GCOE Program TPU
New Frontier of Education and Research in Wind Engineering

Wind Effects

New Frontier of Education and Research in Wind Engineering

Bulletin

Vol.10 September 2008

Wind Engineering Research Center
Graduate School of Engineering
Tokyo Polytechnic University

INDEX

Adoption of Global Center of Excellence Program by Tokyo Polytechnic University

Shin-ichiro Wakao, President of Tokyo Polytechnic University

The "New Frontier of Education and Research in Wind Engineering" launched by the Department of Architecture of Tokyo Polytechnic University was adopted as a "Global Center of Excellence Program" sponsored by the Ministry of Education, Culture, Sports, Science and Technology. The program was established to promote internationally competitive universities so that the educational and research functions of graduate schools can be further improved and reinforced, and students can be trained in a research environment at the top international level to become creative people who will play a leading role in the world. The adoption of the program shows that our long-standing, continuing efforts in promoting educational research activities have received high acclaim. Our activities have included the research outcome of the Wind Engineering Research Center, which was established by Tokyo Polytechnic University and authorized as an academic frontier promotion base in 2000, and the research outcome of the 21st Century Center of Excellence Program that was launched five years ago.

In the 21st century, the earth will face various environmental problems such as global warming, environmental destruction, energy problems, and wind disasters. Here in Japan, we have recently seen a markedly increasing number of natural phenomena that are thought to be caused by environmental problems, such as regional thunderstorms called "guerilla rain," off-season typhoons, and disasters caused by gale-force winds and tornados. The world has seen a growing number of various environmental problems that include heat island phenomena caused by environmental changes such as the construction of high-rise buildings, disasters caused by winds of strong typhoons and tornadoes, and a rising sea level caused by global warming.

According to a "survey on attitudes toward global problems" conducted by the Ministry of Internal Affairs and Communications in 2005, the most serious global problem we face in our daily life is global warming, and the second most serious global problem is environmental destruction. The same results were obtained with regard to "issues Japan should take the lead in addressing." However, satisfactory action has not necessarily been taken because the problems are extensive and diversified, and each country and region has different social backgrounds and attitudes toward the significance of the problems.

The program adopted this time focuses on three research fields: the wind-resistant construction field, which aims to contribute to urban disaster prevention through the development of a systematic wind-resistant design method; the ventilation field, which aims to realize the construction of a human and earth-friendly environment; and the wind environment and air pollution field, which aims to propose measures to improve thermal and atmospheric environments. I feel that we now need to recognize the importance of the science of wind engineering, and bring about technological changes for the safety of humans and for environmental conservation. In this program, we established a virtual engineering organization aligned with research organizations in various countries in cooperation with the University of Notre Dame in the U.S. We now aim to establish a global-scale educational research system with our university as a base for research.

We are also committed to carrying out an important mission to cultivate human resources. Our basic educational principle is to develop world-class talent with the emphasis on passion for humans in the wind-resistant construction field, for global resources in the ventilation field, and for the atmospheric environment in the wind environment and air pollution field. Our goal is to produce capable researchers who have a truly international perspective and passion for humans and the earth, and who are capable of exercising international leadership,

and to produce and disseminate advanced technology across the country and all over the world.

In addition, in order to realize these educational and research goals, we have been reinforcing our management system and organizational support system. We will establish a Global COE Steering Committee with the President of Tokyo Polytechnic University as its Chairperson in order to exchange practical opinions about how to promote educational and research activities, and to discuss our future direction, coordination and support for researchers and other personnel, and to discuss what facilities are available and other physical aspects. We are now organizing a system in which all of us to work on the program under my leadership. We will also establish a Global COE Advisory Board as an organization for conducting strict external evaluations of activities for forming a base for research, and to provide guidance and advice. The advisory board, with notable Japanese and foreign engineers specializing in wind engineering as its members, will examine various opinions and conduct objective evaluations, rectify plans, and contribute to the fulfillment of future plans.

Population growth and economic development will continue in each country of the world into the future. There is no doubt that the coexistence of culture and civilizations built by humans, and nature, will become an important and extremely difficult issue. Tokyo Polytechnic University will continue to promote educational and research activities as a university capable of making a contribution to our society and the world.

We strongly believe that the research progress of this project will contribute to the construction of a major foundation for the protection of the valuable earth, where mankind lives.

From 21st Century Center of Excellence Program to Global Center of Excellence Program

Yukio Tamura, Professor, Program Director

Under the 21st Century Center of Excellence (COE) Program, Tokyo Polytechnic University (TPU) completed successfully on March 31, 2008 a COE entitled “Wind Effects on Buildings and Urban Environment.” I believe the TPU COE has been very extremely successful because of the major contributions made to the field by the COE and cooperating members from Japan and around the world. I would like to extend my sincere thanks to all of them as well as to many friends in our wind engineering community for their kind collaboration with us for almost five years from July 2003 to March 2008.

