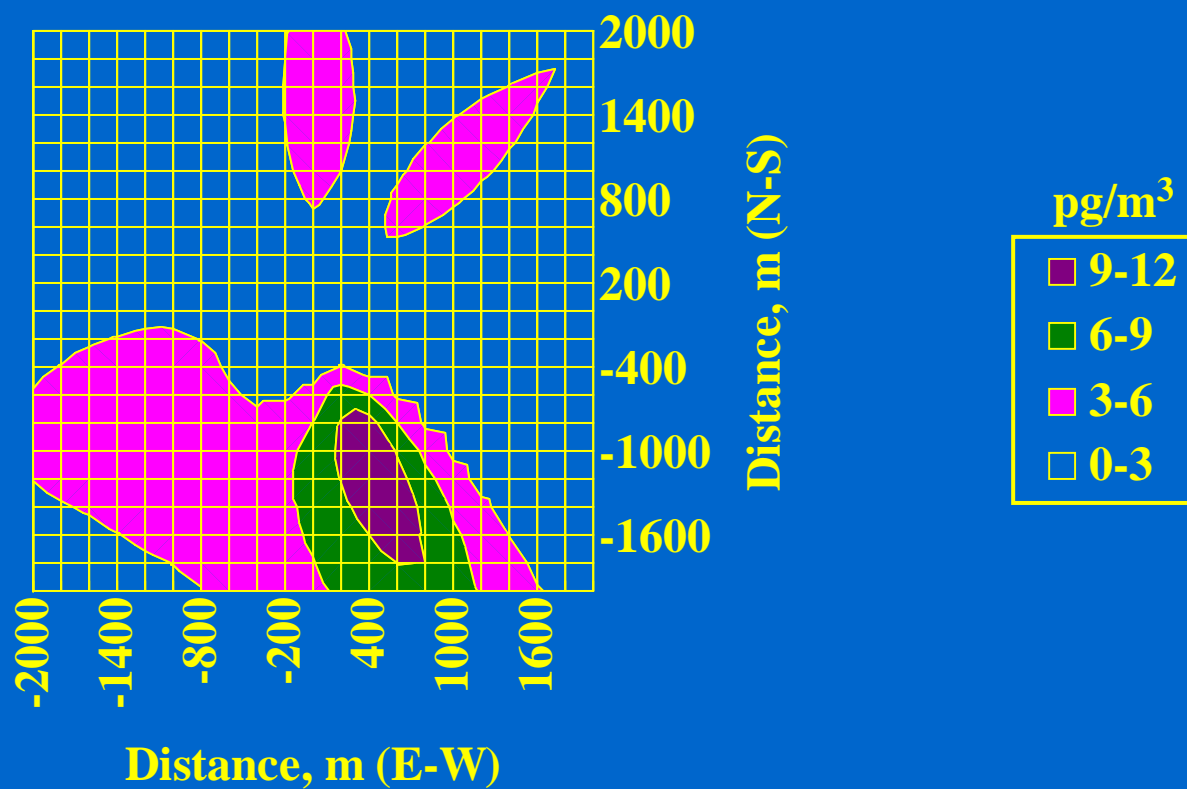


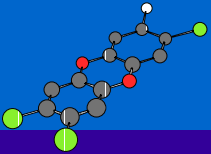
# Concentration-Distribution Profile of Atmospheric PCDD/F in Gas Phase



