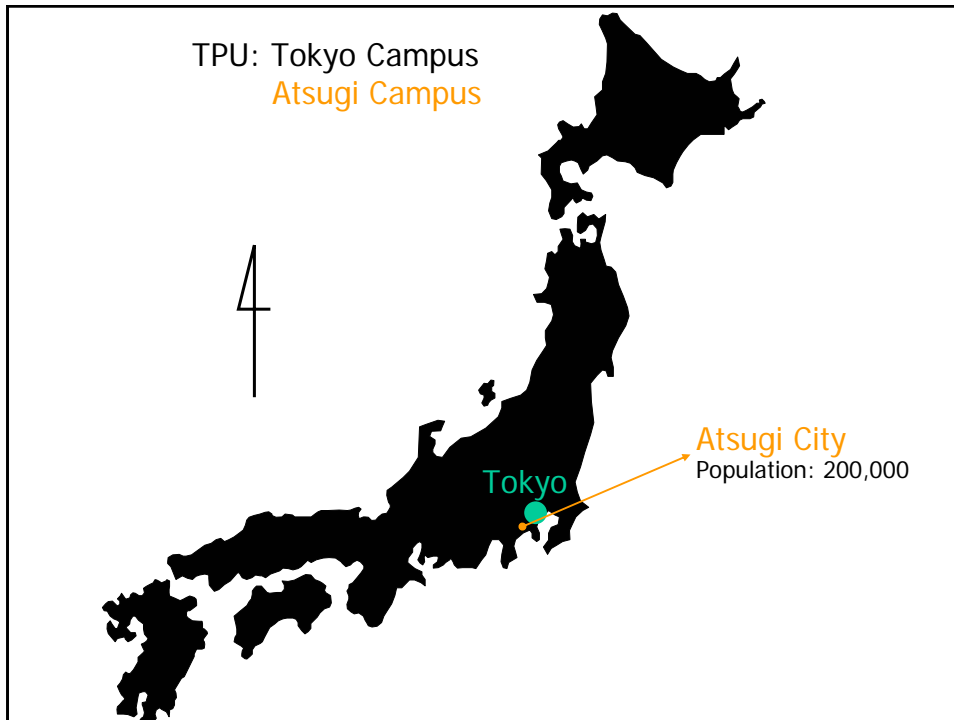


# Introduction

## The 21st Century COE Program Wind Effects on Buildings and Urban Environment

Tokyo Polytechnic University  
Wind Engineering Research Center



## **Support by Government for Establishing World Leading Research Core (COE)**

- **The 21st Century Center of Excellence Program was proposed by Ministry of Education, Culture, Science, Sports and Technology (MEXT).**
- **Twenty-three groups have been awarded in “Engineering” field including civil engineering.**

## **Support by Government for Establishing World Leading Research Core (COE)**

- **Financial Support with Overriding Priority from the MEXT for 5 FYs from 2003**

## Support System by University for Establishing World Leading Research Core

- Increase of Faculty Staffs for Wind Engineering Research
- Enforcement of Post Doctoral Fellowship
  - Employment as COE Researchers
- Enforcement of Graduate Course
  - Full Financial Support to PhD Students

## Under the Strong Leadership by the University President

Advisory Board Committee  
Chaired by the University President

COE Administrative  
Office

Wind Engineering  
Research Center

## **Advisory Board Committee**

**Prof. Ken'ichi Honda** Former President  
(Chairman) Tokyo Polytechnic University

**Prof. Nobuyuki Kobayashi** President  
Tokyo Polytechnic University

**Prof. Ahsan Kareem** University of Notre Dame

**Prof. Jian-ming Ko** Hong Kong Polytechnic  
University

**Prof. Masaru Matsumoto** Kyoto University

**Prof. Shuzo Murakami** Keio University

**Prof. Giovanni Solari** University of Genova

## **Wind Effects on Buildings and Urban Environment**

**Yukio Tamura** Professor (Director)

**Masaaki Ohba** Professor

**Ryuichiro Yoshie** Professor

**Takashi Ohno** Professor

**Takeshi Ohkuma** Guest Professor

**Masahiro Matsui** Associate Professor

**Kazuhide Itoh** Assistant Professor

## Research Staffs belonging to TPU WERC

**Dr. S. Cao** COE Associate Professor  
**Mr. A. Yoshida** Research Associate  
**Dr. S. C. Yaragal** COE Researcher  
**Dr. C.H. Hu** COE Researcher  
**Dr. Y. Quan** COE Researcher  
**Dr. T. Goto** COE Researcher  
**Dr. H. Tanaka** COE Researcher  
**Dr. J. K. Upadhyay** (Academic Frontier)  
**Dr. Zhihong Zhang** (Academic Frontier)