We at the TPU Wind Engineering Research Center (WERC), in collaboration with the NatHaz Modeling Laboratory at the University of Notre Dame (UND), submitted the "GLOBAL COE (GCOE)" Program entitled “New Frontier of Education and Research in Wind Engineering” to the Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan, in February 2008. The GCOE Program is the next level of the COE Program intended to provide funding support for establishing education and research centers that perform at the apex of global excellence to elevate the international competitiveness of Japanese universities. The selection for the GCOE initiative was very competitive and included several layers of evaluation processes as well as the final phase involving an interview by thirty experts from the entire engineering field. Professor Shinichiro Wakao, the President of TPU; Prof. Ahsan Kareem, representing UND; Prof. Masaaki Ohba, representing the TPU wind environmental group; and

myself, the Director of the GCOE Program, attended the 45min interview held on May 7, 2008. I am very pleased to report that the GCOE has been awarded to fourteen teams from thirteen universities, and TPU was one of the recipients of the prestigious GCOE award on June 17th, 2008. The financial support for GCOE will be provided by MEXT for almost five years from July 2008 to March 2013.

The GCOE's focus will be on developing an integrated education and research program that spans a wide spectrum of problems to address wind-related challenges of new frontiers in urban regions of Asia and beyond. The GCOE will focus on education and research on wind effects on buildings and the urban environment with emphasis on three fields: Wind-Resistant Design of structures, Natural/Cross Ventilation and Wind Environment/Air-pollution. Advanced education and research on wind engineering will be conducted by effectively integrating the activities of three groups under the umbrella of the TPU: WERC, whose primary charter is to conduct research and to organize international conferences, symposiums and workshops; the APEC Wind Hazard Mitigation Center (WHMC), which provides education and training to young researchers and engineers; the Wind Engineering Information Center (WEIC), which issues publications, disseminates research reports, experimental databases and educational materials, and provides wind engineers around the world with a leading comprehensive information exchange network.

A novel feature of the GCOE is that it will develop a virtual organization utilizing a cyber-based infrastructure to share intellectual and physical infrastructures among participating member countries and organizations through its collaboration with UND. This infrastructure, named VORTEX-Winds (Virtual Organization for Reducing the Toll of EXtreme Winds on society), will house design and analysis modules and knowledge bases involving, for example, aerodynamic databases, wind resistant design databases, and wind hazard databases pooled together from different participants, and development of windwiki for advancing research, knowledge and education in a cyberspace. The development of VORTEX-Winds will offer additional cyber-based means of communication among various groups. Thus, GCOE will help establish global wind engineering initiatives that will transcend economic, cultural and technological boundaries among nations.

Many important activities initiated by the 21st Century COE Program will be continued. GCOE plans to take on a leadership role in international wind engineering activities by holding around 20 international conferences, symposia and workshops over the next five years, including: the International Symposium on Wind Engineering (ISWE, 3 times), International Workshop on Natural Ventilation (IWNV, 3 times), Workshops on Regional Harmonization of Wind Loading and Wind Environmental Specifications in Asia-Pacific Economies (APEC-WW, 4 times) and Korea-Japan Joint Meeting on Wind Engineering (JaWEiK, 4 times). Regarding the educational programs, in order to develop an exceptional cadre of human resources, the WHMC plans to hold Open Seminars around 20 times a year and to introduce International Internship Programs for PhD students (8 persons a year), Short-term Fellowships (for 3 months, 10 persons a year), and an International Advanced School in Wind Engineering (week-long, once a year). For information and knowledge dissemination, the WEIC has been publishing Newsletters (quarterly, in Japanese) and Bulletins (biannual, in English). Electronic Aerodynamic Databases, Wind Hazard Databases, and Natural Ventilation Databases have been established and disseminated via the WEIC web site. Wind Engineering IT Contents including streaming services of Open Seminars and so on are also available to anybody via the web site.

The members of the GCOE team will do their best to achieve the targeted objectives to realize a safe and secure society, to preserve natural resources and to improve environmental conditions around the world. In this context, we are hoping that like the COE in the past years, we can count on your kind and enthusiastic cooperation.

Next Frontiers of Education and Research in Wind Engineering: A Cyberinfrastructure Perspective

Ahsan Kareem, University of Notre Dame
Tracy Kijewski-Correa, University of Notre Dame
Yukio Yamura, Tokyo Polytechnic University

Wind-related catastrophes inflict enormous devastation on the built environment and result in a staggering number of fatalities, which may continue to rise in the future given the increase in exposure as population migrates towards the coasts. To better manage the impact of extreme wind events, given the heavy reliance on empirical and experimental data in the design process, a new paradigm is required utilizing shared resources and global collaborations. An engineering virtual organization (EVO) would enable such a paradigm shift by offering real-time shared access to geographically dispersed resources for more effective research and education to achieve improved understanding and modeling of wind effects on structures. This report summarizes such a program initiated by the authors to develop an EVO that serves the international community under the sponsorship of the Global Center of Excellence at the Tokyo Polytechnic University.

Despite many advances in the area of wind effects on structures in recent decades, research has been conducted with limited resources scattered physically throughout universities, government, and private research laboratories as well as industry and trade organizations. With the trend toward increasingly complex designs such as free form architectures and the escalating potential for losses in coastal communities, the old paradigm is no longer optimal and requires the pooling of resources through a virtual organization reliant on cyberinfrastructure (CI). By centralizing tools and services within a flexible CI architecture to support research and education objectives in real-time, this synergistic, integrative approach offers efficacious tools that the community can use to minimize windstorm damage and meet the challenges posed by burgeoning emergence of wind-sensitive structures in expanding urban and suburban locales.

