Report of Japan Chapter Activity from July 1, 2020 to June 30, 2021

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President of Japan Chapter

BOG, Officer & Chair 2020 - 2021

ASHRAE® Japan Chapter

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BOG

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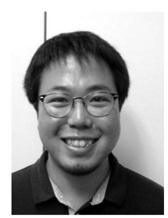
BOG



Masanari Ukai
BOG

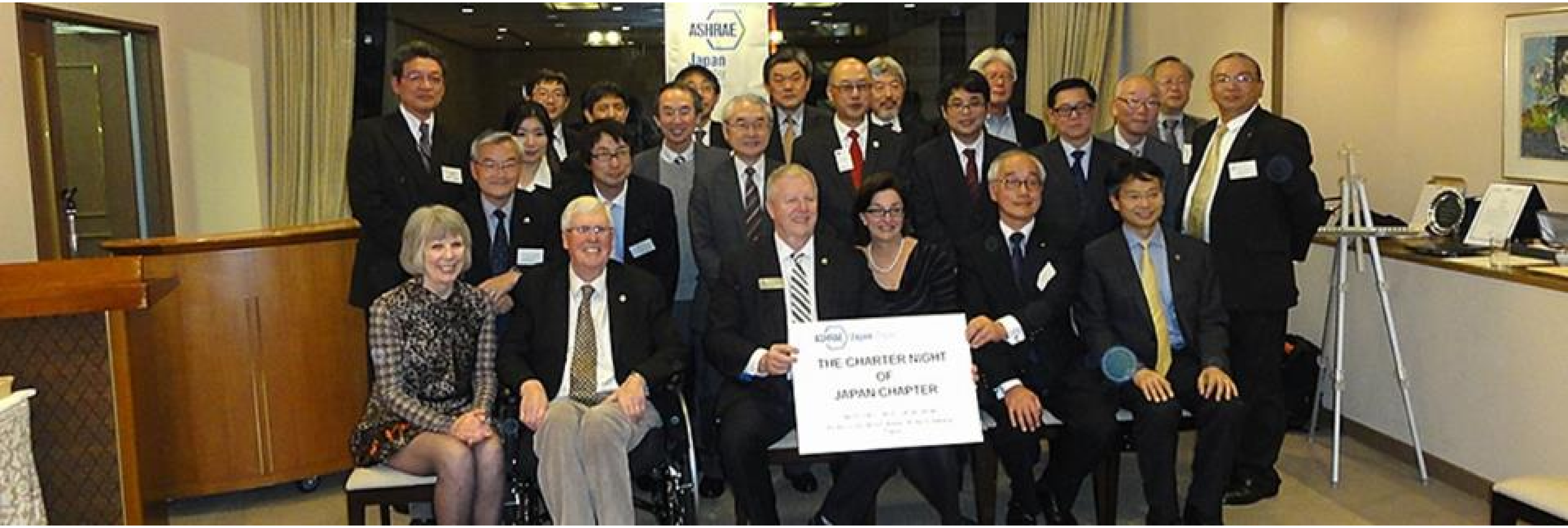
Akio Miyara
BOG

Kitaro Mizuide
BOG

Hideki Kikumoto
BOG

Start of the History

- Established on October 7th, 2014
  - Number of members is 222 as of June, 2021.



Activities in 2020 - 2021

2020

- February 1 - 5: ASHRAE Winter Conference @Orlando, Florida
- February 20: BOG meeting @Nikken Sekkei Takebashi Office
- March 2: Co-sponsored seminar “Air purification technologies: abilities and limitations” @Institue of Industrial Science, Prof. Fariborz Haghighat, The University of Tokyo
- April 11: Region XIII Planning Meeting @GoTo Meeting
- April 14: BOG meeting @Zoom
- May 9: Region XIII Pre RPM-2 and CRC-2020 Preparations Meeting @GoTo Meeting
- May 26: BOG meeting @Zoom
- June 6: Region XIII RPM-2 @GoTo Meeting
- June 29 - July 2: ASHRAE Virtual Conference
- July 20: General meeting @Zoom
- August 1, 8, 15, 22, 23: Region XIII CRC, RPM-1, etc. @GoTo Meeting
- September 2: BOG meeting @Zoom
- October 6: Region XIII Virtual Dialogue with Society President @GoTo Meeting
- November 13: BOG meeting @Zoom
- November 28: Region XIII RPM-1 @GoTo Meeting

2021

- January 27: BOG meeting @Zoom
- February 9 - 11: ASHRAE Virtual Winter Conference
- April 13: BOG meeting @Zoom
- April 29: Ex meeting @GoTo Meeting
- May 10: BOG meeting @Zoom
- June 5, 12 : RPM-2 @GoTo Meeting
- Jul. 20 : General meeting @Zoom

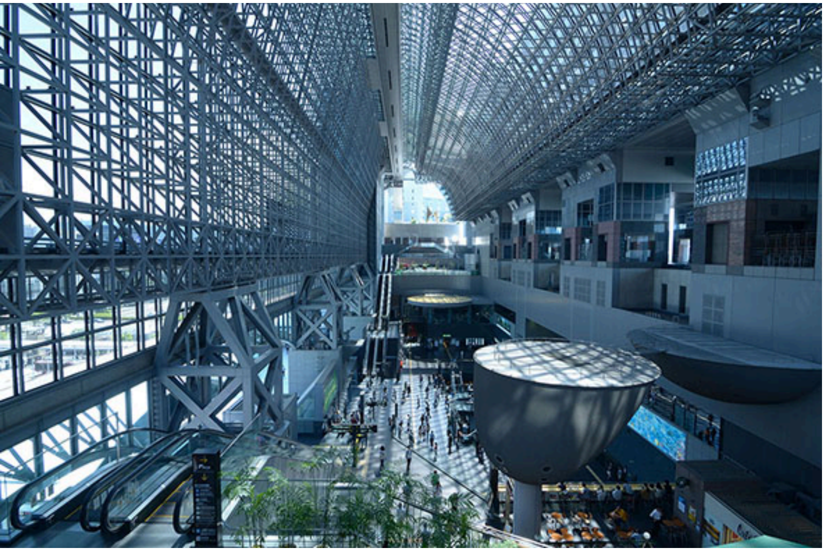
BOG meeting @Zoom

2021 Technology Award - First Place

- Kyoto Station

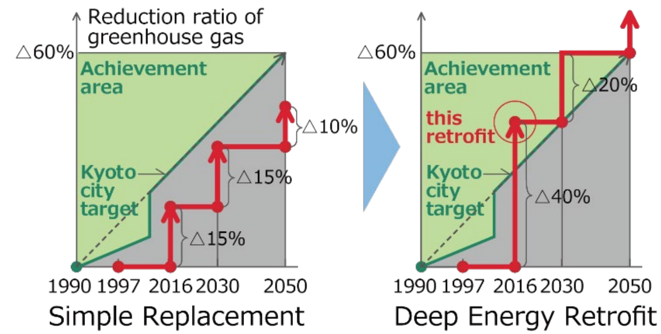
Tomoaki Ushio, Harunori Yoshida, Shigemi Mori

Category I – Commercial Buildings – Existing



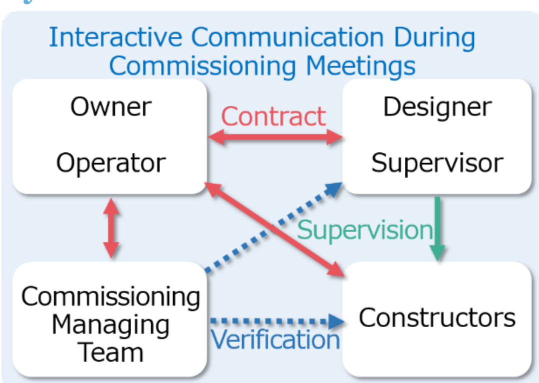
Kyoto Station Radical Energy Retrofit

Kyoto station total area 239,000 sqm		Global environmental issues
794	Heiankyo ↓ 1200th Anniversary Project	
1997	Current building completed →	Kyoto protocol adopted in COP3
2009	Owner noticed Kyoto station has the largest energy consumption building. Owner decided deep energy retrofit. ←	Kyoto city is certified as "Environmental model city". Kyoto city sets greenhouse gas reduction target

