台灣氣膠研究學會
Taiwan Association for Aerosol Research
Newsletter
NO.74 March 2019

Announcement

- The 14th board meeting of the 3rd Committee of Directors and Supervisors has been held at National Yunlin University of Science and Technology on March 9 , 2019. We have another four new members becoming primary membership and full membership. Welcome to join us：
  1. Rong-Fuh Day, Professor, Department of Information Management, National Chi Nan University.
  2. Eddie Lin, General Manager, Integrated Scientific Services Group, Ltd.
  3. Chien-Cheng Jung, Assistant Researcher, Research Center of Environmental Trace Toxic Substances.
  4. Ya-Hsuan Liu, Department of Environmental Engineering, National Central University.
- **Call for paper: AAQR Special Issue**
  1. *Low-cost Air Pollution Sensors*
     Abstract Submission Due: April 1, 2019
  2. *Aerosols, Air Quality and Climate Change in the Himalayan Region*
     Abstract Submission Due: April 1, 2019
  3. *Optical Properties of Atmospheric Aerosol — Observation, Measurement Techniques and Model Analysis for Improving the Accuracy of Aerosol Light Absorption Determinations in Polluted Sites*
     Abstract Submission Due: July 30, 2019
- The TAAR will approached for bidding the hosting right of 2021 Asian Aerosol Conference.
- AAQR Impact Factor: 2.589

Contents

Best wishes to you and your family

TAAR Newsletter is a quarterly publication by the Taiwan Association for Aerosol Research

◎Publisher：Lin Wen-Yinn
◎Editors：Li-Hao Young and Sheng-Lun Lin
◎Date：March 31, 2019
◎Website of TAAR：http://www.taar.org.tw/
◎E-mail：taarasst@gmail.com

Photo of the Committee Meeting

Research Profile: Ming-Tung Chuang Associate Research Specialist

Associate Research Specialist
Research Center for Environmental Changes,
Academia Sinica, Taiwan.
Ph.D., Inst. Environ. Eng., NCU, Taiwan.
MS, Depart. Atmos. Phys., NCU, Taiwan
BS, Depart. Atmos. Phys., NCU, Taiwan
Phone: +886-2-27875894
E-mail: mtchuang100@gmail.com
Website :http://www.rcec.sinica.edu.tw/index.php?action=member&cid=2&id=292

Personal History

In 1987, I graduated from the National Taichung First Senior High School and graduated with a Bachelor degree from the Department of Atmospheric Physics of National Central University (NCU) in 1991. I was honored to have Dr. Ching-Yuang Huang from U.S. as my master thesis advisor. The theme of the thesis is “Numerical Study of Air Pollutants diffusing from Nuclear Power Plant at the Northern Tip of Taiwan under Prevailing North-East Wind”, which discussed the pollutant diffusion with the boundary layer meteorology, land-sea breeze, valley-mountain wind and topographic effect. After finished serving the military service, I went back to NCU to work under Prof. Chung-Te Lee and Prof. Neng-Hui Lin for an EPA project regarding monitoring data validation, cluster analysis and time series forecast. I then spent 7 years worked at the New-system and SINOTECH engineering consultant companies and participated in many major industrial projects, for example, the air pollution control from construction, sand and gravel industry, implementation of SIP and AQMP plans for several cities in Taiwan, development of management plan for construction of incineration plant, and many EIA projects. In 2002, I pursued my Ph.D. degree in NCU under the supervision of Prof. Chung-Te Lee. My research mainly focused on aerosol chemistry and air quality modeling. In 2005, I joined the US-Taiwan EPA cooperative project and followed Dr. Joshua Fu to use CMAQ model to complete my Ph.D. dissertation in 2008. In order to advance my air quality simulation skills, I worked as a postdoctoral research fellow in North Carolina State University (NCSU) under Dr. Yang Zhang in 2009. I started to use WRF/Chem model and developed a real-time air quality forecast system for the Southeastern U.S. Upon return to Taiwan in 2010, I started my academic career in NCU and became an expert in the studies of long-range transport (LRT), especially on the issues of China haze and Southeast Asia biomass burning aerosols. From 2012 to 2015, I was commissioned by the Taoyuan EPB to study the cause of high $PM_{2.5}$ and ozone events and hence I started to venture into the problem with local pollution (LP) and relevant topics. Since 2010, I have actively involved in international