## Wind Effects on Buildings and Urban Environment

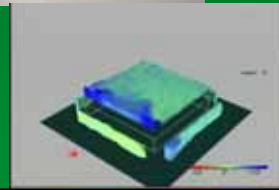
### ■ Organization of Apex Research Core in TPU Wind Engineering Research Center



# Wind Effects on Buildings and Urban Environment

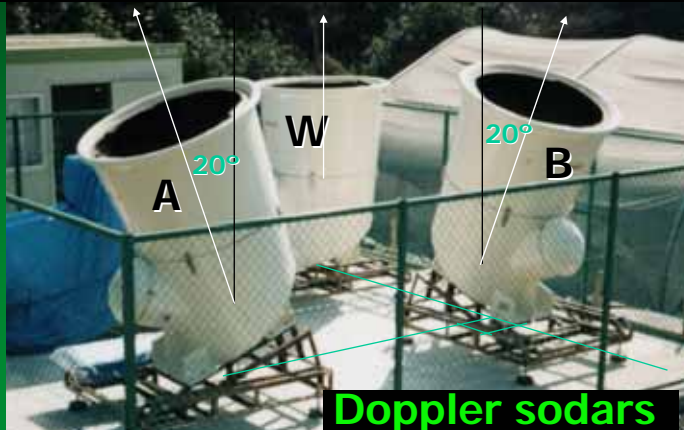
## ■ Organization of Apex Research Core in TPU Wind Engineering Research Center

### 7 Wind Tunnels for Different Purposes



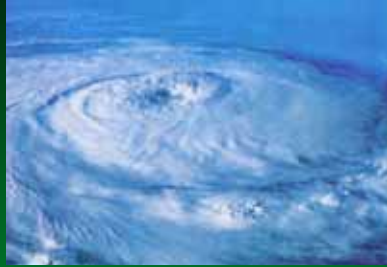
# Wind Effects on Buildings and Urban Environment

## ■ Organization of Apex Research Core in TPU Wind Engineering Research Center



# Wind Effects on Buildings and Urban Environment

## ■ Wind Damage . . .



# Wind Effects on Buildings and Urban Environment

## ■ Wind Damage . . .



# Wind Effects on Buildings and Urban Environment

## ■ Pedestrian Level Winds . . .



Courtesy of Adam Goliger

# Wind Effects on Buildings and Urban Environment

## ■ Air Pollution . . .

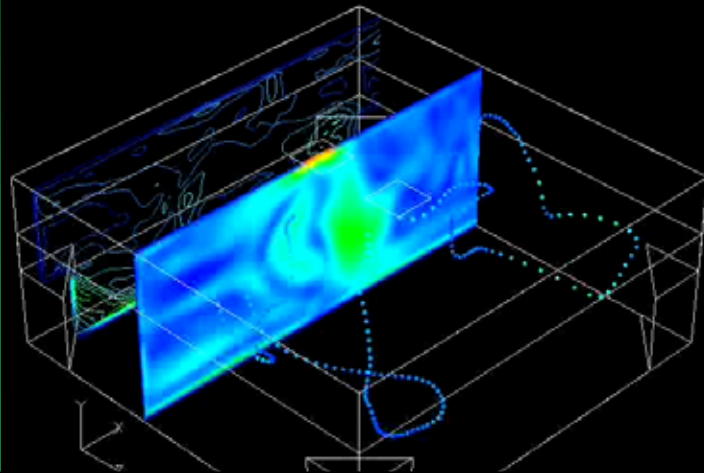


Courtesy of Adam Goliger



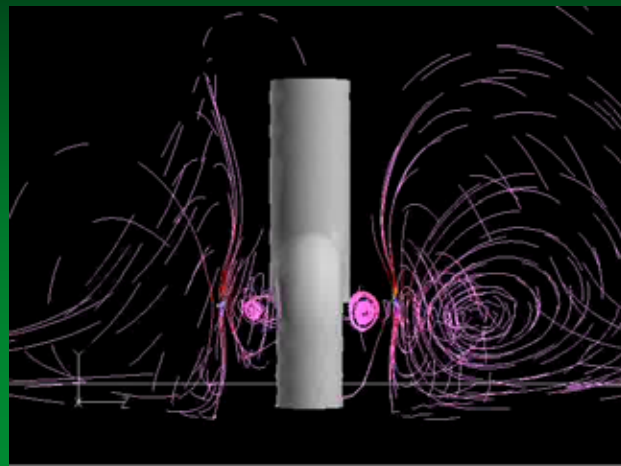
# Wind Effects on Buildings and Urban Environment