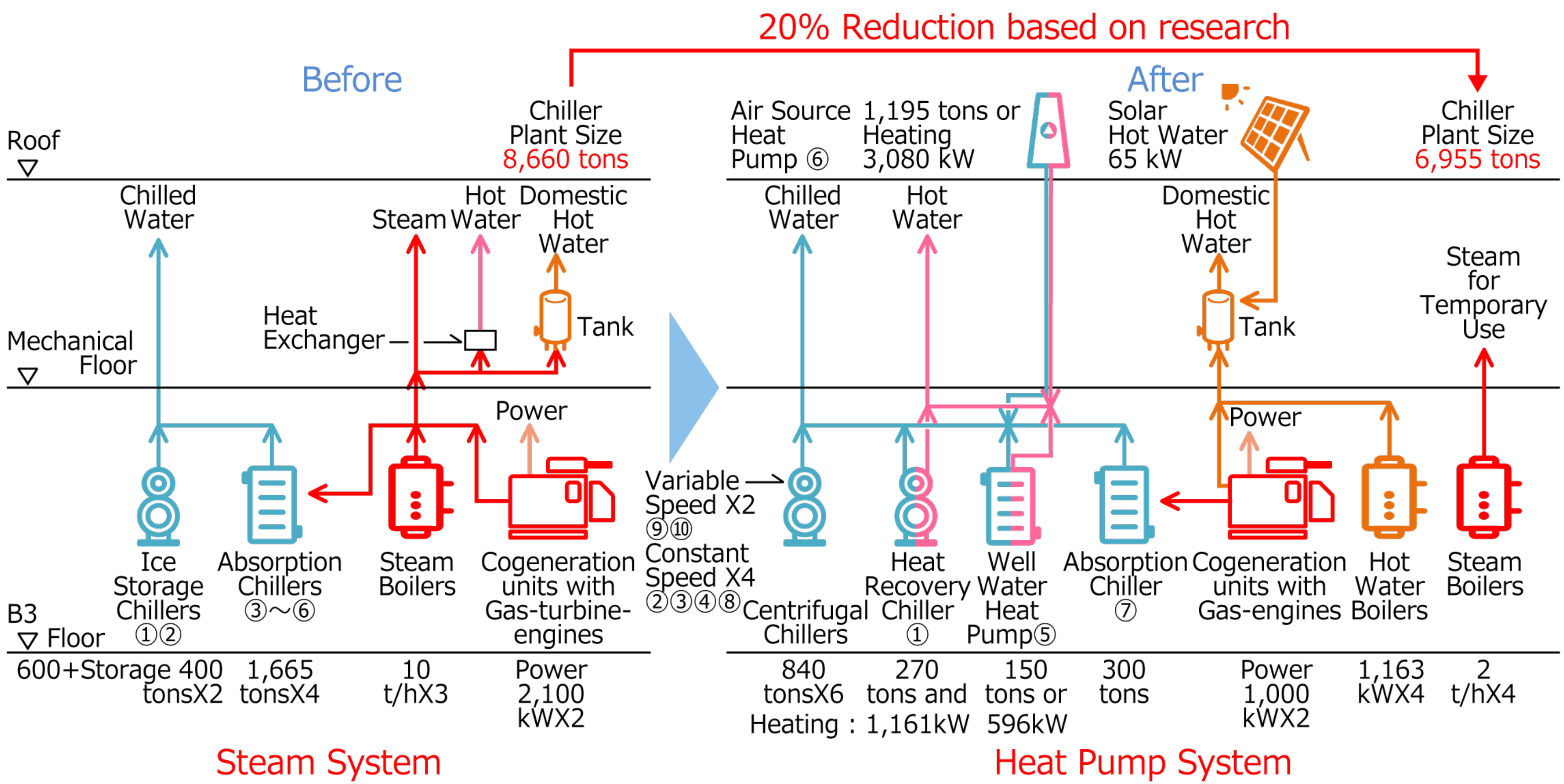


2010	Commissioning team established	
2011	Basic design started	
2014	Detail design started Two subsidiary aids for low carbon project received	
2015	Start of construction work	
2016	Completion of construction	Paris protocol adopted in COP21

Life Cycle Communication Process



Central heating and cooling system : Steam to Heat Pump

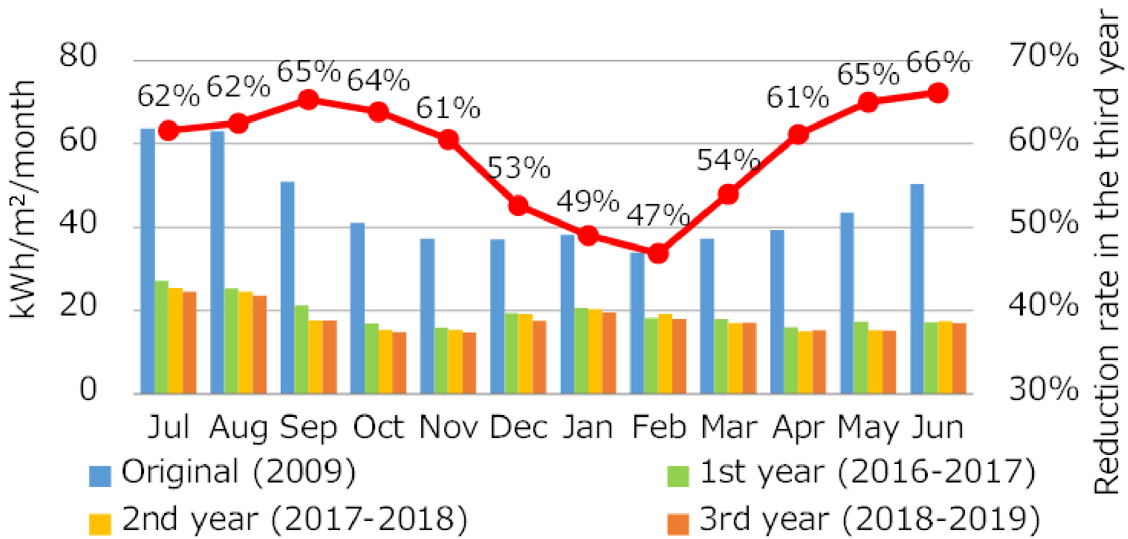


NIKKEN

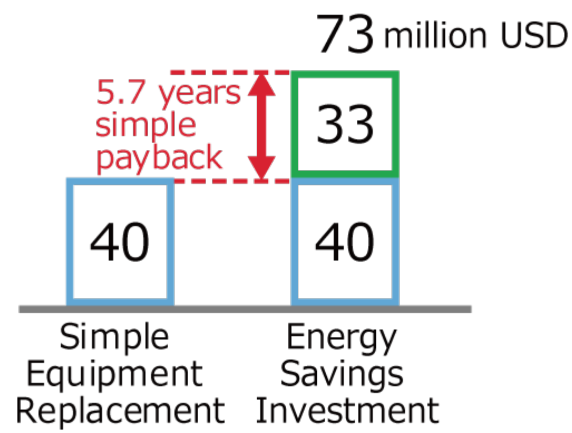
Primary energy consumption for the renovated area :
59.9% Reduction

Payback : 5.7 Years

Whole building source CO2 emission :
40.4% Reduction



Primary energy consumption



2020 ASHRAE Japan Chapter Technology Award

2020
ASHRAE Japan Chapter Technology Award

Yoshiyuki Takaura
Kyoto Station Building Development Co., Ltd.
Kyoto, Japan

Winner of Category
Commercial Buildings – Existing
Kyoto Station Radical Energy Retrofit
Kyoto, Japan

In recognition of outstanding achievement in the design and operation of energy efficient buildings

ASHRAE® Japan Chapter

Chapter President

July 20, 2020

2020
ASHRAE Japan Chapter Technology Award

Tomoaki Ushio
NIKKEN SEKKEI, Ltd.
Osaka, Japan

Winner of Category
Commercial Buildings – Existing
Kyoto Station Radical Energy Retrofit
Kyoto, Japan

In recognition of outstanding achievement in the design and operation of energy efficient buildings

ASHRAE® Japan Chapter

Chapter President

July 20, 2020

BOG members’ lectures against COVID-19

SHIN-ICHI TANABE, WASEDA UNIV.