cooperation like MICS-Asia workshop, 7-SEAS research, TOAR, etc. In 2016, I got promoted to Associate Professor after several manuscripts published. In the beginning of 2019, I have started to join the Research Center for Environmental Changes, Academia Sinica, as Associate Research Specialist.

Research Interests

1. The long-range transport of pollutants from Asian continent to Taiwan.

During the Ph.D. period, I analyzed the continuous observations data of yellow sand events in 2002 at Taipei supersite and published my first journal paper (Lee et al., 2006). This is the first ever study that analyzed the particles size and compositions of continuous monitoring at the Taipei supersite. It was found that the maximum particle concentration is proportional to the impact duration of yellow sand. Moreover, the yellow sand plume contained abundant fine particles. Therefore, it extended to another study which applied CMAQ model to simulate the chemical evolution of $PM_{2.5}$ compositions along the path of transport. With the cooperation of Prof. Lee in NCU, Dr. Carey Jang in USEPA, and Dr. Joshua Fu in University of Tennessee, we completed the first study which simulated the LRT of China haze from Asian continent to Taiwan in Asia (Chuang et al., 2008a). In 2016, we found that the $PM_{2.5}$ episodes occurring at the northern tip of Taiwan were not always from LRT but also from the LP or the mix of LRT and LP (Chuang et al., 2017).

In order to quantify the impact or contribution of LRT and LP, some have analyzed the weather patterns or utilized air quality modeling for their research. However, those methods have their generic discrimination. Therefore, we developed an economic and systematic method to efficiently estimate the contributions of LRT and LP at any place in western Taiwan during the northeast monsoon season from 2006 to 2015 (Chuang et al., 2018).

Lee C.T.*, **Chuang M.T.**, Chan C.C., Cheng T.J., Huang S.L., 2006. Aerosol characteristics from the Taiwan aerosol supersite in the Asian yellow-dust periods of 2002. Atmospheric Environment 40, 3409–3418.

Chuang, M.T., Fu, J.S., Jiang, C.J., Chan, C.C., Ni, P.C., Lee, C.T.*, 2008a. Simulation of long-range transport aerosols from Asian Continent to Taiwan by a Southward Asian high-pressure system. Science of the Total Environment 406, 168-179.

Chuang, M.T.*, Chou, C.C.K., Lin, N.H., Takami, A., Hsiao, T.C., Lin, T.H., Fu, J.S., Pani, S.K., Lu, Y.R., Yang, T.Y., 2017. A simulation study on PM2.5 sources and meteorological characteristics at the northern tip of Taiwan in the early stage of the Asian haze period. AAQR 17, 3166-3178.

Chuang, M.T.*, Chung-Te Lee*, Hui-Chun Hsu, 2018. Quantifying $PM_{2.5}$ from long-range transport and local pollution in Taiwan during winter monsoon: An efficient estimation method. Journal of Environmental Management 227, 10-22.

2. Characteristics of biomass burning aerosol in Indochina peninsula and transport of biomass burning aerosol from Indochina to Taiwan.

As for the biomass burning (BB) aerosol over Indochina peninsula, we can divide our achievement into two parts: data analysis and modeling analysis. Prof. Chung-Te Lee's lab contributed much on building the sampling PM2.5 composition database. With the available data, I have critically analysed and completed several related studies like the analysis of water-soluble ions (Lee et al., 2011) and carbonaceous aerosol species (Chuang et al., 2014) observed at Lulin mountain, properties of BB aerosols near the fire source region (Chuang et al., 2013a), aerosol properties at Dongsha island in spring time (Chuang et al., 2013b), and the aging of BB aerosols during the transport from Indochina to Taiwan (Chuang et al., 2016a). The above studies have comprehensively analyzed the characteristics of BB aerosols from the upstream (fire sources) and downstream (Lulin site) and in between. I really appreciate the effort from Prof. Lee's team.

