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- M.S.** 2017/09-2019/09
Graduate Institute of Environmental Engineering, National Taiwan University
Validity Analysis of Short-term Air Quality Contingency Measures under Multiple Weather Types: in Northern Taiwan
- Ph.D.** 2020/09-2026/06
Graduate Institute of Environmental Engineering, National Taiwan University
Data-Driven Visibility Assessment: Integrating Image-Based Monitoring and Decoupling Analysis
- 2025/04-2026/04
Conducting research at Carnegie Mellon University through the Ministry of Science and Technology's Overseas Project.
An Observation-Constrained Causal Machine Learning Framework for AOD-UHI
- 2026/09-
Department of Civil and Construction Engineering, National Taiwan University of Science and Technology
Microgrid Optimization and Optimal Building Performance Management through an LLM-Driven Multi-Agent Collaborative System

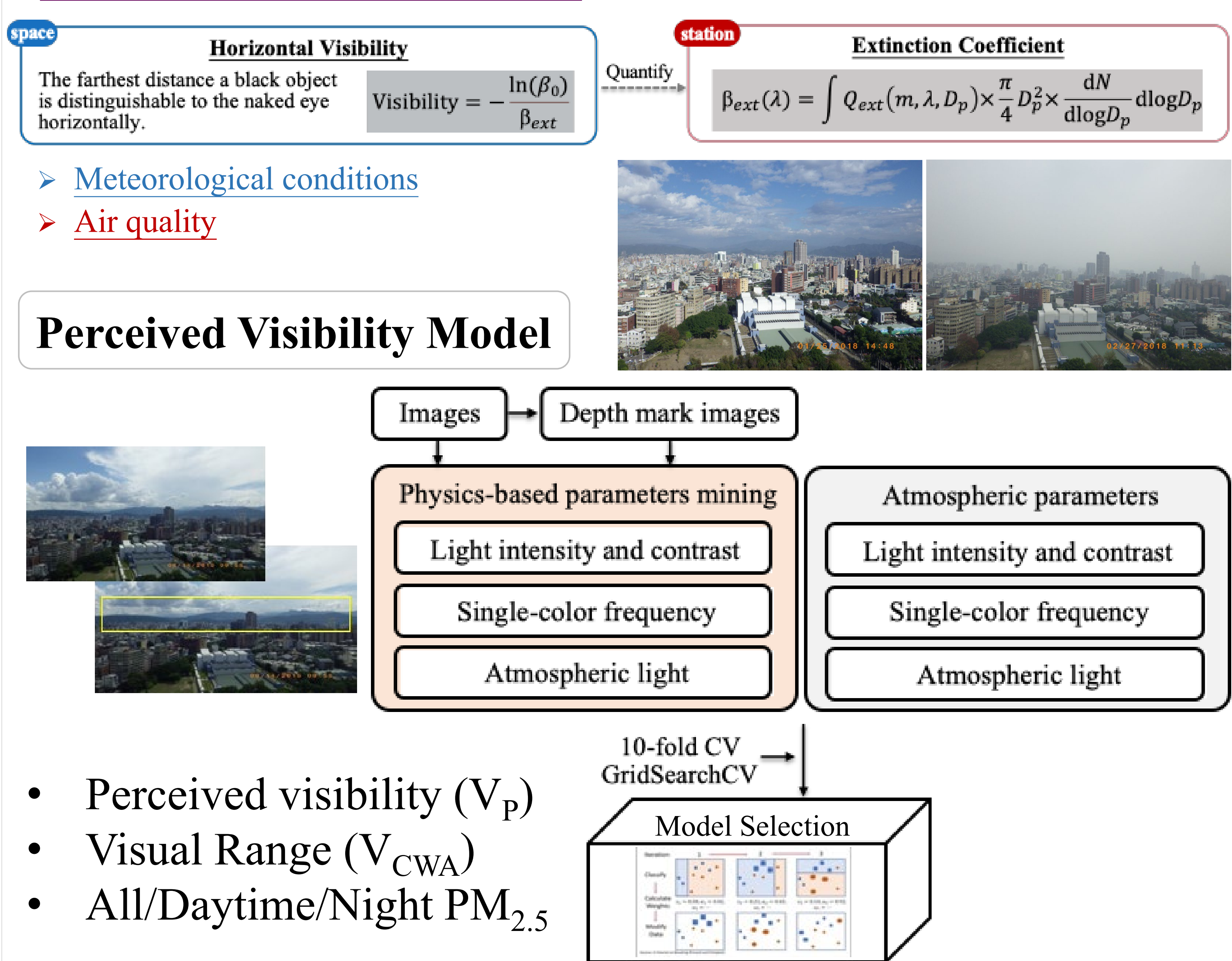
Research Interests & Expertise: Environmental Data Science and AI | Atmospheric Science and Air Quality | Remote Sensing and GIS | Smart Energy Systems | Sustainability and Environmental Decision-Making |