Society of Heating, Air-conditioning and Sanitary Engineers (SHASE) Architectural Institute of Japan (AIJ) Emergency presidential discourse

WASEDA University

March 23, 2020

SHASE

March 23, 2020

The Society of Heating, Air-Conditioning and Sanitary Engineers of Japan (SHASE)

President Shin-ichi Tanabe

Architectural Institute of Japan (AIJ)

President Izuru Takewaki

Role of ventilation in the control of the COVID-19 infection:

Emergency presidential discourse

At the Ministry of Health, Labour and Welfare's Expert Meeting on Novel Coronavirus Infectious Disease Control on March 9, 2020, "A View on Novel Coronavirus Infectious Disease Control" was announced [1]. Subsequently, on March 18, the Prime Minister's Office, together with the Ministry of Health, Labour and Welfare, published a leaflet titled "Let's Avoid These Three Conditions When We Go Out!" [2], according to which to be avoided are closed spaces with poor ventilation, crowded places, and close contact. Inquiries about ventilation have been received from members of the Architectural Institute of Japan and the Society of Heating, Air-Conditioning and Sanitary Engineers of Japan, both of which specialize in indoor environments.

Regarding the effects of ventilation on the novel coronavirus (COVID-19), Nishiura et al. analyzed the

Three Cs March 9, 2020

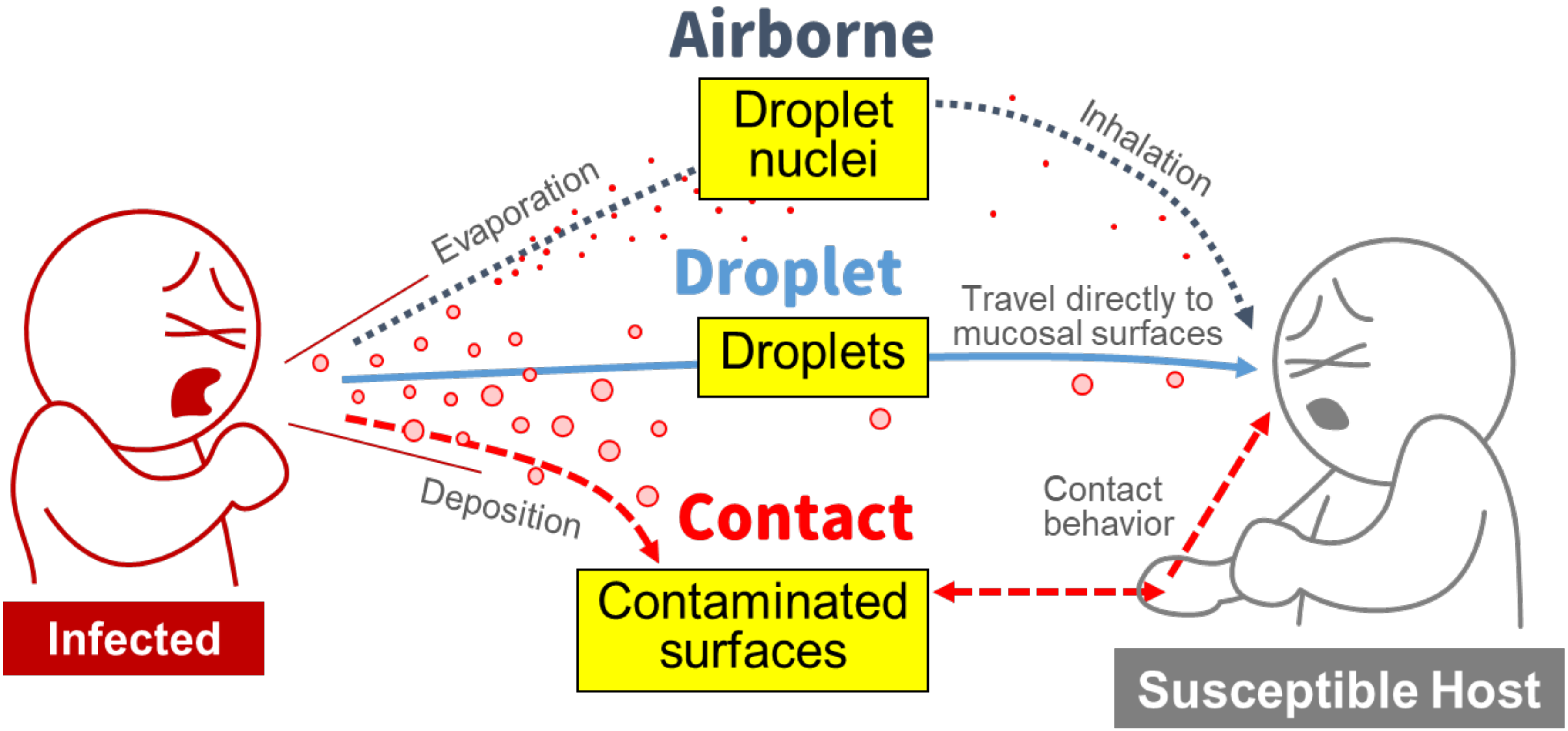
❶ Closed indoor venue
with poor ventilation

❷ Crowded place
where many gather

❸ Close-contact
conversatoins

https://www.kantei.go.jp/jp/content/000061935.pdf

Three possible modes of transmission



Tanabe, Waseda University

It is Time to Address Airborne Transmission of COVID-19

Lidia Morawska, Donald K. Milton

Clinical Infectious Diseases

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Supplementary data

Comments (0)

ACCEPTED MANUSCRIPT

It is Time to Address Airborne Transmission of COVID-19

Lidia Morawska ✉, Donald K Milton

Clinical Infectious Diseases, ciaa939, https://doi.org/10.1093/cid/ciaa939

Published: 06 July 2020 **Article history** ▾

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There is significant potential for inhalation exposure to viruses in microscopic respiratory droplets (microdroplets) at short to medium distances (up to several meters, or room scale), and we are advocating for the use of preventive measures to mitigate this route of airborne transmission.

July 6, 2020

The following scientists contributed to formulating this commentary: Linsey C. Marr, William Bahnfleth, Jose-Luis Jimenez, Yuguo Li, William W. Nazaroff, Catherine Noakes, Chandra Sekhar, Julian Wei-Tze Tang, Raymond Tellier, Philomena M. Bluyssen, Atze Boerstra, Giorgio Buonanno, Junji Cao, Stephanie J. Dancer, Francesco Franchimon, Charles Haworth, Jaap Hogeling, Christina Isaxon, Jarek Kurnitski, Marcel Loomans, Guy B. Marks, Livio Mazzarella, Arsen Krikor Melikov, Shelly Miller, Peter V. Nielsen, Jordan Peccia, Xavier Querol, Olli Seppänen, Shin-ichi Tanabe, Kwok Wai Tham, Pawel Wargocki, Aneta Wierzbicka, Maosheng Yao.

WASEDA University

WHO recommend Three Cs July 11, 2020

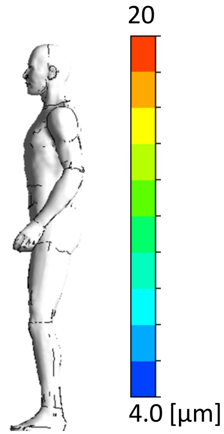
https://www.who.int/brunei/news/infographics---english

BOG members' lectures against COVID-19

KAZUHIDE ITO, KYUSYU UNIV.