Based on the cognition of observation analysis, we started to probe into the chemical evolution of BB aerosols from Indochina to Taiwan with simulation skills (Chuang et al., 2015). That study revealed how the precursors convert to different kinds $PM_{2.5}$ compositions. Then, we extended it to study the chemical evolution of BB aerosols in the BB plume moving to overhead of Taiwan island and the anthropogenic sources moving from ground to the top of Lulin mountain. (Chuang et al., 2016b).

Lee, C.T. *, **Chuang, M.T.**, Lin, N.H., Wang, J.L., Sheu, G.R., Wang, S.H., Huang, H., Chen, H.W., Weng, G.H., Hsu, S.P., 2011. The enhancement of biosmoke from Southeast Asia on $PM_{2.5}$ water-soluble ions during the transport over the Mountain Lulin site in Taiwan. Atmospheric Environment 45, 5784-5794.

Chuang, M.T., Lin, N.H., Chou, C.C.K., Sopajareepom, K., Wang, J.L., Sheu, G.R., Chang, Y.J., Lee, C.T. *, 2013a. Characterization of aerosol chemical properties from near-source biomass burning in the northern Indochina during 7-SEAS/Dongsha experiment. Atmospheric Environment 78, 72-81.

Chuang, M.T., Lin, N.H., Chang,S.C., Wang, J.L., Sheu, G.R., Chang, Y.J., Lee, C.T. *, 2013b. Aerosol chemical properties and related pollutants measured in Dongsha Island in the northern South China Sea during 7-SEAS/Dongsha experiment. Atmospheric Environment 78, 82-92.

Chuang, M.T., Lee, C.T. *, Lin, N.H., Chou, C.C.K., Wang, J.L., Sheu, G.R., Chang, S.C., Wang, S.H., Huang, H., Cheng, H.W., Weng, G.H., Lai, S.Y., Hsu, S.P., Chang, Y.J., 2014. Carbonaceous aerosols in the air masses transported from Indochina to Taiwan: Long-term observation at Mountain Lulin. Atmospheric Environment 89, 507-516. June, 2014.

Chuang, M.T.*, Fu, J.S., Lin, N.H., Lee, C.T., Gao, Y.,Wang, S.H., Wang, S.H., Sheu, G.R., Hsiao, T.C., Wang, J.L.,Yen, M.C., Lin, T.H., Thongboonchoo, N., Chen, W.C., 2015. Simulating transport and chemical evolution of of biomass burning pollutants originating from Southeast Asia during 7-SEAS/2010 Dongsha Experiment. Atmospheric Environment, 112, 294-305.

Chuang, M.T., Lin, N.H., Chang,S.Y., Sopajareepom, K., Wang, J.L., Sheu, G.R., Chang, S.C., Chang, Y.J., Lee, C.T. *, 2016a. Aerosol transport from Chiangmai, Thailand to Mt.Lulin, Taiwan-implication of aerosol aging during long-range transport. Atmospheric Environment, 137, 101-112.

Chuang, M.T., Fu, J.S., Lee, C.T., Lin, N.H., Gao, Y., Wang, S.H., Sheu, G.R., Hsiao, T.C., Wang, J.L., Yen, M.C., Lin, T.H., Thongboonchoo, N., 2016b. The simulation of long-range transport of biomass burning plume and short-range transport of anthropogenic pollutants to a mountain observatory in East Asia during the 7-SEAS/2010 Dongsha Experiment. AAQR 16, 2933-2949.