## ■ Natural Ventilation . . .



# Wind Effects on Buildings and Urban Environment

## ■ Indoor Air Quality . . .



## Wind Effects on Buildings and Urban Environments Research Projects

**Wind Hazards**

**Strong Winds**

### Project 1: Wind Hazards Mitigation

- ✧ Wind Resistant Design Methods  
Design Wind Speed , Aerodynamic Data , Dynamic Responses
- ✧ Health Monitoring System
- ✧ Urban Wind Disaster Mitigation System

**Wind Environment**

**Weak Winds**

### Project 2: Design Methods of Natural/Cross Ventilation

- ✧ Sustainable design methods of outdoor/indoor air environment
- ✧ Reduction of Energy Consumption

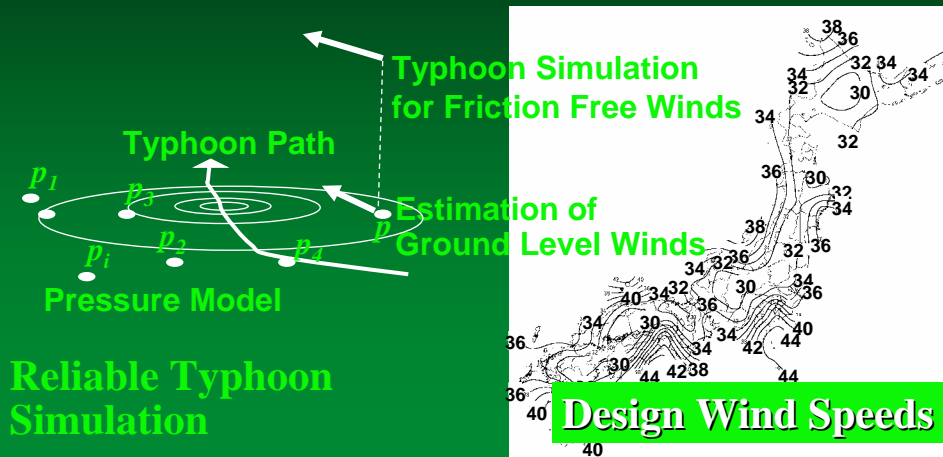
### Project 3: Air Pollution and Its Assessment System

- ✧ Air Pollution Inside Buildings / Sick House
- ✧ Discharged Gas in Urban Area

## Project 1: Wind Hazards Mitigation

Research Topics in 2003 FY

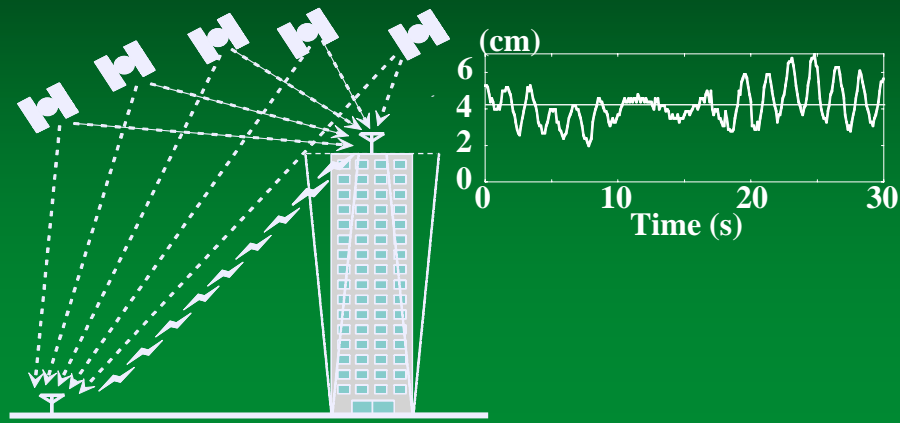
### ■ Pressure model around Japan due to typhoons