Data-Driven Air Quality Visibility Assessment: Image-Based Perception Quantification and Meteorological–Anthropogenic Decoupling

Advisor: Pei-Te Chiueh, Ph.D., Ta-Chih Hsiao, Ph.D.

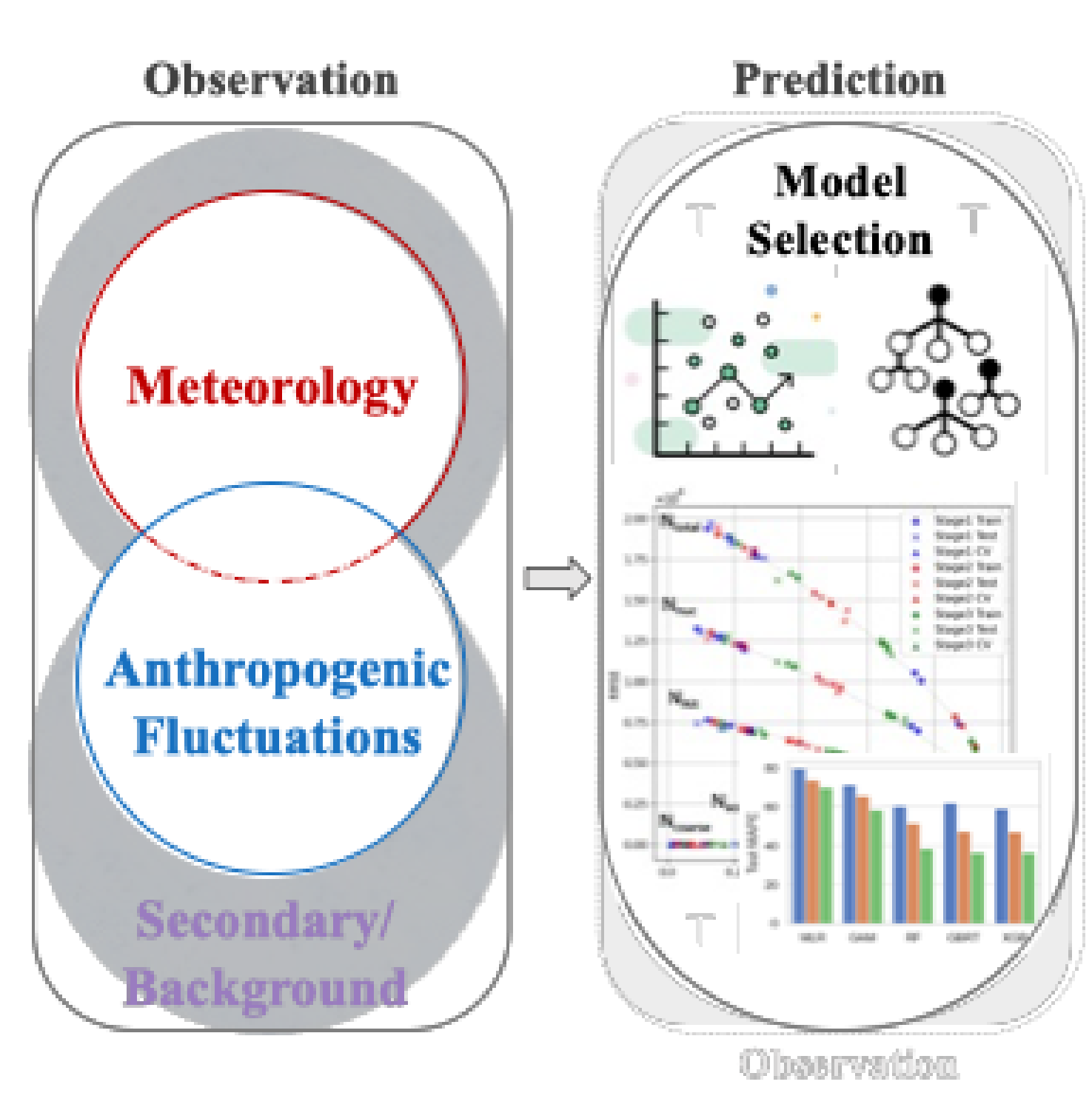
Keywords: atmospheric visibility, image-based perception, air quality perception index, meteorological decoupling, SHAP attribution, anthropogenic contribution

