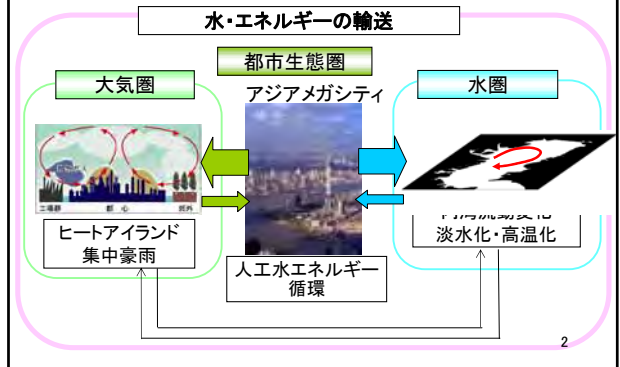


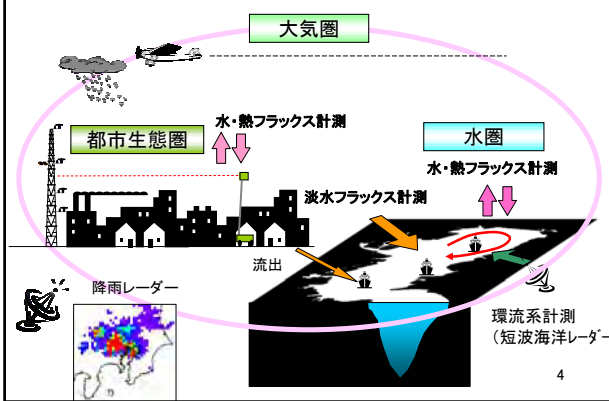
都市生態圏—大気圏—水圏における水・エネルギー交換過程の解明

研究代表者
東京工業大学大学院・理工学研究科
国際開発工学専攻
神田 学

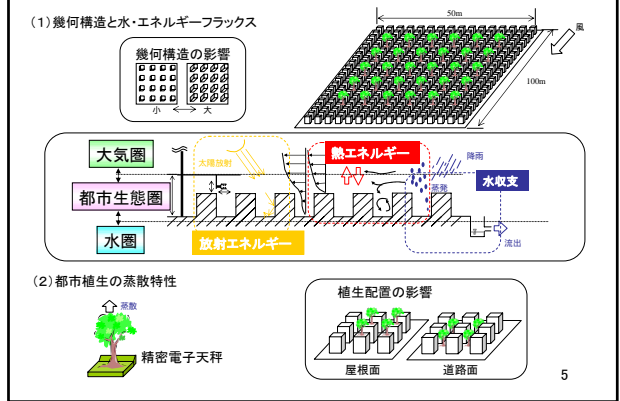
都市生態圏—大気圏—水圏における水・エネルギー交換過程の解明 研究の背景とねらい



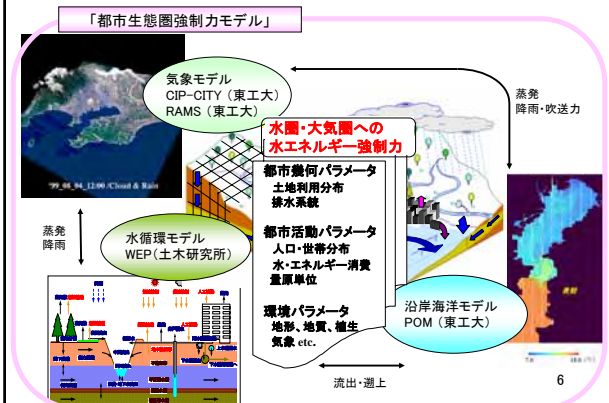
I. 大気海洋同時観測 (定常・集中) ～都市のフォーシングの実態把握 その(1)



I. 準実スケールモデル都市実験 ～都市のフォーシングの実態把握 その(2)



II. 強制力モデルによる水エネルギーフローの再評価



今日の発表のポイント

他の陸面と比較して、
都市特有と考えられる水文気象の発見と、
その**陸面パラメタリゼーション**の進展に
大きく寄与したと考えられる
CRESTオリジナルの結果を紹介