# Project 1: Wind Hazards Mitigation

Research Topics in 2003 FY

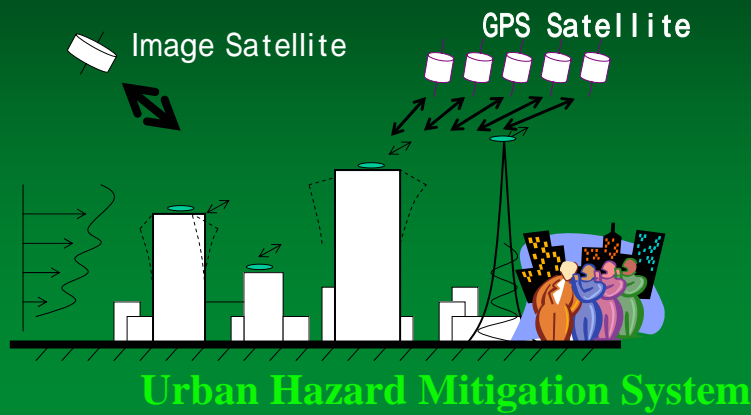
- GPS monitoring of building responses



# Project 1: Wind Hazards Mitigation

Research Topics in 2003 FY

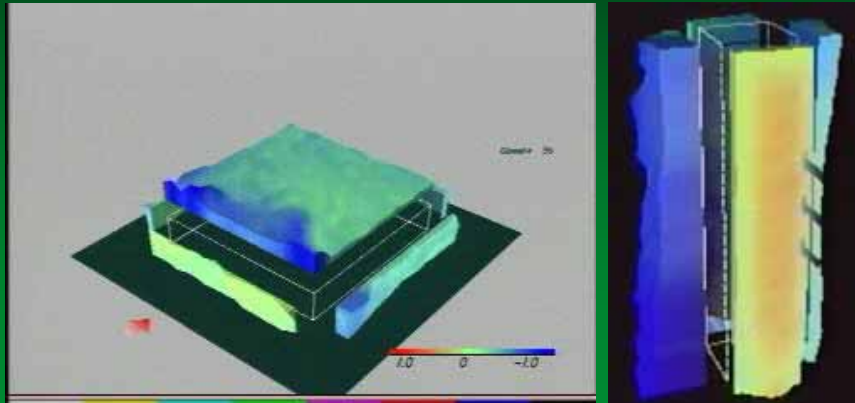
- GPS monitoring of building responses



## Project 1: **Wind Hazards Mitigation**

Research Topics in 2003 FY

- **Aerodynamic database**



## Project 1: **Wind Hazards Mitigation**

Research Topics in 2003 FY

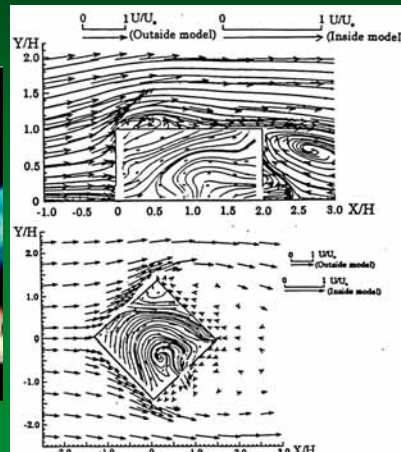
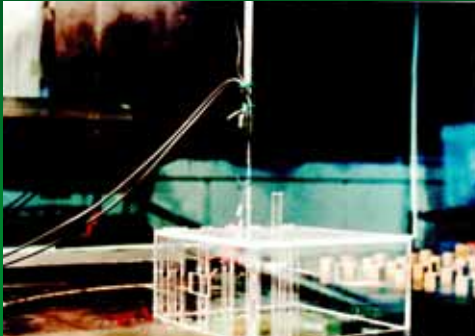
- **Wind resistant design method for roof systems**



## Project 2: Design Methods of Natural / Cross Ventilation

Research Topics in 2003 FY

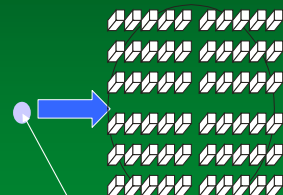
- Investigation of complex flow fields around openings



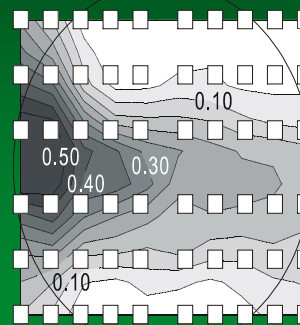
## Project 3: Air Pollution and Its Assessment System

