Office of Institutional Research and Social Responsibility, NTU
International Degree Program in Climate Change and Sustainable Development, NTU
Research Center for Future Earth, NTU

NEWSLETTER
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SC+NTU

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SC+NTU Work Team

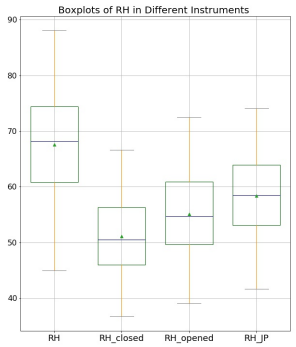
With the completion of the field verification and the deployment of NTU4AQ, the first microclimate sensing network independently developed by NTU faculty and students has now been officially launched. Soon, the micro-scale sensing data will be converted into legible comfort indicators. The real-time dashboard will also be used to support research and development of urban microclimate models, thereby providing critical foundational information for urban climate research, and making National Taiwan University an important node for regional and global urban climate action.

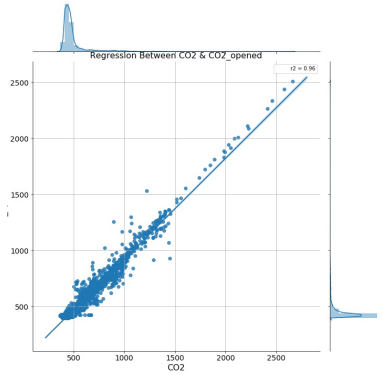
Meanwhile, as part of the overall airbox improvement plan, the team also began cooperation with the Academic Affairs Office and held a follow-up discussion on airbox monitoring strategy, with the goals of conducting deeper analysis on the impact factors and improving efficiency. The team is also integrating the application of sensors with semester courses, so that students of International Degree Program in Climate Change and Sustainable Development (IPCS) can participate in the analysis of sensor data and expand the flexibility of data collection through the use of mobile sensing equipment. The project team also synthesized relevant research and development results to participate in the sustainable living laboratory competition jointly organized by CTCI EF and the Taiwan Institute for Sustainable Energy (TAISE), where they received an award for outstanding work.

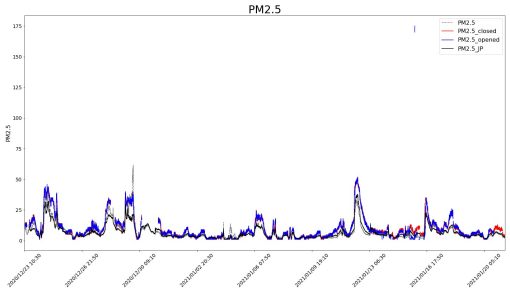
03/08

Completion of Indoor Sensor Data Quality Verification

Our team worked in cooperation in Professor Jen-ping Chen of the Department of Atmospheric Sciences during the period from 12/23 to 1/20 in the collection of environmental data in classroom B105. The environmental values measured by the precision instruments provided by Professor Chen were used to further communicate with the open Maps sensor and compare data with the unopened MAPS sensor. Preliminary results show that the data has obvious variations in temperature and humidity readings. In terms of temperature, readings from the MAPS sensor are approximately 2-5 degrees higher than the those from the precision instruments; that is, unopened MAPS>open MAPS>precision instrument. In terms of relative humidity, the opposite is true. In terms of PM2.5 and PM10 readings, the values measured by the precision instruments are only slightly lower than those of the MAPS sensor. In terms of CO2, there is no significant difference. From the trend comparison with the precision instrument data, it can be shown that there is a positive relationship between the MAPS sensing data and that of the precision instrument; with the determination coefficient of each parameter higher than 0.85. In terms of temperature, the determination coefficient of the unopened MAPS (0.96) is higher than that of the open MAPS (0.88); but in terms of humidity, both have extremely high R Squared (0.98). In terms of suspended particles, the performance of the unopened MAPS (PM2.5: 0.96; PM10:0.97) is higher than that of the open sensor (PM2.5: 0.85; PM10: 0.89). In terms of CO2, there is no significant difference. From the above results, we can further optimize the data provided by the MAPS sensor, and we can also establish a regression formula for each parameter to assist with data correction and optimization in the future.







03/11

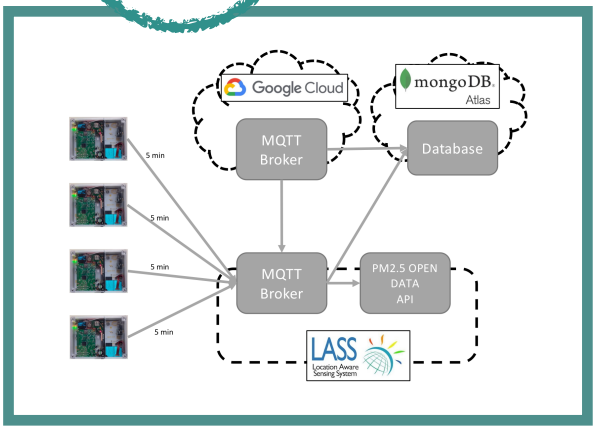
Meeting with Academic Affairs Office

A follow-up discussion with the team from the Academic Affairs Office was held on the direction of the cooperative endeavor to measure and improve air quality in lecture halls. During the winter vacation, the Office of Academic Affairs made improvements to the General Education building classrooms such as additional exhaust fans and green plants. The nature and level of impacts that these improvements may have is a research topic that will be discussed in-depth by both parties in the future.