In order to mitigate escalating damage to property, loss of lives and disruption of local economies, a new research, teaching and design paradigm is proposed addressing wind effects on structures through the formation of a virtual organization utilizing integrated cyberinfrastructure technologies. Wind hazards would particularly benefit from this paradigm given the reliance on experimental and empirical data in the design process. The following sections detail a Virtual Organization for Reducing the Toll of EXtreme Winds (VORTEX-Winds), its overall vision and various levels of functionality of a prototype EVO under development. It encompasses real-time shared access to geographically dispersed resources, as well as providing a publicly accessible knowledge-base.

The basic vision of VORTEX-Winds is the development of a comprehensive gateway for research and education to achieve improved understanding and modeling of wind effects on structures to counter the escalating loss of property and associated indirect losses and the increase in the sensitivity of emerging structural systems in urban areas to winds. In response to this vision, the authors have established a virtual organization employing integrated cyberinfrastructure-based system that facilitates real-time, shared access to integrated design aids and services using geographically dispersed databases, specialized design/analysis tools, experimental facilities and full-scale monitoring networks, as well as providing a knowledge-base, with the following goals:

(i) To establish and sustain a community contributing to and employing the resources integrated by cyberinfrastructure technologies to facilitate the

mitigation of escalating damage, loss of lives and disruption of local economies posed by wind;

(ii) To enhance analysis and design capabilities to address the challenges of innovative structural systems needed to realize, in a cost effective manner, buildings with ever increasing heights, bridges that span oceans, and offshore platforms tapping hydrocarbons in deeper waters exposed to weather extremes like hurricanes;

(iii) To facilitate education and training of the future workforce in the field so that the growing competition in the global market is met through a cadre of well trained professionals and educators.

The EVO structure is conceptually defined in Figure 1 as having two branches: the e-analysis and design modules and the Knowledge Base. The e-analysis and design modules are contributed from a number of universities, research centers and laboratories, based on their own independent work, and will be classified into six divisions. These six divisions are *Database-Assisted Design, Full-Scale/Field Site Data Repository, Statistical/Stochastic Toolboxes, Tele-Experimentation Services, Uncertainty Modeling, and Computational Platforms.* Examples of the modules offered within each of the divisions are also shown in Figure 1. The modules can be interrogated independently or automatically queried and input into an integrated analysis and design approach. In Figure 2, an example of an integrated analysis and design framework is presented.

The second branch of VORTEX-Winds is the knowledge base intended to aggregate and centralize the shared knowledge of the collaboratory. Services in this area include the virtual encyclopedia or *wind-wiki* encompassing basic terminology and concepts pertaining to wind-structure interaction, a *damage database* (curated archives of post-disaster reconnaissance), a *help desk*, where users can submit a question to the collaboratory and where past responses are archived as FAQs, *bulletin boards* hosting open discussions, *email list servers* for