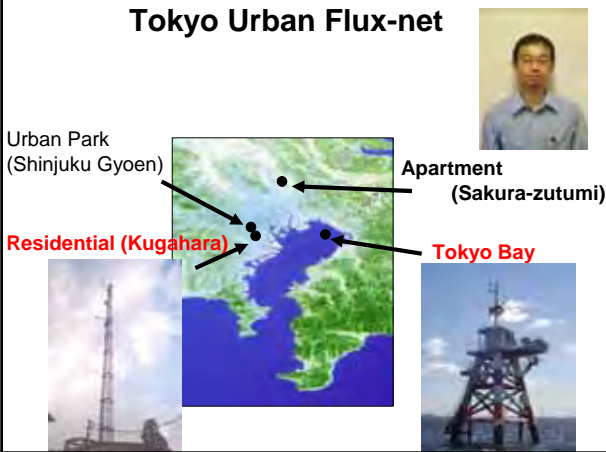
1, フラックスネット観測 都市特有の境界層現象の発見

Urban CO₂-Flux Towers

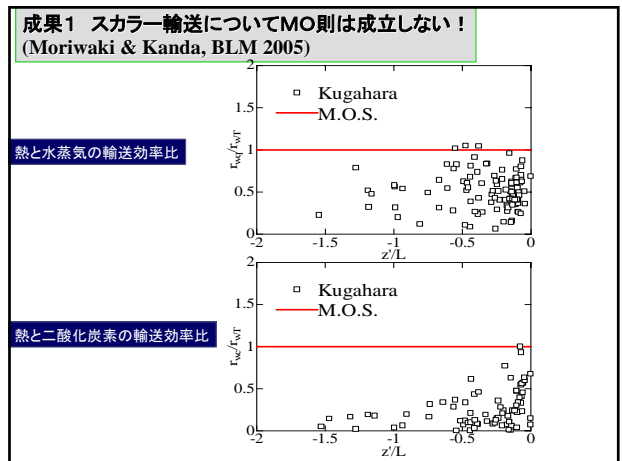
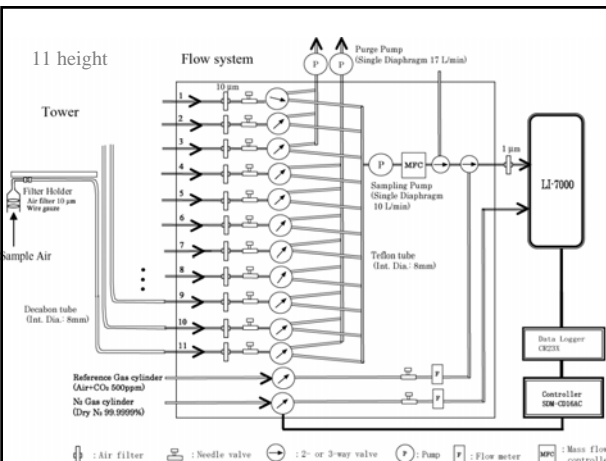
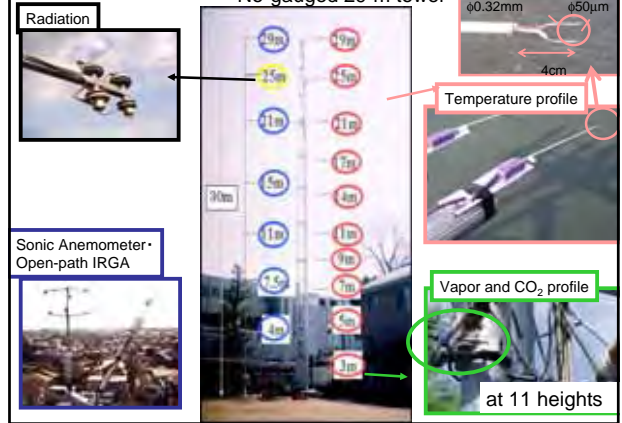


