

OOKA LAB.

Future Urban Planning & Future Energy System to Realize ZEB



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Urban Energy Engineering

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Prediction of Building and Urban Environment

Prediction systems of building and urban environment have been developed to create sustainable building and urban spaces. We focus on flow, heat and pollutant dispersion in multiple scales from human-ambient to urban/regional.

■ Wind velocity observation with a Doppler lidar

■ Estimation of heat fluxes using Scintillometer

■ Distribution of time-averaged pollutant concentration in street canyon with hedge barriers

■ Measurement of different pollens

■ PIV measurement of flow characteristics during conversation, cough and sneeze

■ Measurement of aerosol size distribution generated by breathing, coughing, and speaking activities

■ Clarification of the flow field structure around building using SPOD

■ Evaluation of thermal sensation in an outdoor environment

Systems to Realize Zero Energy Building

In order to realize Zero Energy Building (ZEB), it is important to improve the efficiency of heat source systems. We have reduced their energy consumption using advanced control algorithms such as AI-based MPC. Main areas of study are air conditioning system with renewable energy sources and optimization of heat source system. Furthermore, we are interpreting the controls with XAI to understand the inner workings of the AI model.

■ Prediction of indoor airflow distribution using ANN

■ MPC of building heat source system using AI

■ Interpreting AI controls using XAI

■ Optimization of thermal and electrical grid