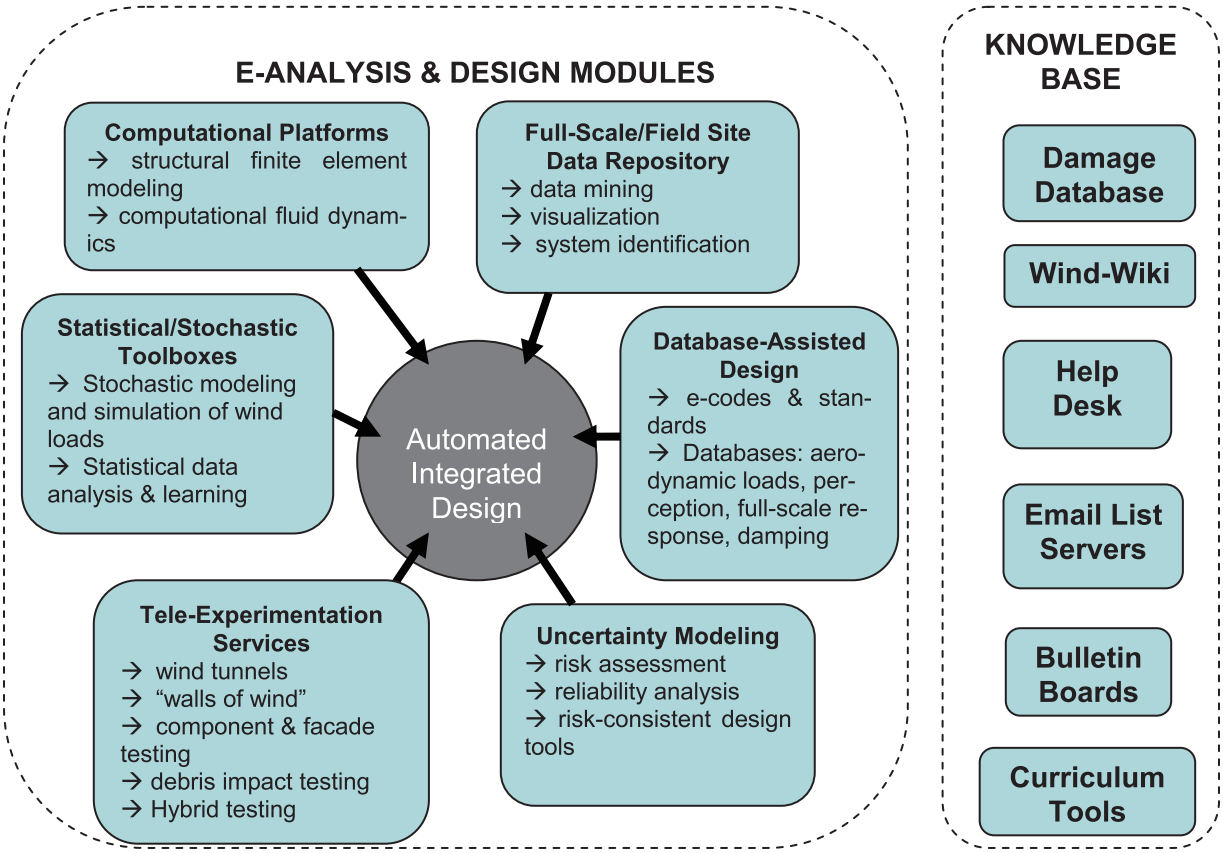

Figure 1. Schematic of VORTEX-Winds Capabilities.

rapidly circulating announcements and other information, and *curriculum tools* to provide educators a means to formally integrate EVO services into their teaching. The knowledge base material will be broadly classified into 5 major areas: *Engineering Micrometeorology; Aerodynamics/Aeroelasticity; Structural Dynamics; Experimental Methods; Performance Evaluation* (encompassing Risk/Reliability and Codes/Standards).

The initial membership of the EVO has already been populated many of the world's leading universities, research centers and laboratories specializing in wind effects on structures. A select group of end users and stakeholders have also been identified and will help to drive the services and features of the EVO and beta-test the prototype developed. These private sector end users are leading design firms, and the stakeholders include major professional organizations. In addition, an educational end user community has been assembled to evaluate the EVO's suitability as an academic resource.

Through a collection of tools and services networked with a flexible architecture and interfaces to support research and education objectives in real-time, VORTEX-Winds promises to enhance the capability of each individual participant beyond their current resources through a synergistic, integrative approach to understanding and modeling the complex wind-structure interactions. The result will be a community as a whole better positioned to address the next frontiers in the field. Accordingly, VORTEX-Winds will serve as an end-to-end system that integrates global community resources related to wind effects on structures. It will facilitate an effective, transformative, and conveniently accessible venue for the acceleration of advances in research and development, as well as teaching and learning, in this area and would have a revolutionary impact on this field due to its unprecedented dissemination of knowledge and resources.

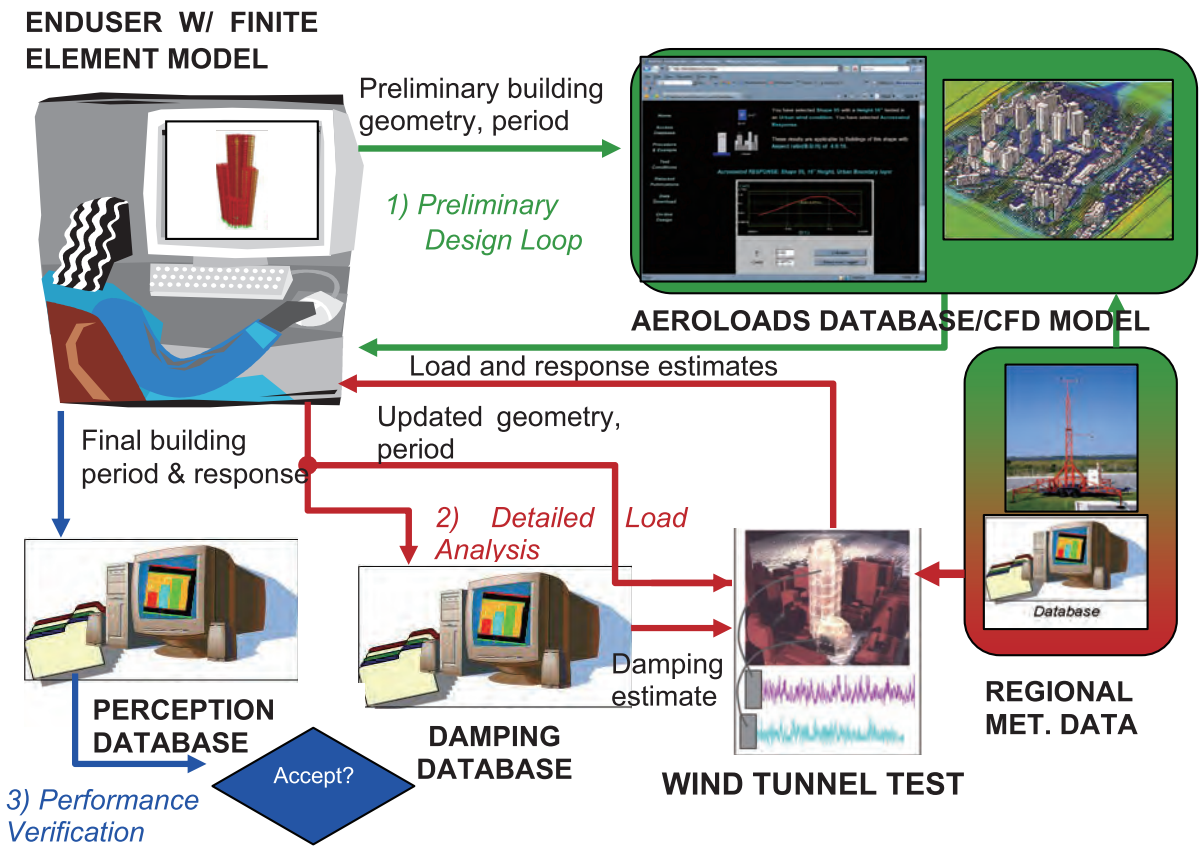

Figure 2. Schematic of Integrated Analysis and Design Concept.