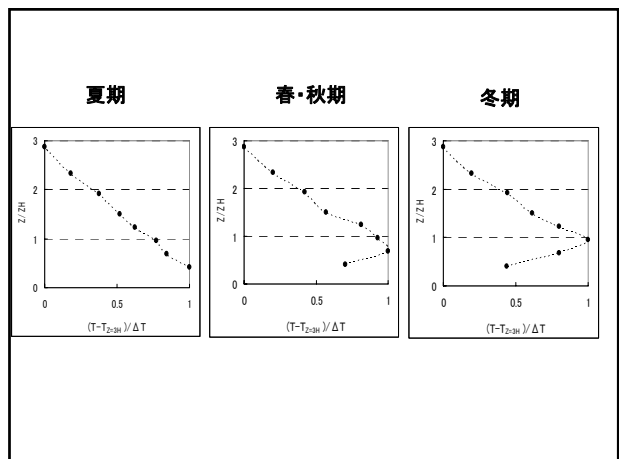
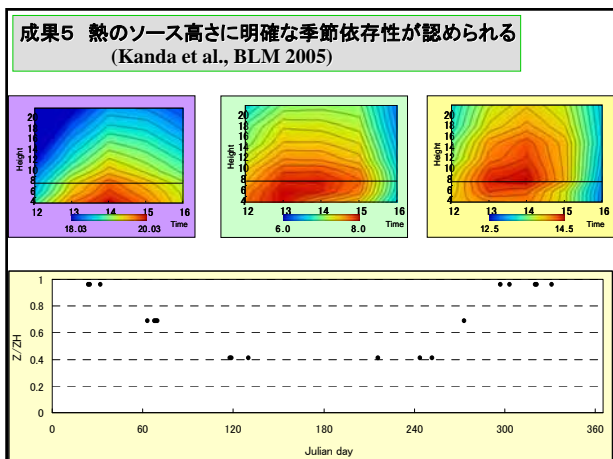
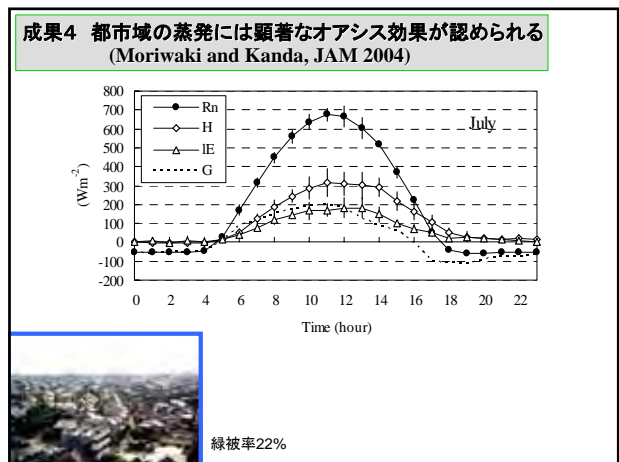
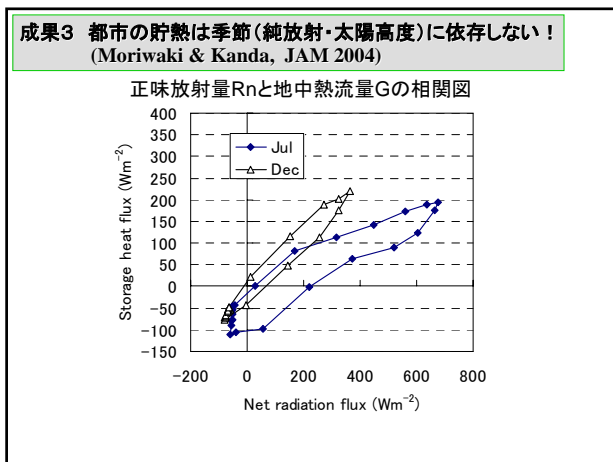
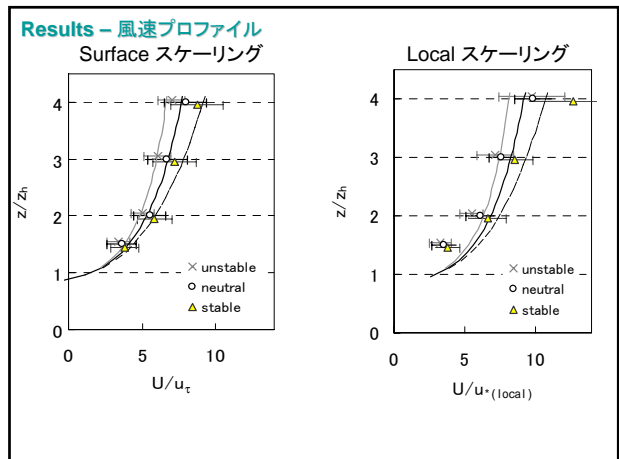
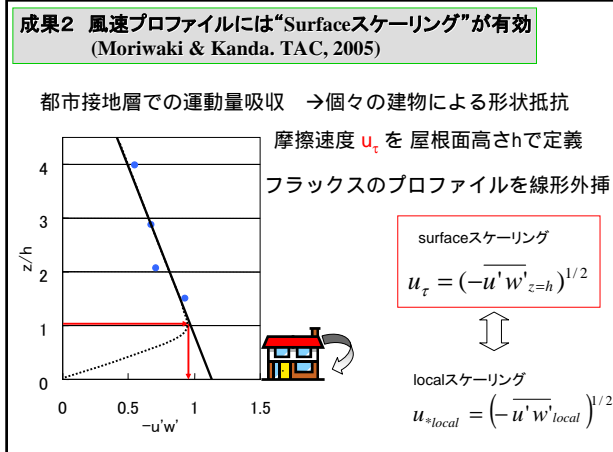
Planned, currently operated and discontinued sites with CO₂-flux measurements in urban areas. (Grimmond et al.)