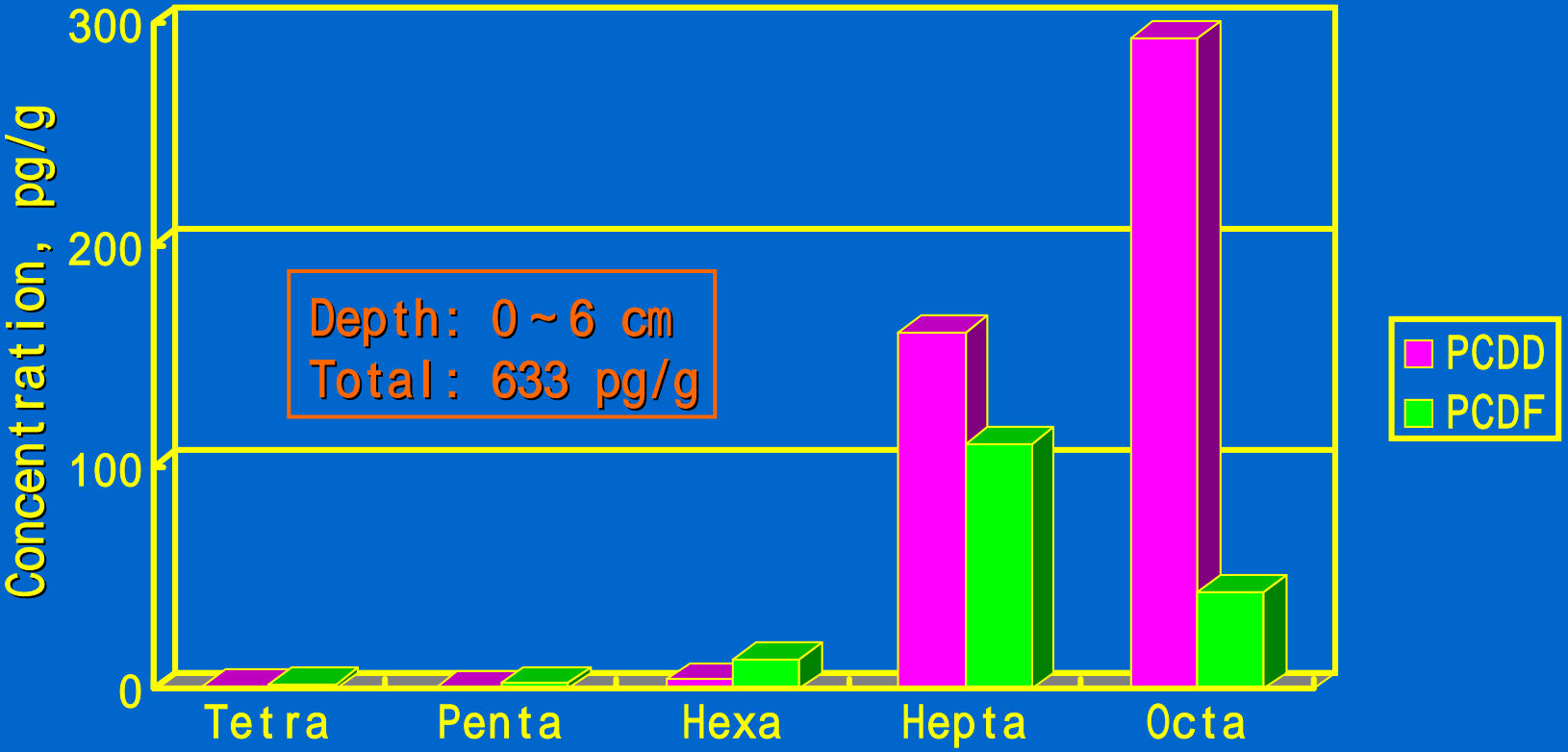


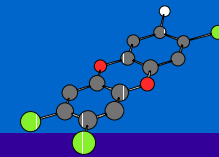
# Concentration-Distribution Profile of Atmospheric PCDD/F adsorbed onto 10- $\mu\text{m}$ -diameter Particles