3. The interaction between prevailing wind and terrain, and urban atmospheric chemistry

Prof. Liang, Prof. Lee, and Prof. Chen in National Taiwan University have serially studied the weather patterns of O_3 and $PM_{2.5}$ episodes in Taiwan. As an extension of their research, we classified all the weather patterns into 7 for Taipei basin (updated to 9 for O_3 and 12 for $PM_{2.5}$ for Taiwan in 2018) based on the formation mechanism (Chuang et al., 2008b). Among all the weather patterns, 5 are related to terrain effects of the Snow Mountain on the right side and the Da-tun mountains terrain on north side of Taipei basin. In order to study the terrain effects on the episodes in Taipei basin, we conducted an observation experiment in April 2004 inside and outside the Taipei basin. It is found that the $PM_{2.5}$ ammonium and $PM_{2.5}$ nitrate were apt to accumulate during the high concentration period in Taipei and those at urban site were 1.5 and 4-12 folds of those at background site. $PM_{2.5}$ sulfate at urban site was comparable to that at the background site and accounted for 30% of total $PM_{2.5}$. The $PM_{2.5}$ sulfate came mainly from LRT but the PM2.5 nitrate and OC came from the LP.

We applied the air quality modeling to study the O_3 and $PM_{2.5}$ events in Taoyuan from 2012 to 2014. The process analysis technique in the CMAQ model was applied to study the transport mechanisms and spatial distribution of NOx-limited and VOC-limited in the city. The manuscript for publication is under preparation for publication. Meanwhile, we cooperated with Prof. Shih-Yu Chang and applied the PMF receptor model to discuss the sources of $PM_{2.5}$ in Taoyuan city (Chuang et al., 2016c).

Chuang M.T., Chiang P.C., Chan, C.C., Wang C.F., Chang Y.Y., Lee C.T. *, 2008b. The effects of synoptical weather pattern and complex terrain on the formation of aerosol events in the greater Taipei area. Science of the Total Environment 399, 128-146.

Chuang, M. T., Chen, Y.C., Lee, C.T., Cheng, C.H., Wu, Y.P., Chang, S.Y. *, 2016c. Apportionment of the sources of high fine particulate matter concentration events in a developing aerotropolis in Taoyuan, Taiwan. Environmental Pollution, 214, 273-281.

4. The real-time air quality forecasting

When following Dr. Yang Zhang in NCSU for postdoc research in 2009, I started to use the WRF/Chem model to forecast O_3 and $PM_{2.5}$ in the Southeastern region of U.S. We completed an air quality forecast system and compared the CMAQ and WRF/Chem simulation results of an episode. The test of the forecast system started from May to September in 2009 and restarted from November in the same year. While we processed and improved the forecast system for the uncertainties of meteorology and emission, we are able to understand in the formation

Chuang, M.T., Fu, J.S., Lee, C.T., Lin, N.H., Gao, Y., Wang, S.H., Sheu, G.R., Hsiao, T.C., Wang, J.L., Yen, M.C., Lin, T.H., Thongboonchoo, N., 2016b. The simulation of long-range transport of biomass burning plume and short-range transport of anthropogenic pollutants to a mountain observatory in East Asia during the 7-SEAS/2010 Dongsha Experiment. AAQR 16, 2933-2949.

3. The interaction between prevailing wind and terrain, and urban atmospheric chemistry

Prof. Liang, Prof. Lee, and Prof. Chen in National Taiwan University have serially studied the weather patterns of O_3 and $PM_{2.5}$ episodes in Taiwan. As an extension of their research, we classified all the weather patterns into 7 for Taipei basin (updated to 9 for O_3 and 12 for $PM_{2.5}$ for Taiwan in 2018) based on the formation mechanism (Chuang et al., 2008b). Among all the weather patterns, 5 are related to terrain effects of the Snow Mountain on the right side and the Da-tun mountains terrain on north side of Taipei basin. In order to study the terrain effects on the episodes in Taipei basin, we conducted an observation experiment in April 2004 inside and outside the Taipei basin. It is found that the $PM_{2.5}$ ammonium and $PM_{2.5}$ nitrate were apt to accumulate during the high concentration period in Taipei and those at urban site were 1.5 and 4-12 folds of those at background site. $PM_{2.5}$ sulfate at urban site was comparable to that at the background site and accounted for 30% of total $PM_{2.5}$. The $PM_{2.5}$ sulfate came mainly from LRT but the PM2.5 nitrate and OC came from the LP.