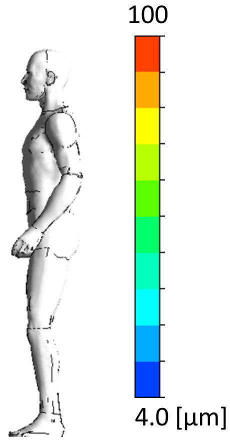
Droplet Dispersion and Droplet Nuclei Despersion

Dp=20µm, constant

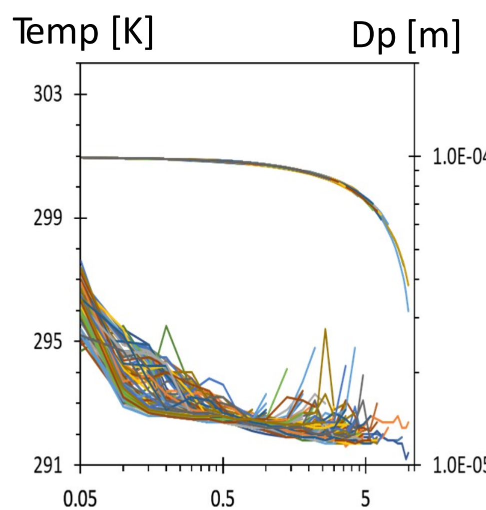


Initial Dp=20µm, Evaporation

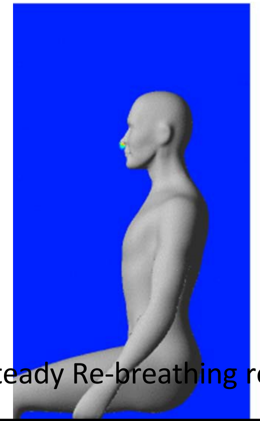
Dp= 100µm, constant



Initial Dp=100µm, Evaporation



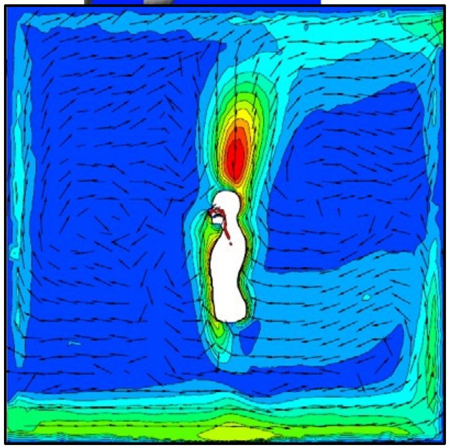
Heterogeneity / Non-uniformity in Indoor Environmental Quality



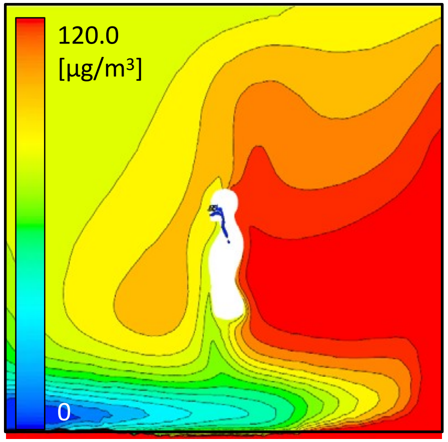
Max. **0.25**m/s

70% of air from Floor

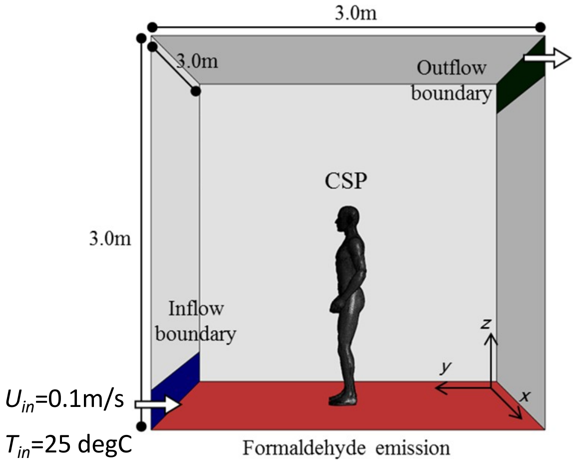
Unsteady Re-breathing region



Velocity distribution



Formaldehyde concentration distribution



What is the Representative Con. to Control?

Perfect Mix. Con (Ext. outlet) : 100.0μg/m$^3_{(air)}$

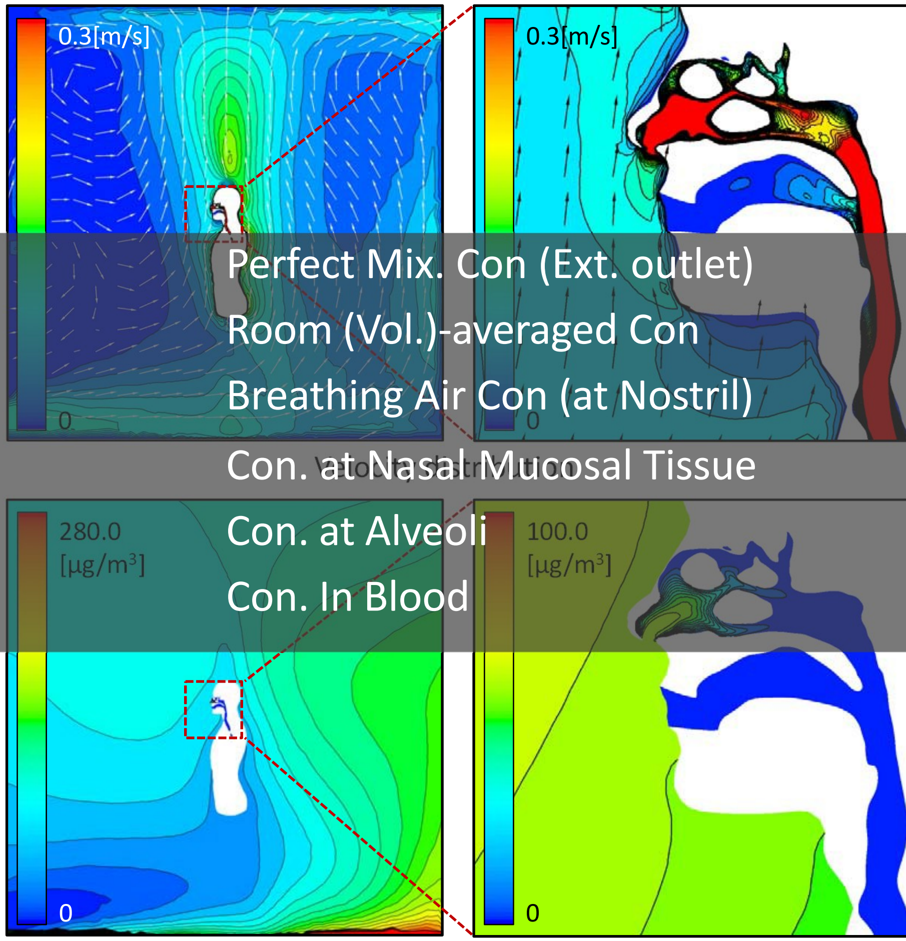
Room (Vol.)-averaged Con : 91.1μg/m$^3_{(air)}$

Breathing Air Con (at Nostril) : 62.7μg/m$^3_{(air)}$

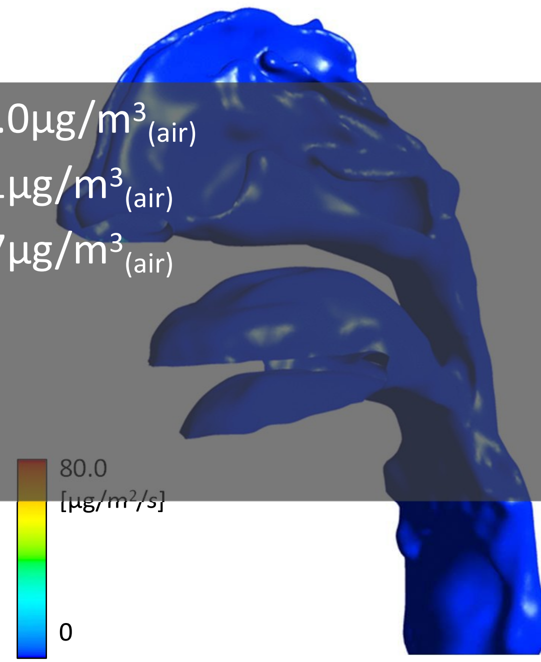
Con. at Nasal Mucosal Tissue : ?