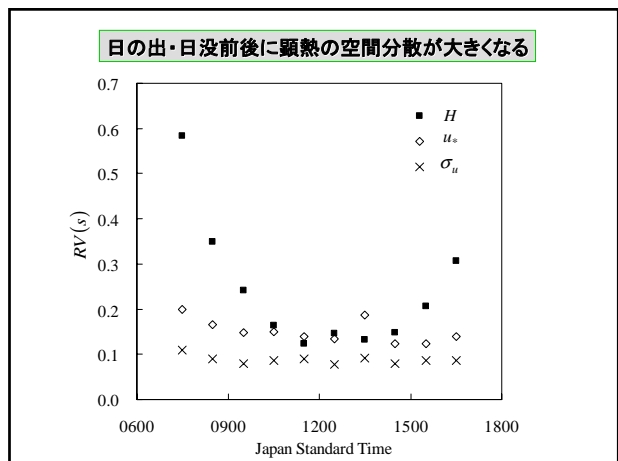
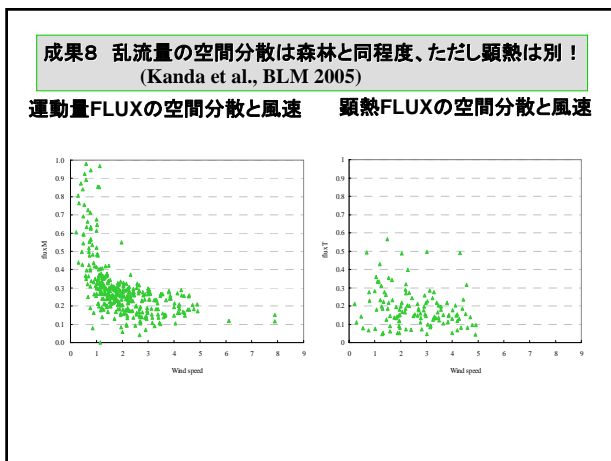
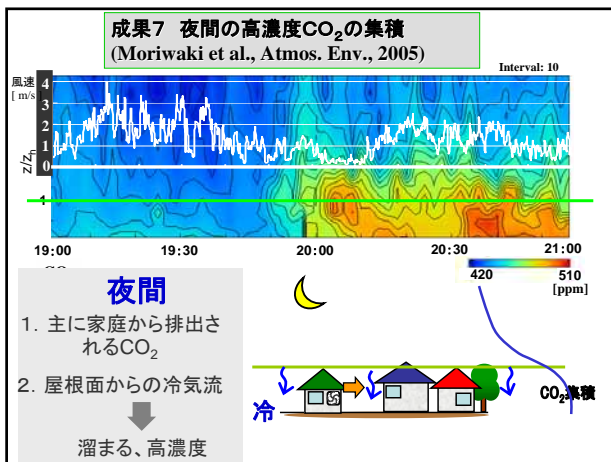
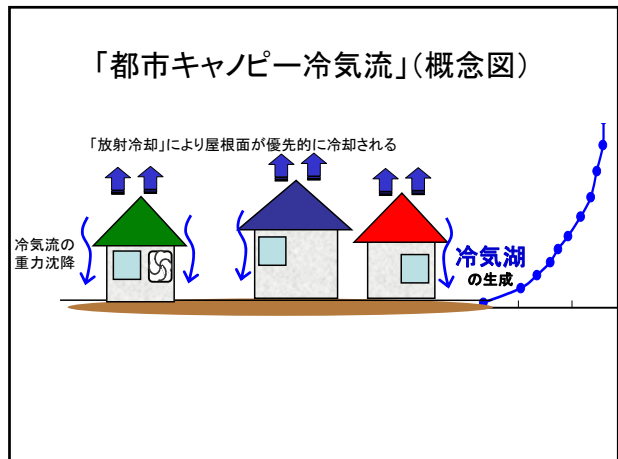
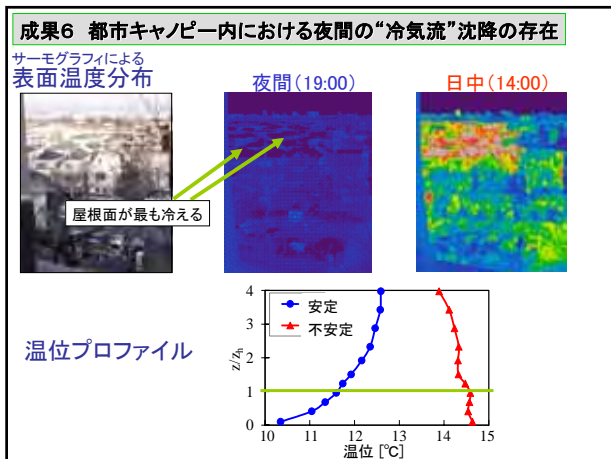
Tokyo Urban Flux-net