Abstract of the Global COE Program: New Frontier of Education and Research in Wind Engineering

Purpose of base formation

85% of economic losses due to natural hazards in the world are caused by wind damage. Losses from tornado and other gusts, as well as from typhoons, have been increasing. The relationship between global warming and those disasters has also been discussed. It is particularly critical for Japan and Asia to mitigate wind damage, because they have large cities with closely spaced tall buildings and high-density residential areas where the majority of buildings are of wood. Typhoons and cyclones have frequently caused damage to cities and buildings, and the resulting large losses have greatly impacted society. Rapid urbanization and population concentration accompanying economic growth in China, etc. have become a cause of global environmental deterioration. Thus, establishment of a sustainable society with decreased energy consumption and environmental load is an urgent task.

While the world has faced increasing strong-wind disasters caused by typhoons, tornadoes, etc., construction of super-high-rise buildings continues in Asia and the Middle East. An example is the Burji Dubai project. Thus, in order to ensure human/social safety and global environmental sustainability, it will be necessary to promote relevant technology improvement. To this end, the global nature of interdisciplinary wind engineering needs to be fully understood.

The proposed Center will carry out education/research programs on the following areas: mitigating strong-wind disasters (wind-resistant design field), conserving natural resources by utilizing natural energy (natural cross ventilation field), and Ensuring global environmental sustainability (wind environment air pollution field).

The Center will establish EVO (Engineering Virtual Organization) and VORTEX- Winds (Virtual Organization for Reducing Toll of Extreme Winds), which will integrate the work of research institutes all over the world via an information infrastructure. It will also develop a more advanced education/research system. This will more effectively promote the shift from center-based to center-to-center-based education/research on a global scale, which the applicant center has previously recommended.

Consequently, the proposed Center aims to establish a long-life recycling-oriented urban system and to realize a reliable, safe global environment by mitigating wind hazards. It also aims to establish VORTEX-Winds, which is a global education/research system designed to improve the quality of engineering education/research institutes around the world.

Research base formation execution plan

The proposed Center will effectively organize specialists from three fields: wind-resistant design, natural/ cross ventilation and wind environment/air pollution. Then, it will holistically carry out education and research on wind effects on buildings and the urban environment.

In the wind-resistant design field, the Center will carry out research on topics such as high mobility wind observation aimed at mitigating typhoon and tornado disasters, GPS wind response monitoring/ networking aimed at ensuring building safety, and rational wind-resistant design utilizing EVO.

In the natural/ cross ventilation field, the Center will aim to realize a long-term society with small environmental load. It will research methods for designing natural cross ventilation that efficiently utilizes natural draft energy to reduce consumer ventilation energy. It will also develop a hybrid system for dehumidifying/cooling using natural draft and radiated heat by taking advantage of the meteorological conditions of the Asia-Pacific region.

In the wind environment/air pollution field, the Center will research countermeasures to the heat island problem, which is serious in Asian countries. It will also research countermeasures to heat exhaust and air pollution problems for urban areas where the pollution sources are both internal and external.

Educational execution plan

The basic philosophy is love. Education and research in the fields of wind-resistant design, natural cross ventilation and wind environment/air pollution are based on love of human beings, global resources and the atmospheric environment.

To develop truly capable international human resources from graduate students, the Center will hold open seminars 20 times a year and will implement international internship programs for PhD students (8 persons a year),

short-term fellowships (for 3 months, 10 persons a year), and an international advanced school on wind engineering (for a week, once a year).

In addition, the Center will provide a global reformative CI learning system using VORTEX-Winds, and will establish a creative curriculum and improve the quality of educational research centers: not only the proposed Center but also other centers around the world. With this educational system, the Center aims at supplying society with students, engineers and researchers who are fully capable of handling wind loading/environmental evaluation methods, experimental methods, simulation, modeling, etc. as well as achieving international leadership in exploring new frontiers of wind engineering.

Report on “the Third International Symposium on Wind Effects on Buildings and Urban Environment” (ISWE3)

Date: March 4-5, 2008

Venue: Tokyo Station Conference, Tokyo, Japan

The Third International Symposium on Wind Effects on buildings and Urban Environment was held at the Tokyo Station Conference, Tokyo, Japan over two days from March 4 to 5, 2008. The first was from March 8 to 9, 2004 in Tokyo, and second was on September 15, 2005 in Seoul, South Korea.

This latest symposium was entitled "New Frontiers in Wind Engineering", and focused on future development of wind engineering in both research and education.