Con. at Alveoli : ?

Con. In Blood : ?

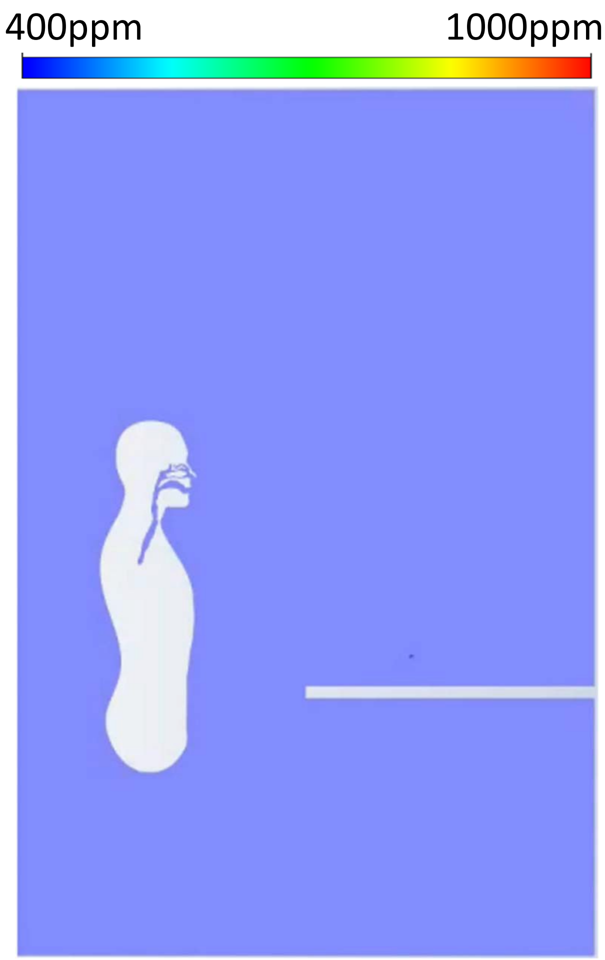


Formaldehyde concentration distribution

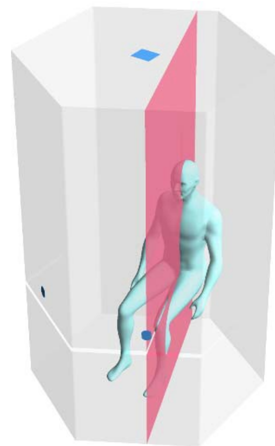


Formaldehyde adsorption flux distribution
(1 breathing cycle)

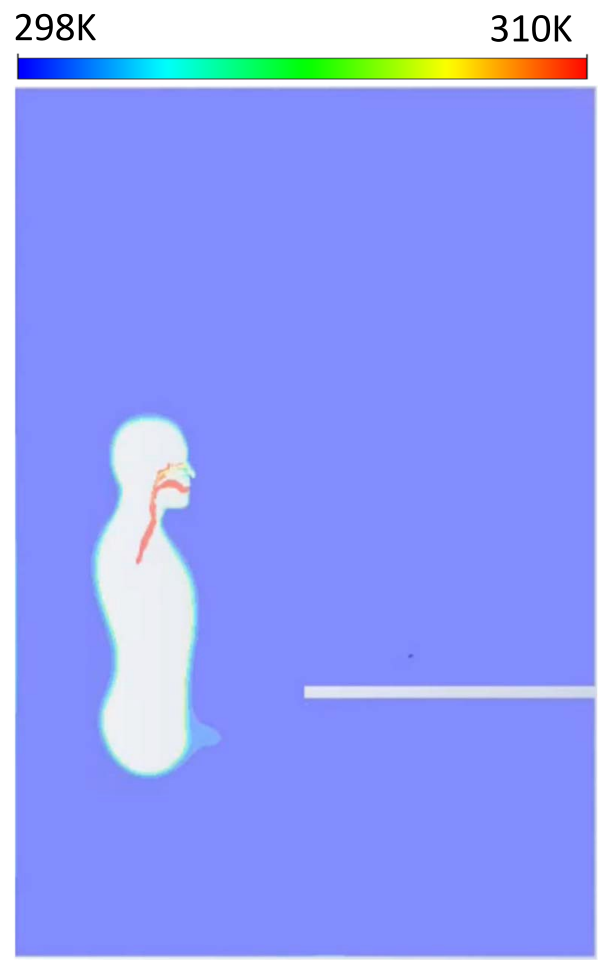
CO_2濃度をセンシングする価値はあるか？



Carbon Dioxide



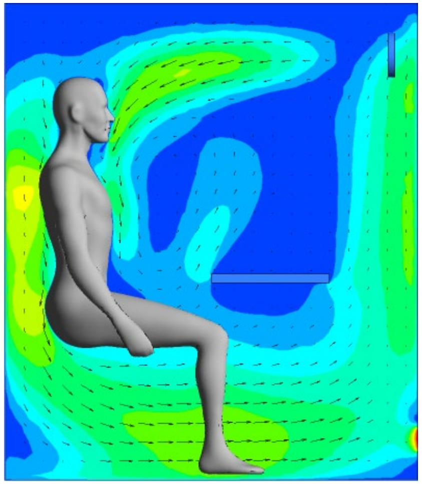
Outdoor air supply at 30 [m^3/h/p]



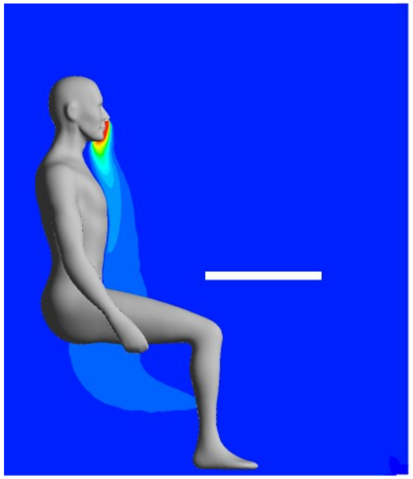
Temperature

呼吸空気の勢力範囲

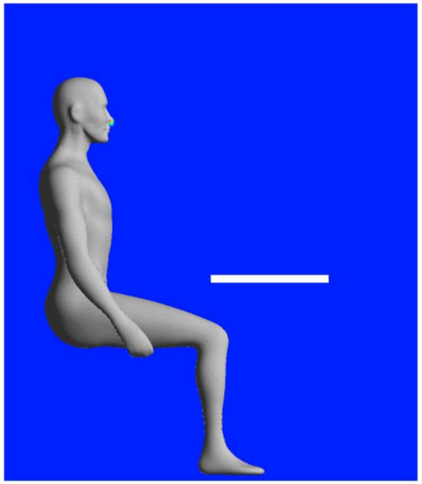
- 鼻呼吸する場合，呼吸する空気は室下部から輸送されてくる



PWE内の流れ場解析結果



呼吸域勢力範囲(定常解析)



呼吸域勢力範囲(非定常解析)