Research Topics in 2003 FY

- Wind tunnel tests on contaminant diffusion or dispersion around buildings for e-database



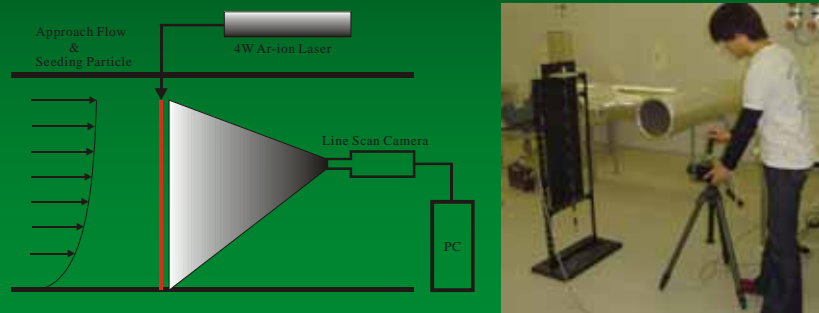
Source of Pollutants



# Project 3: Air Pollution and Its Assessment System

Research Topics in 2003 FY

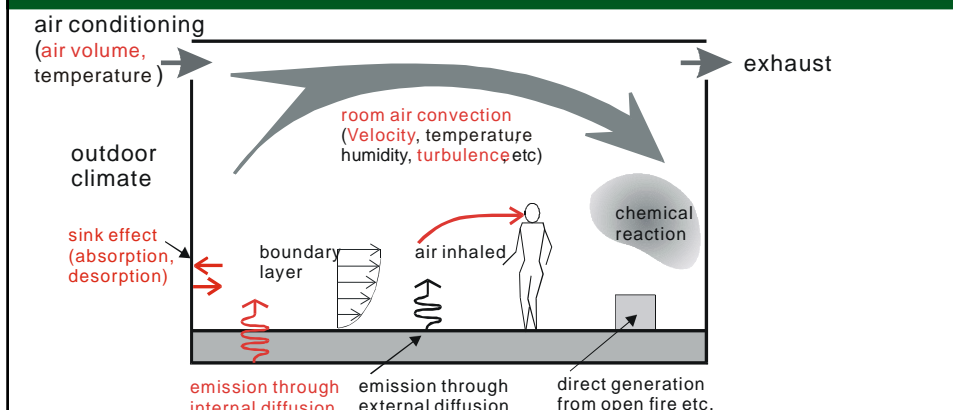
- Development of simple measurement system of fluctuating concentration using image-processing technique



# Project 3: Air Pollution and Its Assessment System

Research Topics in 2003 FY

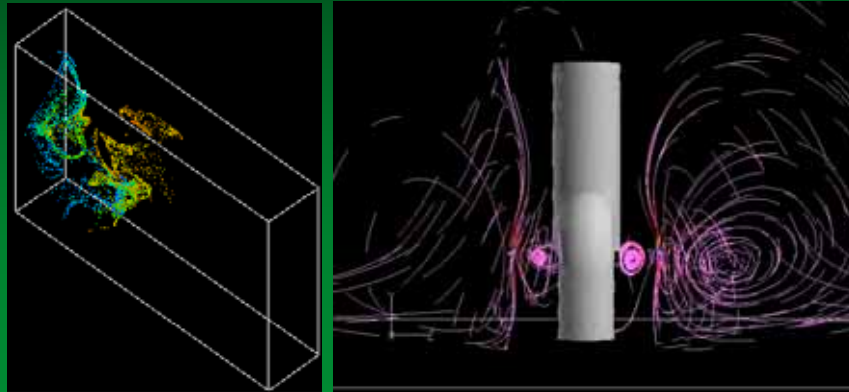
- Study on emission and diffusion process of pollutants from building materials in a room



## Project 3: Air Pollution and Its Assessment System

Research Topics in 2003 FY

- Study on emission and diffusion process of pollutants from building materials in a room



## Establishment of Research and Education Apex Center

- Wind Engineering Research Center acts as a kernel
- Establishment of APEC Wind Hazard Mitigation Center
- Wind Engineering Information Center
- Organization of International Symposium / Seminars
- Post Doctoral Fellowship / Short Term Fellowship / Financial Support to PhD Students
- Promotion of International Collaboration / Information Exchange