03/11

Master Database Completes MAPS6 Data Interface

Project master database completed the sensor data interface of MAPS6. This plan connects MQTT server of LASS, subscribes to the sensor information of MAPS5, filters out the data of the MAPS6 sensor to which this plan belongs, and stores in the database. In comparison with using the restful API method, using the MQTT transmission method to interface data will not cause a traffic burden on the other party's server. Additionally, the design of the database program also retains the flexibility of expansion. The user simply needs to include the desired sensor number to be received in the database list, and the data will be stored in the database accordingly.



03/17

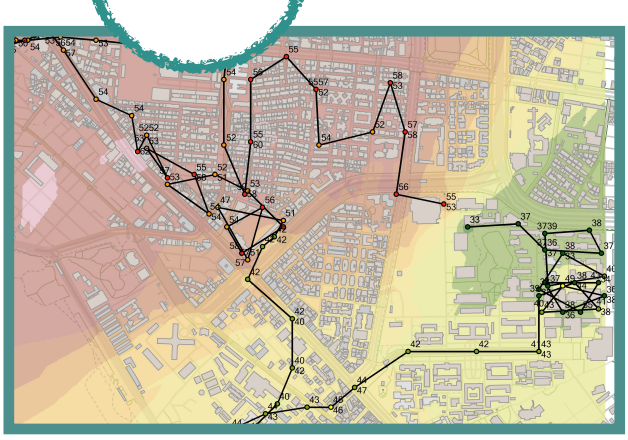
NTU4AQ Campus Deployment Begins

After half a year of instrument assembly and testing, the team began the installation of NTU4AQ in 15 locations selected by NTU in early March. Through onsite survey coordination, the target of 15 units was successfully completed at the end of March, and data collection and data processing were started.

03/18

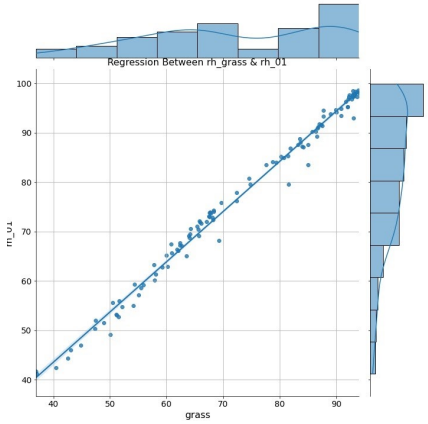
Research on Mobile Measurement Methods

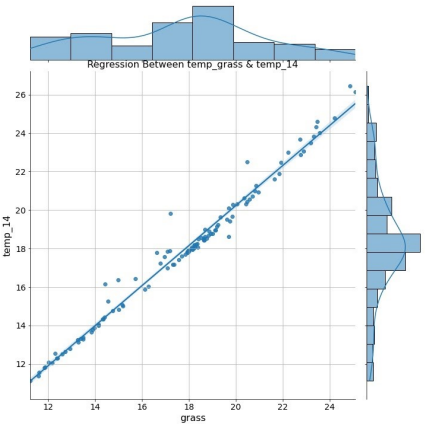
Along with the consecutive launching of NTU4AQ units, the project team has also begun to conduct research and discussion on mobile measurement methods in response to the demand for intensive outdoor observation. The foci of the discussion included: the influence of movement speed and trajectory on data quality, and how variation in movement trajectories can make up for a lack of NTU4AQ observations. At present, three different movement trajectories have initially been tested, including: circling, circuitous forward, and turning back while circling. In addition to referring the results to the instrument design side for reference, a standard mobile measurement method will be formulated in the near future.