Toward the Quantitative Infection Risk Assessment

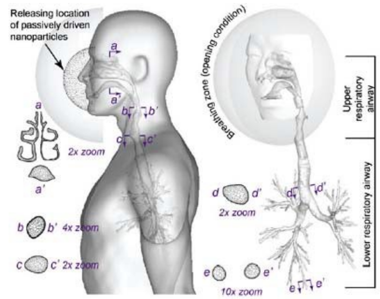
Wells-Riley model

$$P_I = 1 - \exp\left(-\frac{Iqpt}{Q}\right)$$

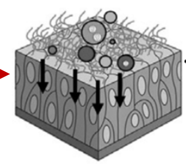
$$P_I = 1 - \exp(-pC_{res} \cdot t)$$

Infection Probability according to Poisson process using total number of inhaled viruses

$$P(N) = 1 - \exp\left(-\frac{N}{N_0}\right)$$

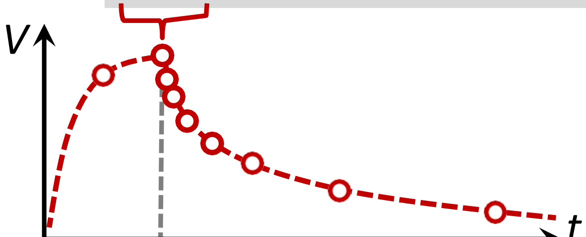


Inhalation



Upper Airway Epithelial Cell

V_{peak} versus PCR detection limit



Bioregulation – Host Cell Dynamics model

(Host cells, Pathogen, Adaptive Immune System)

(Target Cells)

$$\frac{dT_T}{dt} = -\beta_T T_T V - \phi F T_T + \xi R \frac{dR}{dt}$$

(Infected Cells)

$$\frac{dI}{dt} = \beta_T T_T V - \kappa_F IF - \kappa_E I T_C - \delta_X I$$

(Interferon)

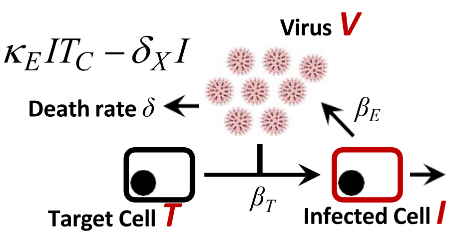
$$\frac{dF}{dt} = \beta_F I - \kappa_A F$$

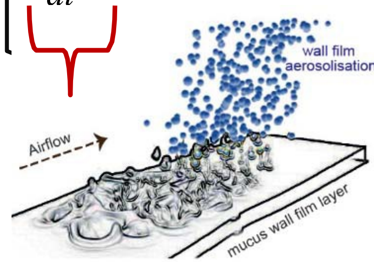
(Helper T Cells)

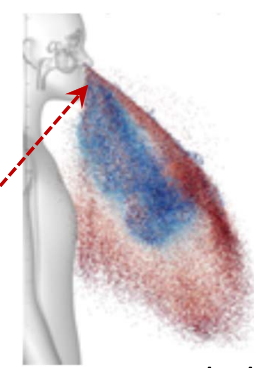
$$\frac{dT_H}{dt} = \left[\frac{\pi_{H2} D_M}{\pi_{H2} + D_M}\right](1 - T_H / K_H) - \left[\frac{\delta_{H2} D_M}{\delta_{H2} + D_M}\right] T_H$$

(Virus)

