【Grant-in-Aid for Transformative Research Areas（B）】

Section II

Title of Project： Micro-meteorology control: Integrated technology of harmonic prediction and active monitoring of micro-meteorology for future autonomous society

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【Purpose of the Research Project】

In future smart cities, various autonomous systems work collaboratively for maintaining sustainable, safe and comfortable society harmonized with nature (Fig.1).

Micrometeorology, which is directly linked to human life, is extremely important in order to realize such a future society. However, despite being related to various social issues, micrometeorology has been largely untouched academically. This project aims to bring new changes in the natural sciences and society by realizing the real-time micrometeorology prediction for the first time in the world and to show the feasibility of new social services based on the prediction information. Mere understanding and prediction of phenomena cannot ultimately create new social value. What is important here is the integration of observation and prediction that can hold the "spatio-temporal scale and accuracy" required for each issue. We will first focus on the integration of observation and prediction to initiate the new academic creation. Rather than simply linking cutting-edge observations and predictions, we will realize a right integration that creates value while sharing the appropriate "spatio-temporal scale and accuracy" according to the ultimate purpose.

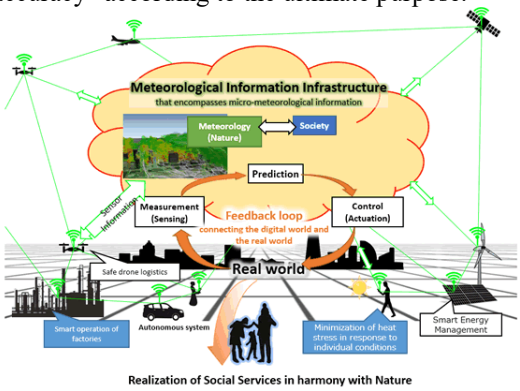

Fig.1: Autonomous society harmonized with nature

【Content of the Research Project】

The bottleneck of micro-meteorology prediction will be solved by fusing AI technology with the cutting-edge ultra-high-resolution micro-meteorology simulation that can consider the effects of artificial structures and human activities (Fig.2). The bottleneck of observation will be solved by active measurement that combines the mobility of a large number of autonomous drones and the adaptability to the unsteady environment.

Simply understanding and predicting phenomena is not enough to ultimately create new value to society. It is necessary to integrate observation and prediction in the right sense through the cooperation technology of observation, prediction, and control that correctly captures the "spatio-temporal scale and accuracy" necessary for solving social issues. In this project, we will build a micro-meteorology prediction system that combines harmonic prediction that has real-time performance and adaptability with active observation that has mobility and adaptability, and a social service infrastructure.

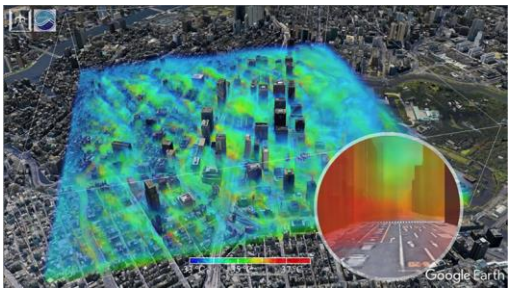

Fig.2: Snapshot of three-dimensional temperature distribution near Tokyo station obtained by our building-resolving urban micro-meteorology simulation.

【Expected Research Achievements and Scientific Significance】

Meteorological information infrastructure that includes micro-meteorology prediction information will be directly linked to the decision-making and control of things and human activities, and thus can provide a foundation for creating new social services. Furthermore, by treating weather and social networks at the same time, we can realize a safe and secure society with "zero victims of weather-related disasters" preventing unexpected disasters or accidents, and a sustainable society harmonized with nature.

【Key Words】

Micro-meteorology: near-surface atmospheric conditions, up to approximately 100 m in height, strongly affected by buildings and human activities.

【Term of Project】 FY2020-2022

【Budget Allocation】 119,900 Thousand Yen

【Homepage Address and Other Contact Information】

https://www.turb.gsic.titech.ac.jp/mmc/