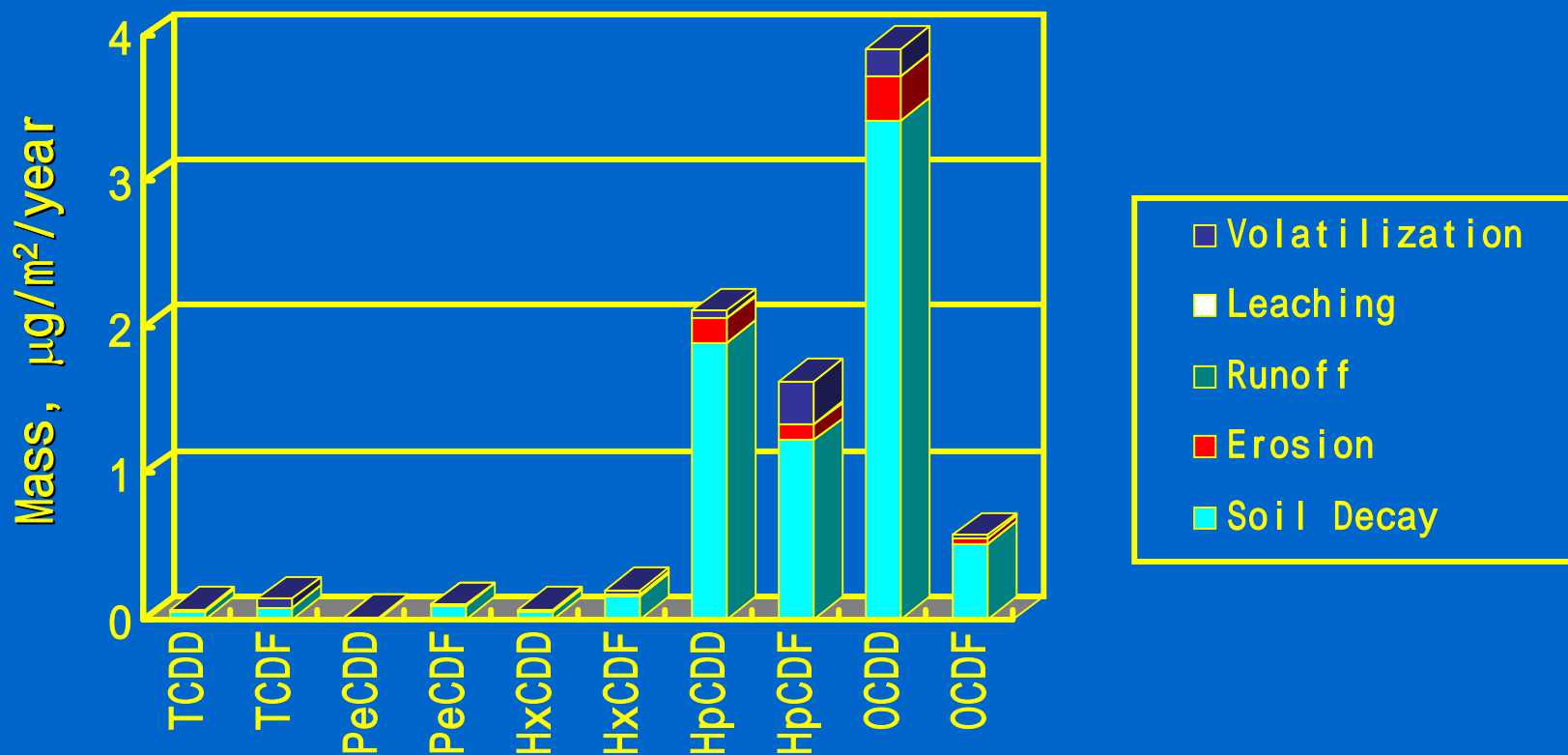


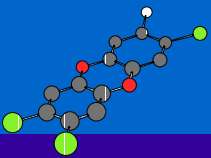
# Estimated Concentration of PCDD/F in the Soil