$$\frac{dV}{dt} = \beta_E I - \delta_V V - \kappa_V V A$$





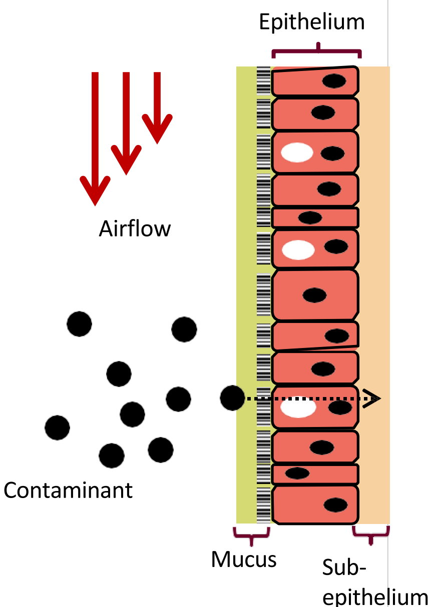


Exhalation

人体の曝露(Exposure)経路

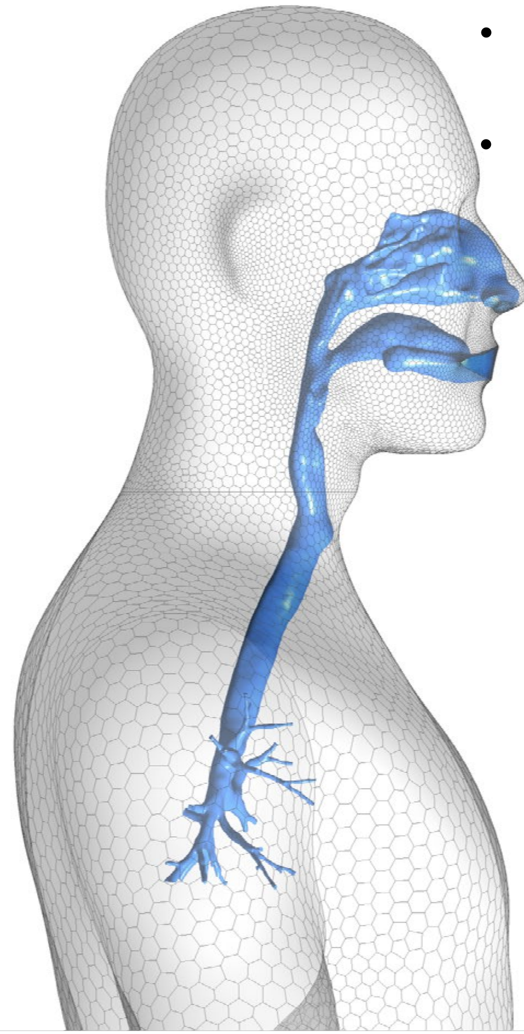
経気道(吸入)曝露

Inhalation (Airway) exposure



経口曝露

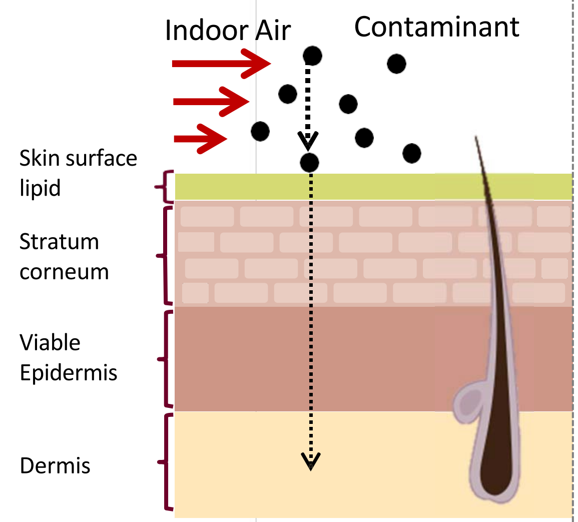
Oral (Ingestion) exposure
口から食道を経由して内臓へ



- 曝露経路(経気道，経口，経皮)と時間経過(急性，慢性)にて分類
- 病原微生物(細菌，ウィルス)，薬物(化学物質)，物理要因

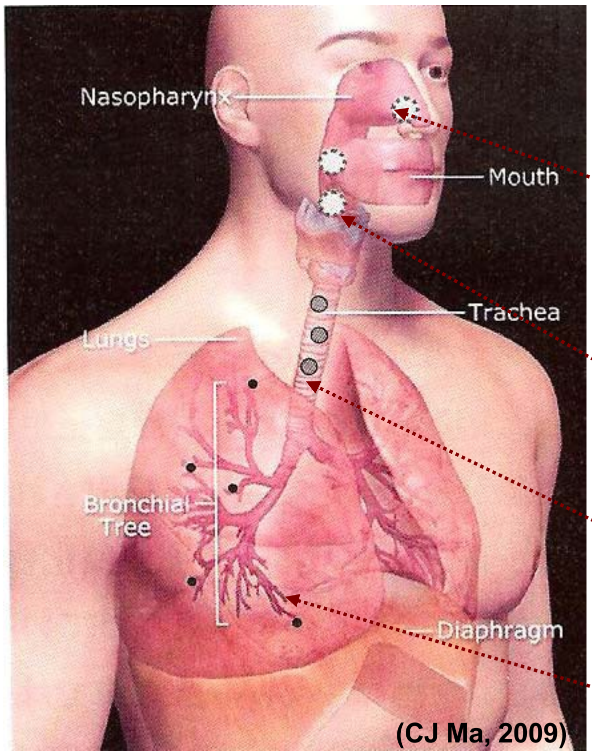
経皮曝露

Dermal (Skin) exposure



呼吸器系の感染防御

粒径別の健康影響：上気道沈着(数μm以上)，肺深部まで侵入(0.1μm以下)
→ アンダーセンサンプラのコンセプト



呼吸器の7つの異物除去機構

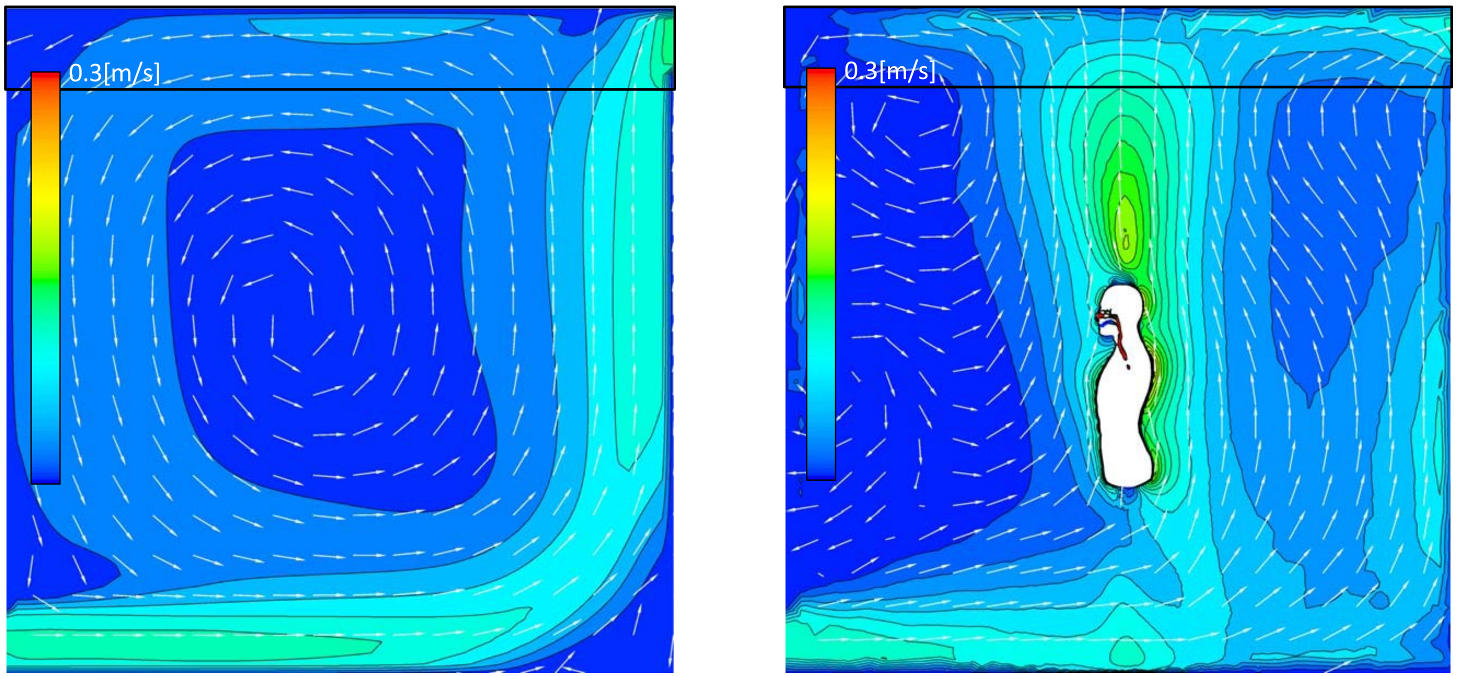
鼻腔
- (1) 鼻毛
- (2) 鼻腔内の粘膜・線毛
- (3) くしゃみ反射(ハクション！)

咽頭
- (4)Waldeyer(ワルダイエル)咽頭輪
  鼻腔背後と咽頭入口に並ぶ扁桃の輪

気管支
- (5) 気管支の粘液・線毛
- (6) 咳嗽反射(ゴホッ，ゴホッ)
  (がいそう)

肺胞
- (7)肺胞マイクロファージ

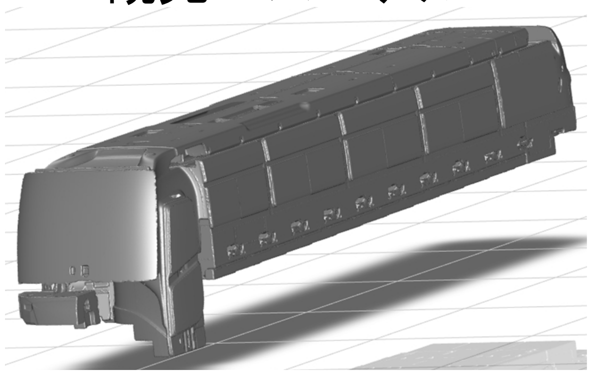
Impact of Human body on Indoor Air Flow

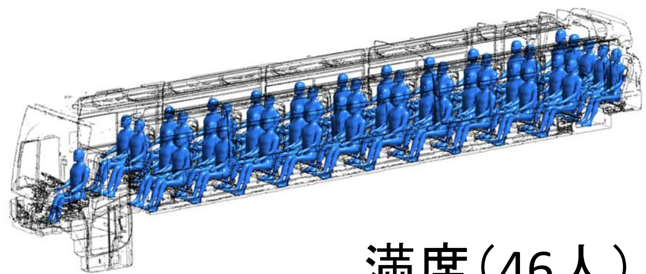


Flow pattern in displacement ventilated indoor environment with/without human body