It comprised 18 invited lectures and 10 general presentations. 106 people participated in the ISWE3 and it was very successful. We wish to express our gratitude to the many speakers, audiences and staffs.

Six lectures are taken up from the invited lectures and their outline is introduced.

Michele Calvi , "Innovative approaches to advanced education and multi disciplinary research"

Prof. Michele Calvi (Pavia University) introduced “innovative approaches to advanced education and multi disciplinary research” at “ROSE School” (www.roseschool.it), a graduate school in earthquake engineering and engineering seismology started in the year 2000 in Pavia University, Italy. The school system was highly innovative, with intensive courses of about seventy hours of lectures and tutorials taught in series rather than in parallel: each course had an approximate duration of one month, with each student taking only one course at a time. This system allowed top professors and researchers to come for four or five weeks, with little interaction with their standard activities, and with an essentially full dedication to students for the duration of the course. The faculty resulted therefore to be completely international (Figure 1) and the same happened to be the case of the students (Figures 1 and 2). They have application from more than one hundreds different countries and the rate of admission has been lower than 10%.

He discussed the interaction between advanced education and high-level research to provide an appropriate environment for the scientific growth of people and ideas. Effects of globalization, e-knowledge and e-learning, long distance interaction and human relations are considered. In this framework, large scale multi-disciplinary projects are individuated as appropriate viable tools for the progress of technology, science and culture.

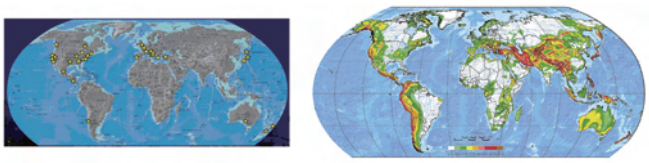

Figure 1. Provenience of the ROSE School Faculty members (left) and of the ROSE School students (right, reported on a world seismic hazard map)

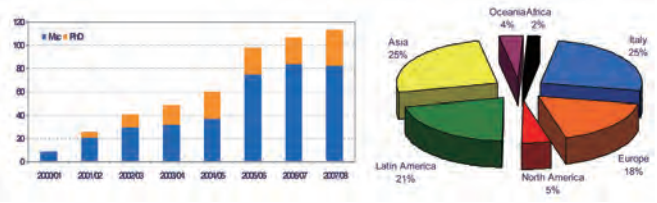

Figure 2. Evolution of the number of students of the ROSE School (left) and area of provenience in percentage of the total (right).

Bernd Leitl, "Quality assurance of urban flow and dispersion models - new challenges and data requirements"

Dr. Bernd Leitl of University of Hamburg talked about “Quality assurance of urban flow and dispersion models - new challenges and data requirements”. Numerical modeling is a commonly accepted tool for predicting wind

flow and pollutant dispersion in urban areas. In order to assure the quality of micro-scale meteorological models predicting flow and dispersion modeling in urban and industrial areas, a COST action 732 has been launched. The main objective of the COST 732 is to develop and establish a commonly accepted model evaluation procedure and to provide data qualified for model validation purposes. Dr. Leitl also introduced wind tunnel experiments and field measurements to provide reliable data for validation of numerical models.

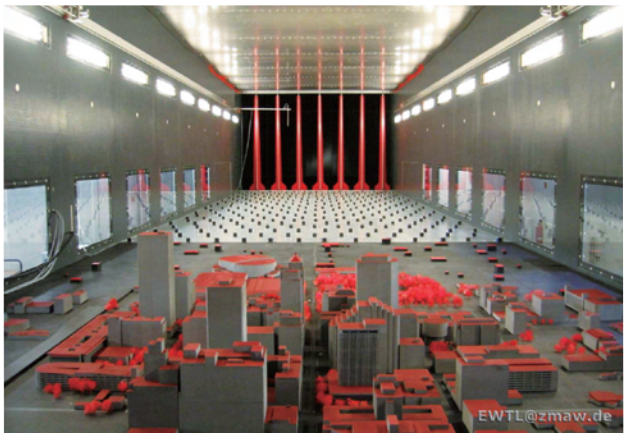

Figure 3. The 1:300 scale model of the Central Business District of Oklahoma City, mounted in the test section of the large boundary layer wind tunnel at EWTL.

Giovanni Solari, ”The Wind Engineering and Structural Dynamics Research Group at the University of Genoa: retrospective, current plans and some prospects”

Prof. Giovanni Solari (University of Genoa) presented the following lecture. The University of Genoa has participated in the plentiful activity during about the last thirty years, contributing to research, applications, education and co-operation in the broad field of wind engineering. Such contributions can be framed into three successive periods, indicatively corresponding to a decade each. The period from the end of the ‘70s to the beginning of the ‘90s is characterized by the first researchers carried out by the author on the wind-excited response of structures and on the wind climate, the first applications to real structures, and the first contributions to the codification sector. The period from the beginning to the end of the ‘90s is dominated by the establishment of the first core of a research group aimed at widening its interests in wind engineering; it is also characterized by the development of a growing number of research contracts, and first contributions given by the author to the International Association for Wind Engineering and first contributions given by the author to IAWE. In the period from the end of the ‘90s to today the Wind Engineering and Structural Dynamics Research Group is enhanced with new young members and the contribution of a growing number of Italian and foreign students; the involvement of the author and his research group in IAWE management assumes a determinant role, as well as the development to new laboratories. Based on a retrospective of its development and experiences, and the international progress and evolution, the wind Engineering and Structural Dynamics Research Group at the University of Genoa is planning its future activities in the prospect of further advances under manifold viewpoints.