Methods & Materials



Weather-Decoupled Analysis

- Stage 1 (Meteorological Model): Meteorological parameters.
- Stage 2 (Temporal Markers): Incorporates cyclic human activity indicators.
- Stage 3 (Time Series Residuals): Time-series residuals as a proxy for unaccounted variations, including background pollution levels and secondary formation processes.



$$\hat{y}_i = \sum_{j=1}^M \frac{|S_i|(|S_i| - |S_j| - 1)}{|S_i|} [V(S_i) - V(S_j)]$$
$$\hat{y}(x) = \hat{y}_0 + \sum_{i=1}^M \hat{y}_i x_i$$

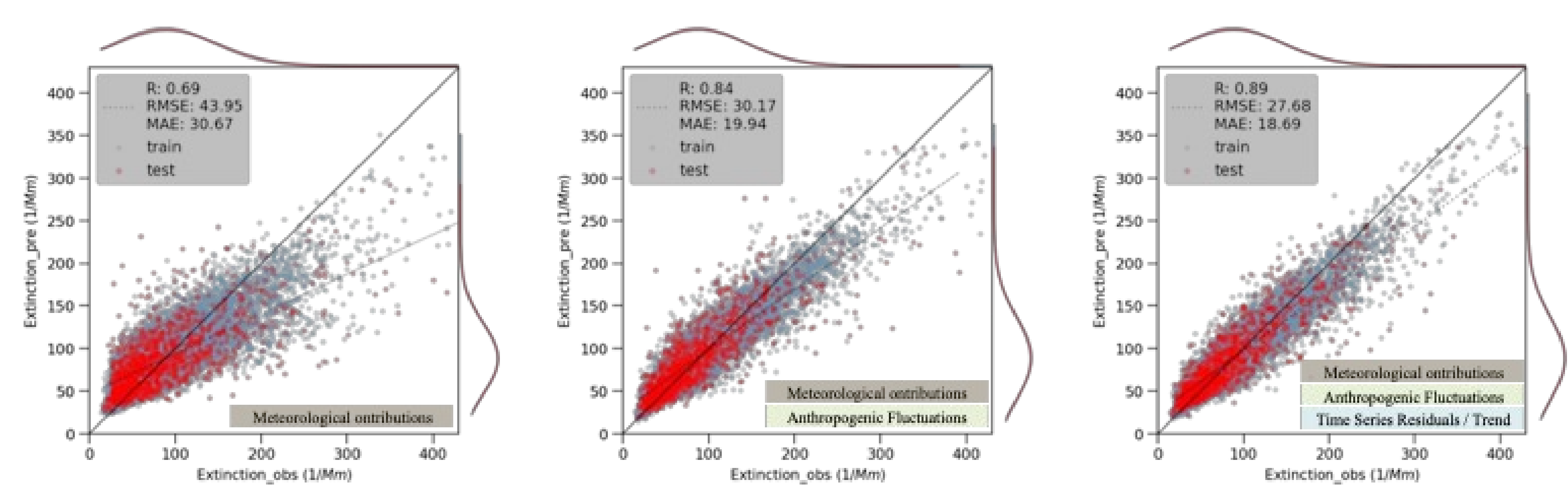
Results & Discussion

Vp Model Performance

The VP model demonstrated strong agreement with image-averaged public perception scores. Overall luminance and chromatic contrast, not distant feature clarity, are the primary perceptual drivers, diverging systematically from station-based V_{CWA} records.