## Wind Effects on Buildings and Urban Environment

### ■ “Wind Engineering Research Center”

- Researches on Wind Effects
- International Seminar, Workshops
- International Collaborative Works
- International Exchange of Researchers

### ■ “APEC Wind Hazard Mitigation Center”

- Establishment of APEC-Researcher-Network
- Receipt & Education of Young APEC Engineers
- Realistic Wind Resistant Construction Methods

### ■ “Wind Engineering Information Center”

- Transmission of Information for Research & Education of Wind Effects
- Establishment & Disclosure of Aerodynamic Electronic Database

## APEC Wind Hazard Mitigation Center

### ■ Special Features of Asian Countries

- High population density
- Constructions of tall buildings swarming cities
- Cyclone / typhoon-prone regions
- Serious air pollution due to rapid urbanization
- Rapid increase in energy consumption
- Low income

Necessity of  
Wind Hazard  
Mitigation

Necessity of  
Steps for Air  
Pollution

Necessity of  
Energy saving

Necessity of  
Mutual  
Collaboration



## **APEC Wind Hazard Mitigation Center**

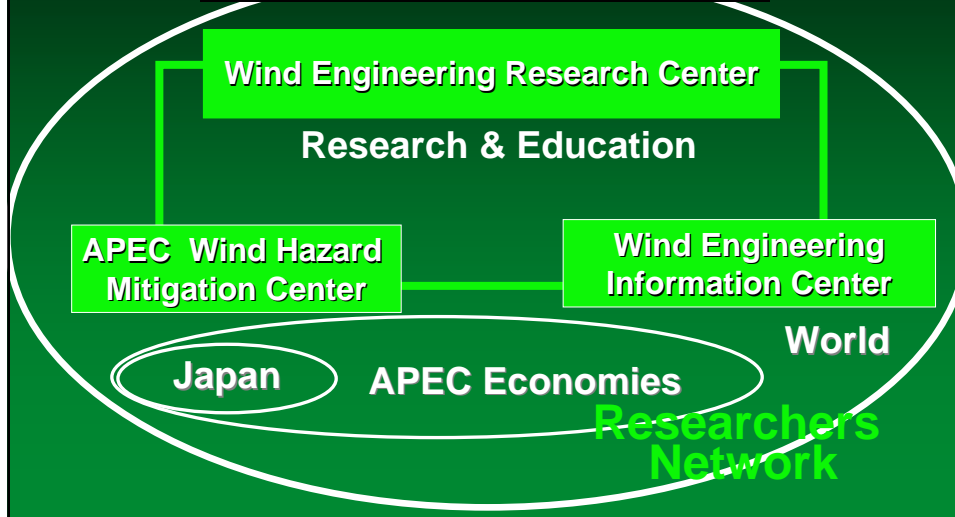
- **Short term fellowship for APEC young Engineers / Researchers (Three months)**
- ◆ **Development of suitable wind resistant technology/method for each APEC economy**
- ◆ **Accumulation of wind damage data/information in APEC economies**
- ◆ **Establishment of APEC wind engineer network**
  - **Alignment of wind load codes**
  - **Collaboration for making integrated wind speed map in APEC area**

## **Wind Engineering Information Center**

- **Transmission of research and educational wind engineering information to the public**
- **Aerodynamic database and its disclosure**
  - **Aerodynamic e-database based design system**
- **Educational IT contents on wind engineering and its disclosure**
  - **Remote teaching and e-learning**
  - **Web-based information disclosure**
  - **Publication of News Letters and Bulletins**

# Wind Effects on Buildings and Urban Environment

## 21st Century COE Program



# Policy of Education in COE Program

**Winds: Disturbances in thin atmospheric layer**



**Affection for**

- **Humanity**
- **Atmosphere**
- **Earth**

## **Policy of Education in COE Program**

- **Wind Hazards Mitigation**  
**Affection for humanity**
- **Air Pollution and Its Assessment System**  
**Affection for atmospheric environment**
- **Design Methods of Natural / Cross Ventilation**  
**Affection for natural resources**

## **If they have affection for the research targets . . .**

- **They can have high level objectives.**
- **They can sustain a strong demand to achieve research objectives.**
- **They can find the best solution or idea.**

**We count on your kind  
collaboration !**

**Research and Education in “Wind Effects”**



*Courtesy of Adam Goliger*