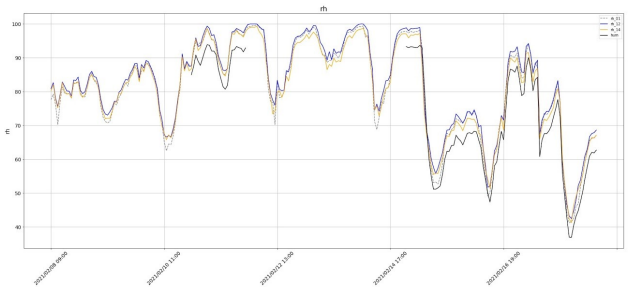


03/22

Preliminary Results of NTU4AQ Data Verification







In order to ensure the accuracy of the NTU4AQ outdoor sensor, our team will calibrate the temperature and humidity measurement of the NTU4AQ and the precision instruments at the NTU atmospheric lawn for a period of two weeks. At present, three of fifteen sensors are selected for comparison and verification with the NTU atmospheric precision instruments. It was found that the correlation coefficient between NTU4AQ's temperature and humidity data and NTU atmospheric precision instruments has reached 0.99, a very high correlation. The trend in timing performance is also highly consistent, which indicates that the temperature and humidity data collected by NTU4AQ is stable and reliable, and that it can be used as a reliable foundation for subsequent research and applications in the future.

Previously, the team assessed that there would be concerns about safety and data quality under the condition that the instrument would be installed at a height of 1.5 meters. Therefore, the instrument was installed at heights of 1.5, 2, 2.5, and 3 meters on the telephone pole in front of the Geography Department. We hope to know whether there are different effects under these various height conditions. After two weeks of data collection, the team used the 1.5m data as a benchmark for comparison with the rest of the height data. It was found that various environmental parameters are highly correlated. For example, the correlation coefficient between the two temperatures is as high as 0.99, and the other parameters such as humidity and air quality are virtually the same. Therefore, after some discussion, the erection height of NTU4AQ on campus has been fixed at 2 meters.

03/25

Upgrade of the Large Classroom Network Environment

Previously installed MAPS6 sensors in the large classrooms encountered a dilemma whereby the unstable network environment meant that the sensor data could not be uploaded to the database in real time through the nbioT/4G, and therefore the latest status of air quality in the classrooms could not be viewed on the dashboard. Under active coordination with the Office of Academic Affairs, a dedicated WIFI network for the sensor project was completed in numerous classrooms, solving the obstacle of real-time data uploading.on issues such as optimal placement of sensors and development of a follow-up plan for classroom indoor air quality monitoring.

03/27

Team Members Receive the Living Lab Project Award

The concept of the Living Lab is to bring the experimental environment of laboratory into the real-life environment of users through perception, prototype, verification and improvement of various, complex solutions in a diverse and evolving real-world environment. The concept involves the performance of verification, and looking forward to solve sustainability problems facing the campus, local communities, society, nations, and the world. The team members proposed to take the National Taiwan University campus as the field site, utilize NTU4AQ data to build a comfort map, and plan a more comfortable exercise route to reduce exposure to environmental health hazards. The hope was to use sports as the starting point to combine the concept of environmental comfort with personalized service apps and promote them to the community, so as to enhance the public's environmental awareness and instill a deeper understanding about the potential impacts of environmental factors on daily life. After nearly a half year of research and development, the team is honored to achieve positive results in the form of the Living Lab project award!

ABOUT OUR TEAM

SC+NTU Work Team

Principal Investigator: Shiuh-Shen, Chien.

Consultant: Jen-Ping, Chen. Ling-Jyh, Chen. Jehn-Yih, Juang.

Executive Consultant: Ming-Kung, Chung. Yi-Huan, Hsieh. Po-Hsiung, Lin.

Work Team: Shao-Yuan, Liu. Fu-Hsiang, Ching. Miao-Jung, Chien.

Cheng-En, Lin. Xin, Yan. Tzu-Chun,Chang.

International Degree Program in Climate Change and Sustainable Development (IPCS)

The International Degree Program in Climate Change and Sustainable Development, as its name suggests, is an interdisciplinary degree program that encompasses a global perspective. Established by the College of Science, the program is a joint effort among NTU faculty members from both scientific research and humanities backgrounds. In dealing with climate change and sustainable development, we instrument in-depth teaching in a wide range of topics. Students are required to bring their knowledge and skills to the table and approach environmental issues from a multi-angled perspective. They are encouraged to break free from traditional views on sustainability and think outside the box. Students are expected to be motivated learners, thinkers, analysts, and most important of all, practitioners. Our ultimate goal is to cultivate students' ability in interdisciplinary problem-solving in dealing with the complexity of climate change issues.

ABOUT OUR TEAM

Location Aware Sensing System (LASS)

The Location Aware Sensing System (LASS) is an important maker community in Taiwan, and it is also the creator of air boxes, water boxes, and other micro-sensing devices. LASS focuses on the integration of citizen technology and spatial information, aiming to design and implement an environmental sensing system with local characteristics through the integration of hardware and software. The community strives to promote open source and public welfare as the main axis, and to create customers instilled with a 'self-creator' spirit, develop low-cost environmental monitoring equipment with an open software and hardware architecture so that the public may build a set of sensing systems that meet their specific needs through a self-made process. At the same time, LASS also adopts and open attitude towards sensing data and allows volunteers to use environmental monitoring data uploaded to the cloud system by other partners in the community in order to build a real-time monitoring network.

PARTNERS ➤

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CONTACT US ➤

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