バスモデル

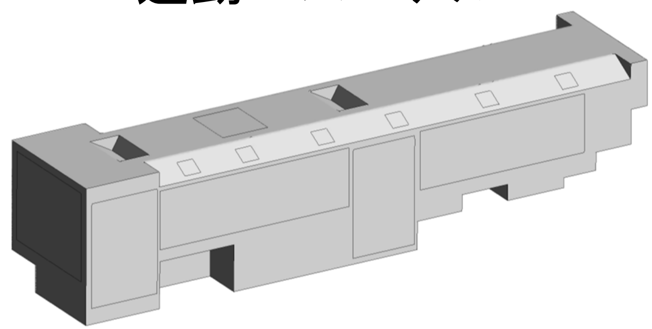
観光バスモデル

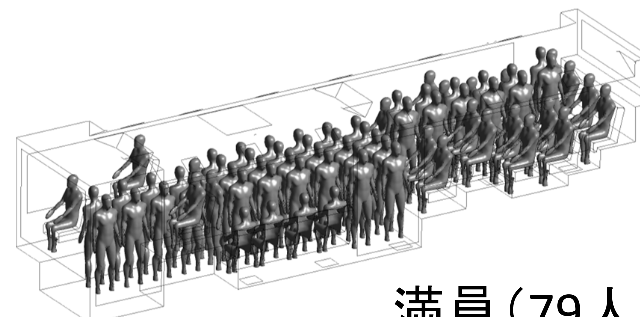




満席（46人）

通勤バスモデル

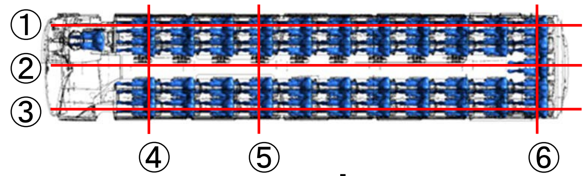




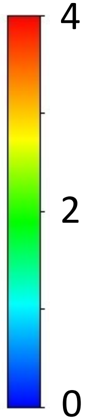
満員（79人）

観光バス・通勤バスともに乗車率100%を再現

観光バス-流れ場の解析結果



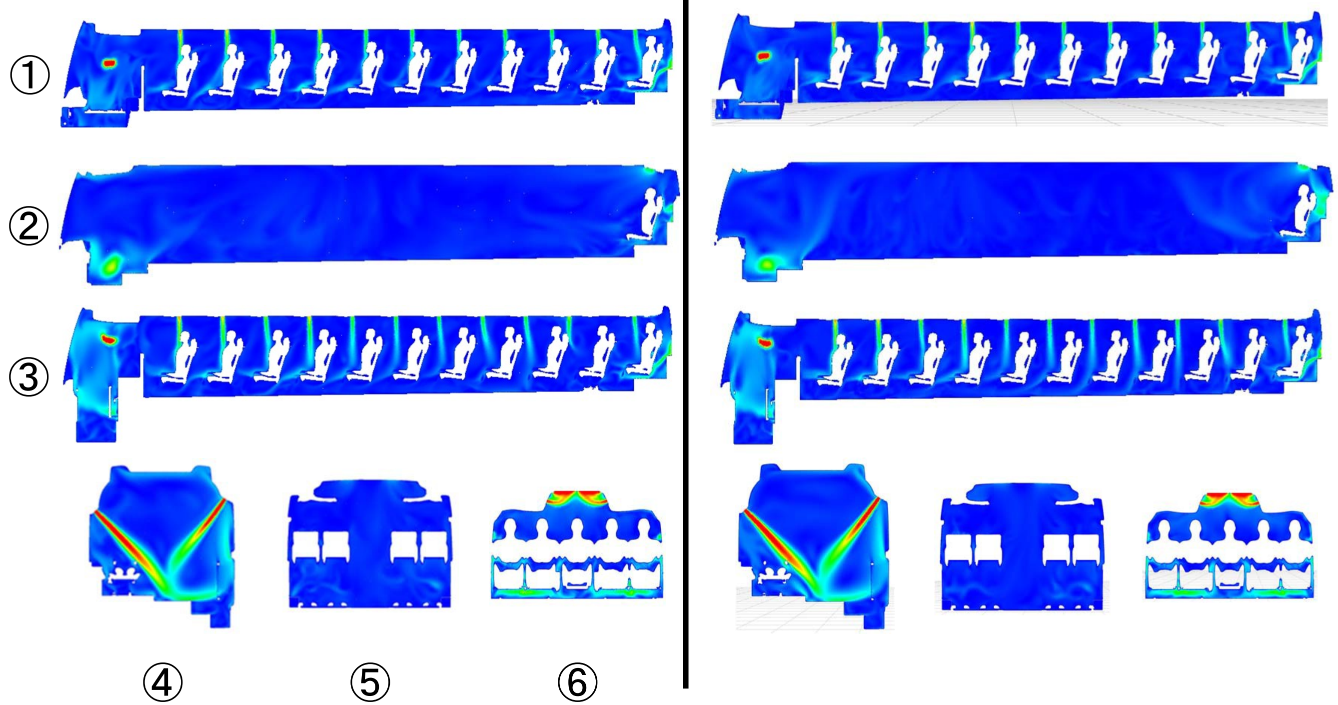
速度



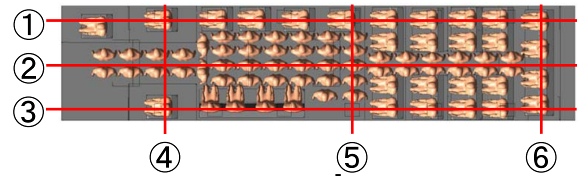
[m/s]

温度を考慮した条件

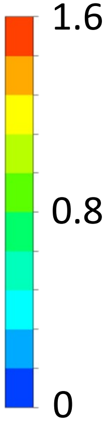
等温条件



路線バス-流れ場の解析結果



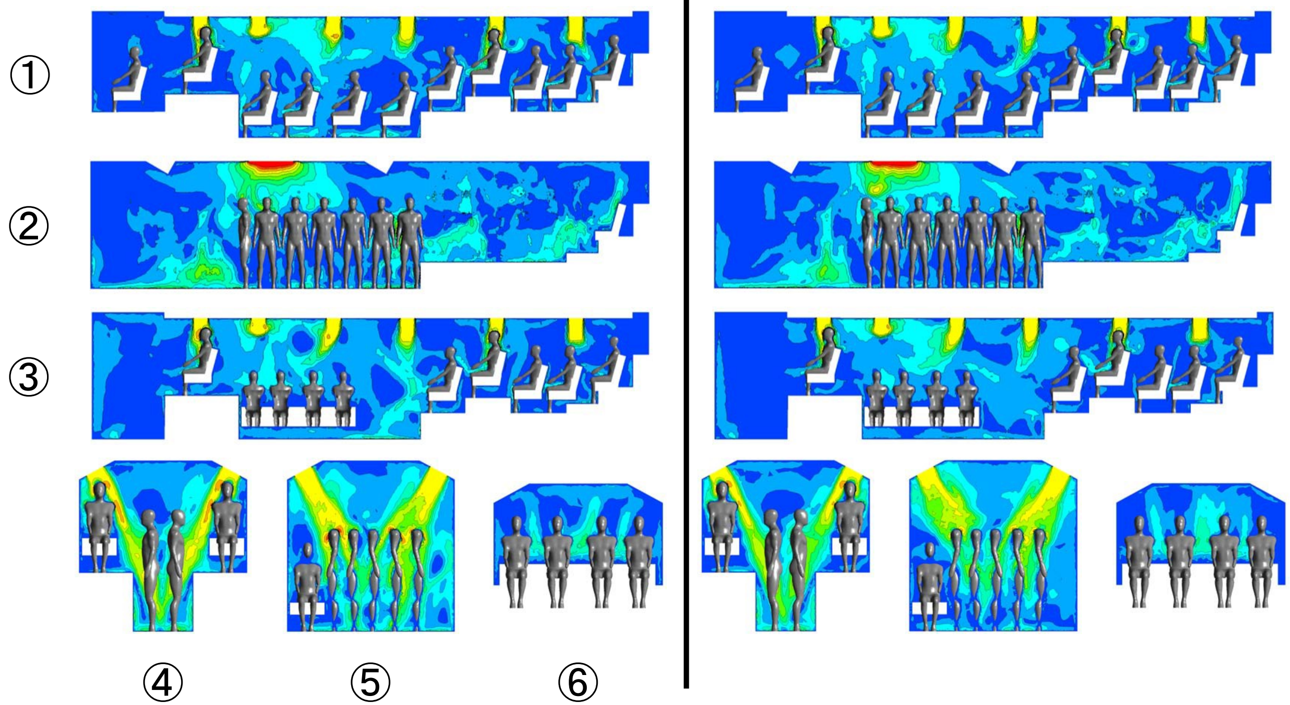
速度



[m/s]

温度を考慮した条件

等温条件



CRC and RPM-2, 2023, Tokyo

- August 19-21, 2022

@Masaru Ibuka Auditorium -International Conference Center, Weseda University

＊20-minute walk from Takadanobaba Station on the JR Yamanote Line or Seibu-Shinjuku Line

＊8-minute walk from Waseda Stataion on the Tozai Subway Line

＊4-minute walk from Nishi-Waseda bus stop on the Tokyo City Bus route from Takadanobaba

Station bound for Sodai Seimon

＊5-minute walk from Waseda stop of Toden Arakawa Line