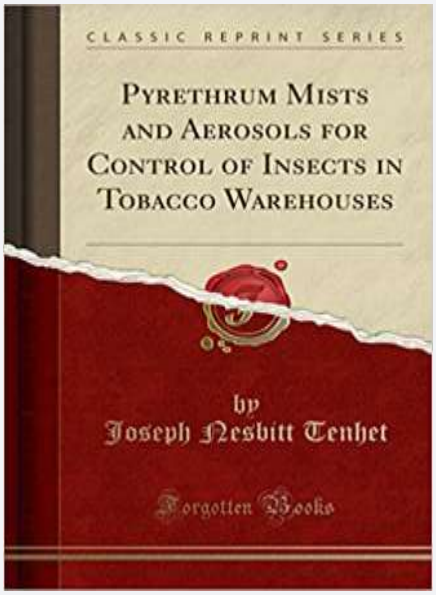
We applied the air quality modeling to study the O_3 and $PM_{2.5}$ events in Taoyuan from 2012 to 2014. The process analysis technique in the CMAQ model was applied to study the transport mechanisms and spatial distribution of NOx-limited and VOC-limited in the city. The manuscript for publication is under preparation for publication. Meanwhile, we cooperated with Prof. Shih-Yu Chang and applied the PMF receptor model to discuss the sources of $PM_{2.5}$ in Taoyuan city (Chuang et al., 2016c).

Chuang M.T., Chiang P.C., Chan, C.C., Wang C.F., Chang Y.Y., Lee C.T.*, 2008b. The effects of synoptical weather pattern and complex terrain on the formation of aerosol events in the greater Taipei area. Science of the Total Environment 399, 128-146.

Chuang, M. T., Chen, Y.C., Lee, C.T., Cheng, C.H., Wu, Y.P., Chang, S.Y.*, 2016c. Apportionment of the sources of high fine particulate matter concentration events in a developing aerotropolis in Taoyuan, Taiwan. Environmental Pollution, 214, 273-281.

4. The real-time air quality forecasting

When following Dr. Yang Zhang in NCSU for postdoc research in 2009, I started to use the WRF/Chem model to forecast O_3 and $PM_{2.5}$ in the Southeastern region of U.S. We completed an air quality forecast system and compared the CMAQ and WRF/Chem simulation results of an episode. The test of the forecast system started from May to September in 2009 and restarted from November in the same year. While we processed and improved the forecast system for the uncertainties of meteorology and emission, we are able to understand in the formation



Title: **Pyrethrum Mists and Aerosols for Control of Insects in Tobacco Warehouses (Classic Reprint)**

Author: Joseph Nesbitt Tenhet
Publisher: Forgotten Books (2019年2月15日)
Language: English
ISBN-10: 0364772166
ISBN-13: 978-0364772164

Description:

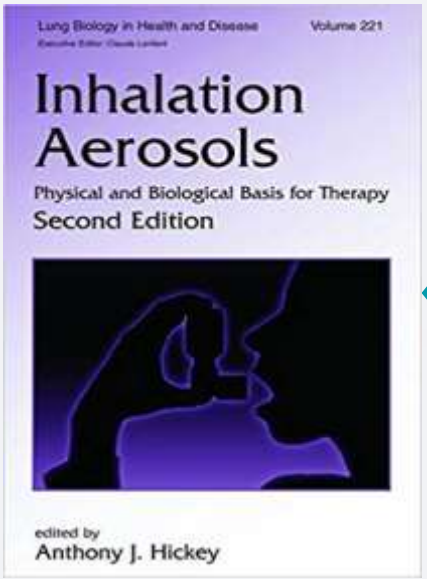
Excerpt from Pyrethrum Mists and Aerosols for Control of Insects in Tobacco Warehouses

Mists and aerosols are not as effective as fumigation for controlling the cigarette beetle. However, they are very useful for controlling insects in loosely constructed buildings where fumigation cannot be used.