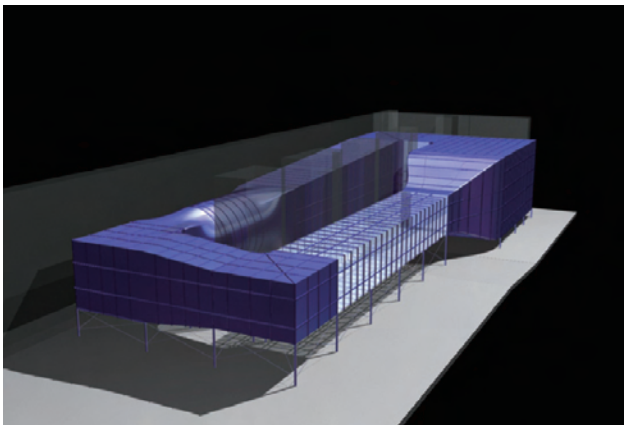

Figure 4. New wind tunnel facility in University of Genoa

Kishor Mehta, "Wind damage using satellite images and education experiment"

P.W. Horn Prof. Kishor Mehta (Texas Tech University) presented the following lecture. Under the sponsorship of the U.S. National Science Foundation’s Integrated Graduate Education and Research Training (IGERT) program, a doctoral degree curriculum in Wind Science and Engineering has been developed. After an experimental period of five years, the curriculum has been upgraded and is now a part of Texas Tech University’ s degree program. The curriculum has been formally

approved by the Texas Higher Education Coordinating Board. The goal of this unique degree program is to develop individuals with an appreciation of, and the ability to execute and lead multidisciplinary wind-related analysis, design and risk management assessment. Wind-related problems can be mitigation of damage caused by extreme winds of hurricanes and tornadoes, reduction of vibrations in tall buildings and long bridges caused by wind, or utilization of the beneficial effects of wind such as energy production and pollution dispersion. The curriculum includes course work in several disciplines, an external internship, multidisciplinary research and opportunities for professional development.

Figure 5. Curriculum on windstorm damage analysis

Chii-Ming Cheng, "e-wind: An integrated engineering solution package for wind sensitive buildings and structures"

Prof. Chii-Ming Cheng presented on “e-wind : An Integrated Engineering Solution Package for Wind Sensitive Buildings and Structures” which is a IT-incorporated project proceeded in the Wind Engineering Research Center of Tamkang University. Figure 6 illustrates the configuration of e-wind. It consists of three major components: An on-line program for education and applications of building wind code, aerodynamic databases for building design wind loads and an on-line real time scheme for pedestrian comfort assessment. There are tree pillars to support e-wind: abundant wind engineering substances, appropriate IT keys to integrate the wind engineering components, and the latest information and web technologies to facilitate the user friendliness and easy accessibility. Currently, they have completed the aerodynamic database for isolated tall buildings, aerodynamic database for the interference effects of two adjacent tall buildings, and they are making the aerodynamic database for low rise buildings, hemispherical domes and other structures. An e-wind system for education and prediction of wind load on high-rise building has been achieved.

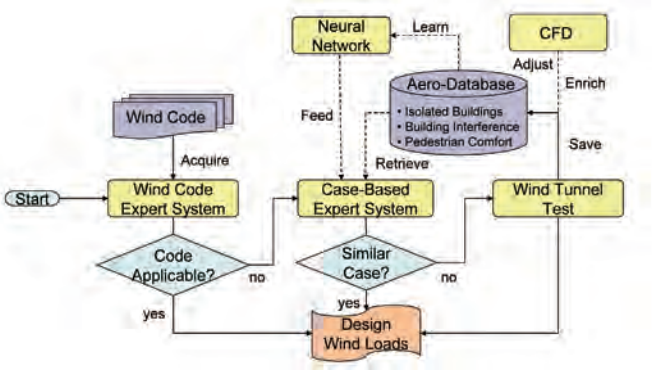

Figure 6. Configuration of e-wind

Yaojun Ge , "Dynamic hazard evolution of major engineering structures"

Prof. Yao Jun Ge of Tongji University introduced a major NSFC (Natural Science Foundation of China) program entitled “Dynamic hazard evolution of major engineering structures - with special interest in aerodynamic hazard” that starts from 2007. Recently China built many large scale structures, which possibly suffer the hazards from severe earthquake and strong wind or typhoon. How to improve the science and technology for disaster mitigation becomes a key issue for the civil engineering community. Major engineering structures related to wind engineering are long-span bridges, super high-rise buildings and large space structures. Key supporting program projects selected in 2007 are: (1) Wind Flow Field and Structural Damage Characteristics of Landing Typhoons (2) Key Effects and Process Control of Wind-Induced Hazards for Super Long-Span Bridges (3) Wind Loading, Wind Induced Effects and Control of Super High-Rise Buildings. These projects will focus on the research of theoretical model of strong wind, effects of nonlinear, non-steady, coupling and others between wind-structure interaction and simulation and control of hazard evolution.