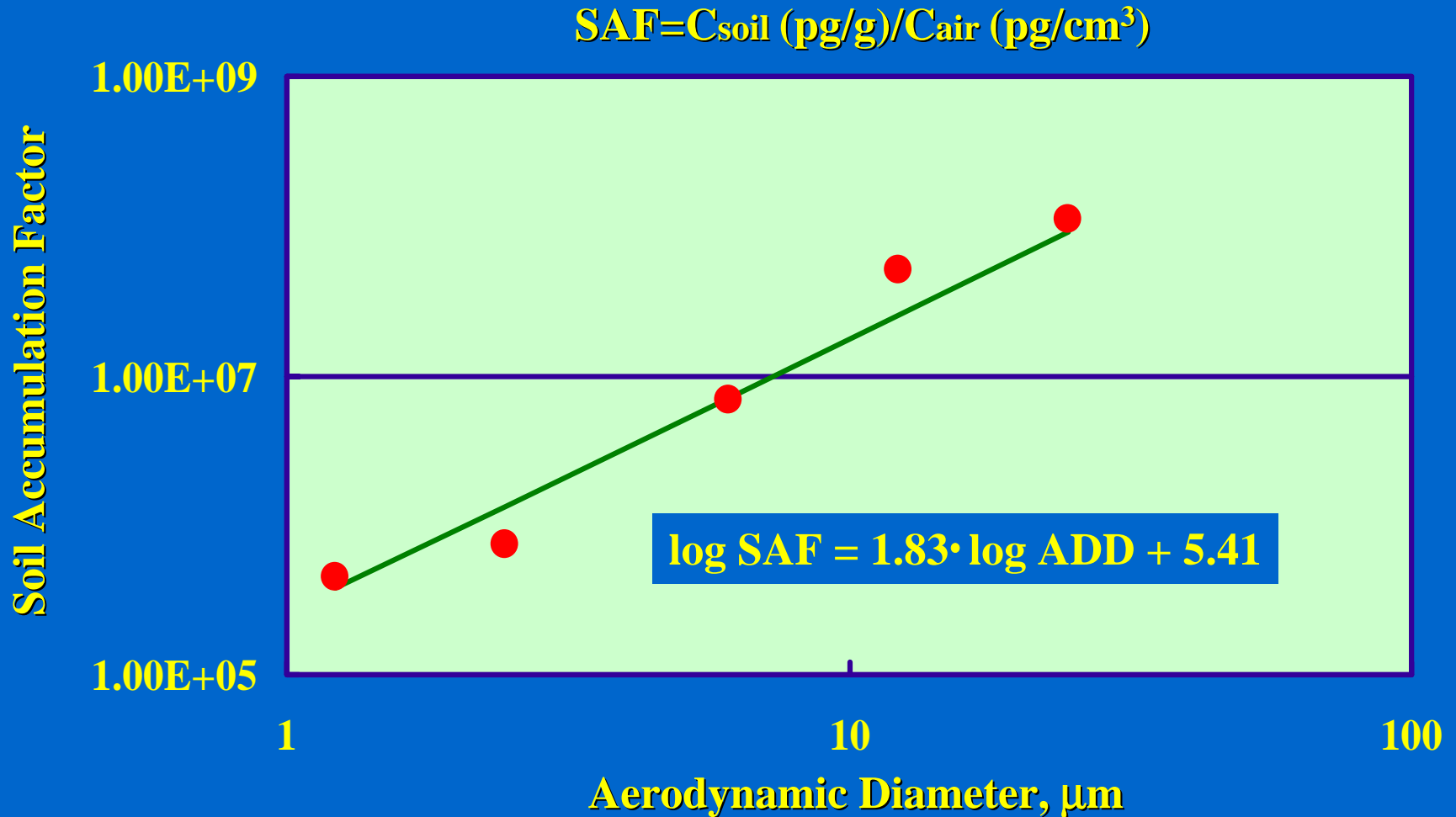


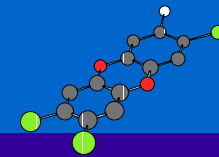
# Steady State Mass Balance of PCDD/F in the Soil





# Relationship of Soil Accumulation Factor to Aerodynamic Diameter of Fly Ash





# Human Exposure Pathways of PCDD/F