The difference between mists and aerosols is in the size of the particles produced, the mists having the larger. Because of this fact, the mists can be used in both Open and closed warehouses whereas the use of aerosols is restricted to closed or semi closed buildings.

The highly refined, very volatile hydrocarbon oil used in these studies proved quite satisfactory. Heavy oils are undesirable because they leave an objectionable greasy deposit in tobacco warehouses.

Synergists for pyrethrum, when used as a contact insecticide, appeared to be of little value against the cigarette beetle.

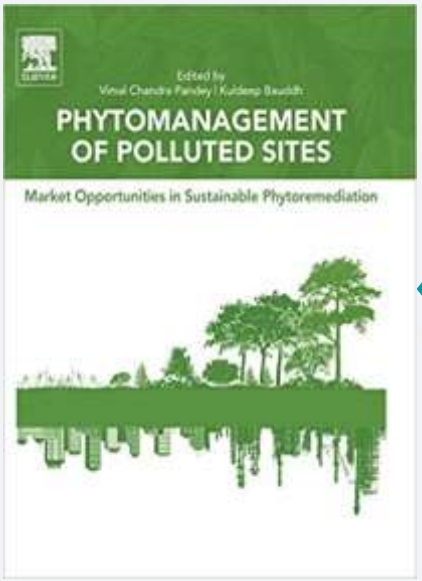


Title: **Inhalation Aerosols: Physical and Biological Basis for Therapy (Lung Biology in Health and Disease Book 221)**

Author: Anthony J. Hickey
Publisher: CRC Press; 2 edition (October 25, 2006)
Language: English
ISBN-10: 0849341604
ISBN-13: 978-0849341601

Description:

Extensively updated to reflect the outpouring of research in the field, this Second Edition documents the theory and practical utilization of aerosols in inhalation therapy and tracks advances in aerosol formulation, development, and application. Supplying readers with studies on physiology, metabolism, and pharmacokinetics for a clear understanding of the therapeutic impact of lung aerosols, this guide analyzes inhalation technologies for a vast array of diseases including asthma, cystic fibrosis, COPD, pulmonary infectious diseases, and diabetes.



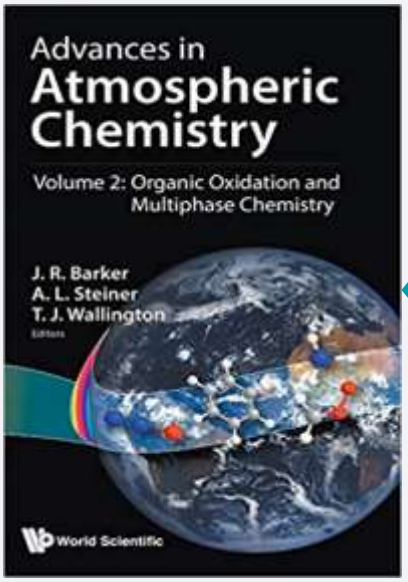
Title: **Phytomanagement of Polluted Sites: Market Opportunities in Sustainable Phytoremediation**

Author: Vimal Chandra Pandey、Kuldeep Bauddh
Publisher: Wiley; 1 edition (May 16, 2018)
Language: English
ISBN-10: 0128139129
ISBN-13: 978-0128139127

Description:

Phytomanagement of Polluted Sites: Market Opportunities in Sustainable Phytoremediation brings together recent and established knowledge on different aspects of phytoremediation, providing this information in a single source that offers a cutting-edge synthesis of scientific and experiential knowledge on industrially contaminated site restoration that is useful for both practitioners and scientists. The book gives interested groups, both non-profit and for-profit, methods to manage dumpsites and other contaminated areas, including tactics on how to mitigate costs and even profit from ecological restoration.