Report of "The Fourth International Conference on Advances in Wind and Structures" (AWAS2008)

Date: May 29-31, 2008
Venue: Seogwipo KAL Hotel, Jeju, Korea

Fourth International Conference on Advances in Wind and Structures (AWAS IV) was held in Seogwipo KAL Hotel, Jeju Island, Korea from 29th to 31th May.(Photo. 1)

Jeju Island is a volcanic island located in the southernmost part of South Korea. Because of its warm climate, it is called "Oriental Hawaii". However, the influence of monsoon and Halla mountain (center of the island) produces strong winds.

Jeju Island is an appropriate location for a conference on wind engineering because, as all wind engineers know, it generates a karman vortex.

This conference was chaired by Prof. Chang-Koon Choi (Korean Advanced Institute of Science & Technology (KAIST), Korea) and John D. Holmes (JDH Consulting, Australia) and organized by KAIST, the Wind Engineering Institute and the Korean Institute of Construction Technology.

More than 150 people participated, and 13 keynote lectures and 150 technical papers were presented in 24 technical sessions during the conference.

The titles of the keynote lectures were:

- John D. Holmes, "Windborne Debris and Damage Risk Models: a Review"
- Masaru Matsumoto, "Mechanism of and How to Suppress Wind-induced Vibration of Inclined Cable of Cable-stayed Bridges"
- Young-Duk Kim, "Experimental and Numerical Study on Wind-induced Noise of Thin ColumnsNear Wake Instabilities and Vortex Structures of Three-Dimensional Bluff Bodies: A Review"
- R.P. Selvam, "Adaptive Stabilized hp-FEM and Large Eddy Simulation for Wind Engineering"
- Jiming Xie, "Progress of Wind Tunnel Techniques for Practical Applications"
- T. Stathopoulos, "On the Use of CFD for Modelling Air Pollutant Dispersion around Buildings"
- Y.L. Xu, "New Frontiers in Wind and Structural Health Monitoring of Long Span Bridges"
- K.C.S. Kwok, "Occupant Comfort Test Using a Tall Building Motion Simulator"
- A. Mochida, "D evelopment of CFD Model for Reproducing Aerodynamic Effects of Moving Automobiles in Street Canyon"
- A. Larsen, "Aerodynamic Stability and Vortex Shedding Excitation of Suspension Bridges"
- M. Ohba, "Studies on Wind-induced Natural Ventilation Using Steady and Unsteady CFD Methods"
- M. Gu, "Interference Effects of Tall Buildings under Wind Action"
- S.D. Kwon, "Aerodynamic Design of Long-Span Bridges in Korea"

Photo 1. Seogwipo KAL Hotel (Conference site)

Photo 2. Opening speech by Prof. C. K. Choi

Announcement

Future events are scheduled as follows.

- Cooperative Actions for Natural Disaster Risk Reduction-
4th International Symposium “Wind Effect on Buildings and Urban Environment”

Date: March 4-5, 2009
Venue: U-Thant Hall, UN University, Tokyo, Japan
Co-hosted by: International Association for Wind Engineering (IAWE)
UN University, UN/ISDR, TPU-GCOE program

3rd International Workshop on Natural Ventilation

Date: March 16, 2009
Venue: AIJ Hall, Tokyo, Japan
Co-hosted by: Tokyo University of Science, TPU-GCOE program, Building Research Institute,
National Institute for Land & Infrastructure Management

Contact Information: Global COE Program Office, Tokyo Polytechnic University
1583 Iiyama, Atsugi, Kanagawa, 243-0297, Japan
Email: gcoe_office@arch.t-kougei.ac.jp
Tel/Fax: 046-242-9658
URL: http://www.wind.arch.t-kougei.ac.jp/

GCOE Program TPU
New Frontier of Education and Research in Wind Engineering

Executors of the Global COE Program
New Frontier of Education and Research in Wind Engineering

Director			
Yukio Tamura	Professor	Educational program for wind engineering	yukio@arch.t-kougei.ac.jp
Ahsan Kareem	Professor	Technology related to EVO	kareem@nd.edu
Masaaki Ohba	Professor	Design method for natural/cross ventilation	ohba@arch.t-kougei.ac.jp
Takashi Ohno	Professor	wind resistant construction	oono@arch.t-kougei.ac.jp
Ryuichiro Yoshie	Professor	Heat exhaust and air pollution in urban area	yoshie@arch.t-kougei.ac.jp
Kunio Mizutani	Professor	Natural ventilation dehumidifying system	mizutani@arch.t-kougei.ac.jp
Takeshi Ohkuma	Invited Professor	Wind resistant design method	ohkuma@arch.kanagawa-u.ac.jp
Masahiro Matsui	Professor	Engineering simulator for tornado-like flow	matsui@arch.t-kougei.ac.jp
Akihito Yoshida	Associate Professor	Develop wind response monitoring network	yoshida@arch.t-kougei.ac.jp

Wind Engineering Research Center
Graduate School of Engineering
Tokyo Polytechnic University
1583 Iiyama, Atsugi, Kanagawa, Japan 243-0297
TEL & FAX：+81-046-242-9658
URL：http://www.wind.arch.t-kougei.ac.jp/

ISBN 4-902713-31-4