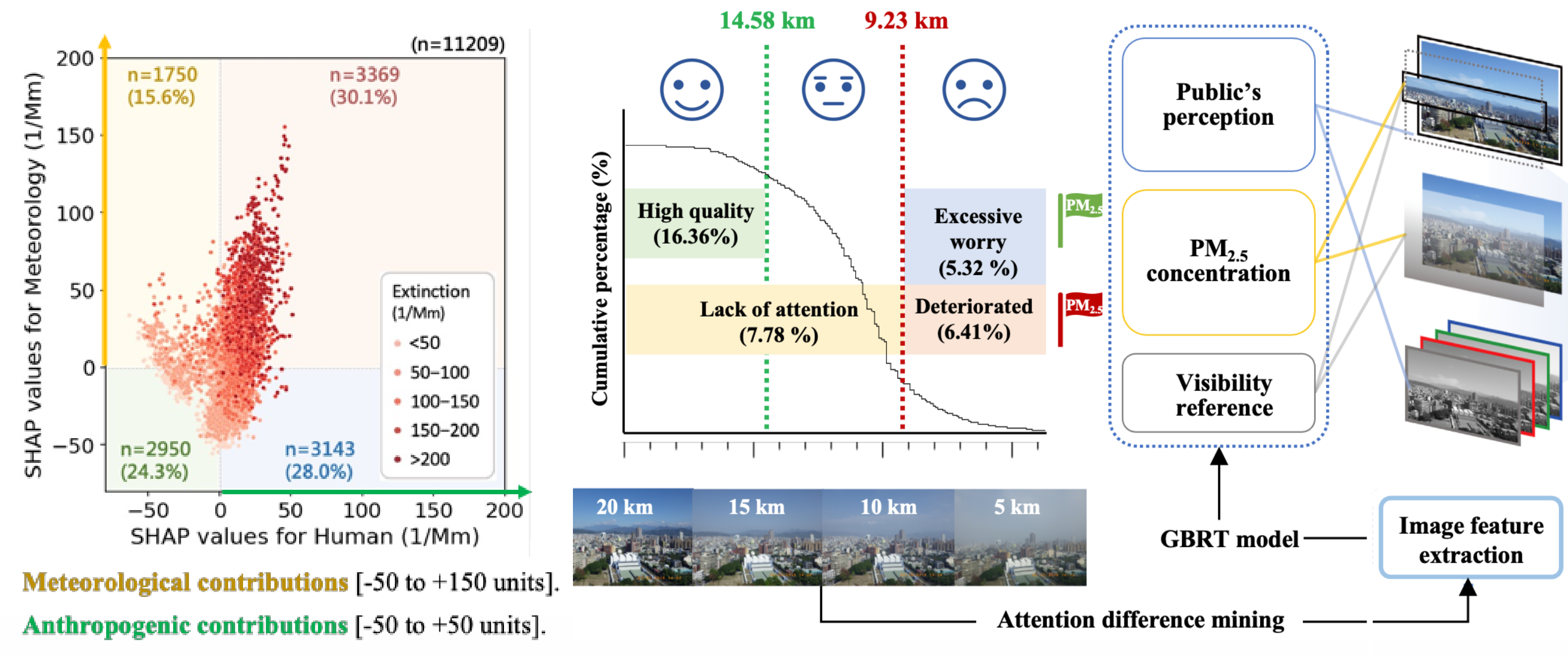
Meteorological vs. Anthropogenic Contributions

Meteorological effects span -50 to $+150 \text{ Mm}^{-1}$; anthropogenic contributions remain within $\pm 50 \text{ Mm}^{-1}$, a ratio of approximately 3:1 to 4:1. Severe degradation occurs when both are simultaneously positive ($\sim 30\%$ of cases).



Integrated Framework & Policy Implications

This study presents an integrated framework linking image-based perception and meteorological decoupling, providing a quantitative basis for perception-informed air quality governance and evidence-based visibility target setting.



Organizers