· Covers successful examples of turning industrially contaminated sites into ecologically healthy revenue producers
· Explores examples of phytomanagement of dumpsites from around the globe
· Provides the tools the reader needs to select specific plant species according to site specificity



Title: **Advances in Atmospheric Chemistry: Volume 2: Organic Oxidation and Multiphase Chemistry**

Author: J R Barker、 A L Steiner、 T J Wallington
Publisher: Elsevier; 1 edition (May 24, 2016)
Language: English
ISBN-10:9813271825
ISBN-13: 978-9813271821

Description:

This series presents authoritative invited summaries of research on atmospheric chemistry in a changing world. These range from comprehensive reviews of major subject areas to focused accounts by individual research groups. The topics may include laboratory studies, field measurements, in situ monitoring and remote sensing, studies of composition, chemical modeling, theories of atmospheric chemistry and climate, feedback mechanisms, emissions and deposition, biogeochemical cycles, and the links between atmospheric chemistry and the climate system at large.
Volume 2 comprises chapters describing research on multiphase chemistry affecting air quality in China, on multiphase chemistry of organic compounds leading to secondary organic aerosol formation, on biogeochemical cycles involving ammonia, on oxidation of aromatic compounds, on reactions of Criegee intermediates (important in oxidation of alkenes), and on laboratory and field measurements of isotopic fractionation in the atmosphere.

Readership: Graduate students and professionals interested in enviromental/atmospheric chemistry, climate science, and surface/interface chemistry.

Calendar of Events

會議日期	會議名稱	會議地點
APR 2, 2019	2019 Theory and Technique Taiwan Forum on Sustainable Environment	NTU, Taiwan
APR 3–6, 2019	12th International Conference on Carbonaceous Particles in the Atmosphere (ICCPA) 2019 (https://iccpa2019.univie.ac.at/home)	Montreux, Switzerland
APR 9 –11, 2019	International Congress on Particle Technology (PARTEC) 2019 (https://www.partec.info)	Nuremberg, Germany
MAY 27–30, 2019	Asian Aerosol Conference (AAC) 2019 (http://www.cityu.edu.hk/aac2019/index.htm)	Hong Kong, China
JUN 21–22, 2019	Workshop on Strategy to Improve Taiwan $PM_{2.5}$ Air Quality, Monitoring and Control Technologies for Stationary and Mobile Sources	Taichung, Taiwan
JUN 25–28, 2019	112th Annual Conference & Exhibition (ACE 2019) of A&WMA (https://www.awma.org/ACE2019)	Quebec, Canada
JUL 11, 2019	Workshop on $PM_{2.5}$ Control by Air Filtration	NCTU, Taiwan
JUL 28–AUG 2, 2019	16th Annual Meeting of Asia Oceania Geosciences Society (AOGS 2019) (http://www.asiaoceania.org/aogs2019/public.asp?page=home.htm)	Singapore
AUG 18–22, 2019	The 9th Cross-Strait Conference on Environment and Ecology – Yilan Forum (2019)	Yilan, Taiwan
AUG 25–30, 2019	Dioxin 2019 - 39th International Symposium on Halogenated Persistent Organic Pollutants (http://www.dioxin2019.org)	Kyoto, Japan
AUG 25–30, 2019	European Aerosol Conference (EAC) 2019 (https://eac2019.se)	Gothenburg, Sweden
OCT 4–5, 2019	The 26th International Conference on Aerosol Science and Technology (ICAST 2019) (Coming soon…)	Taoyuan, Taiwan
OCT 14–18, 2019	AAAR 37th Annual Conference https://www.aaar.org/meetings-events/meetings-and-events/	Portland, OR, USA

Glossary

Primary PM = FPM+CPM

- ✓ According to USEPA Method202, Primary particulate matter is equal Filterable PM (FPM) plus Condensable PM (CPM).
- ✓ FPM comprises particles that are directly emitted by a source as a solid or liquid (aerosol) at stack or release conditions and are captured on the filter of a stack test sampling train.
- ✓ CPM is material that is a vapor at stack conditions, but that condenses and/or reacts upon cooling and dilution in the ambient air to form solid or liquid PM immediately after discharge from the stack, and is a component of primary PM. All CPM is assumed to be in the $PM_{2.5}$ fraction.