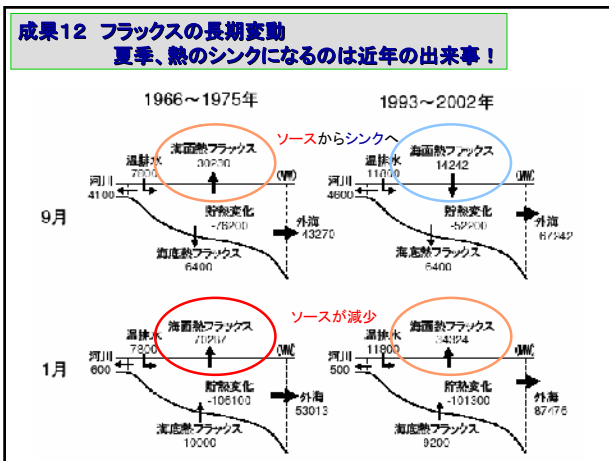
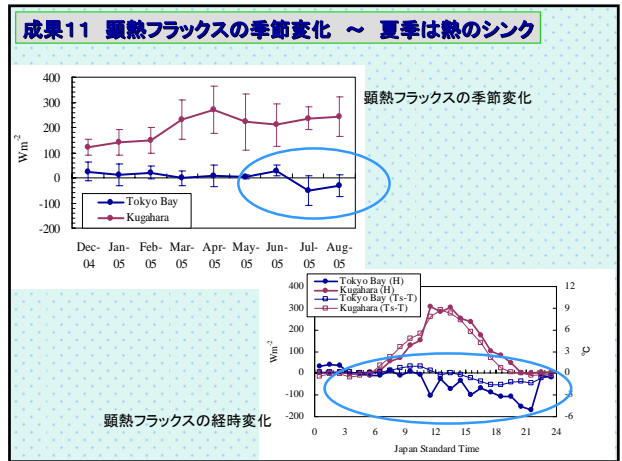
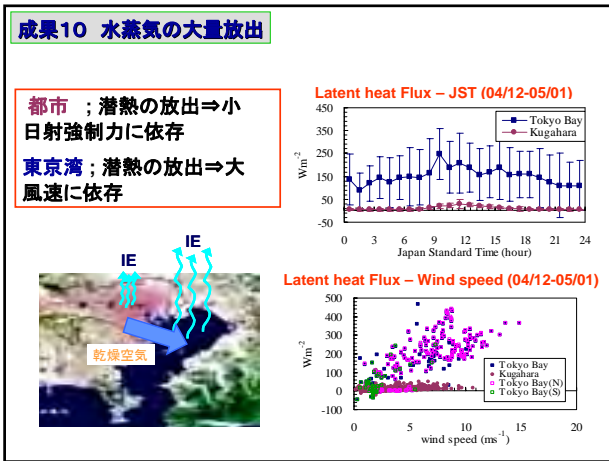
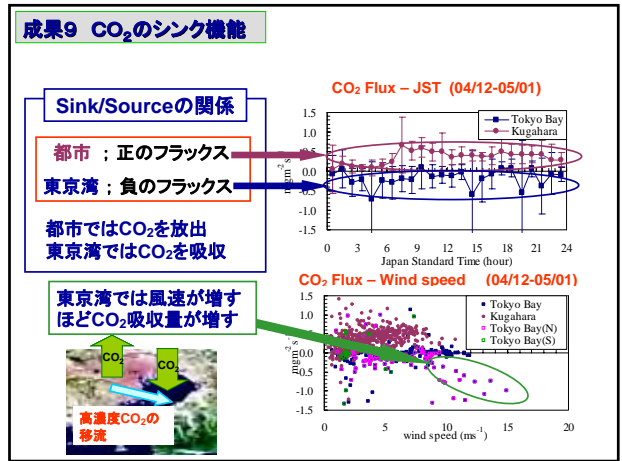


Instrumentation

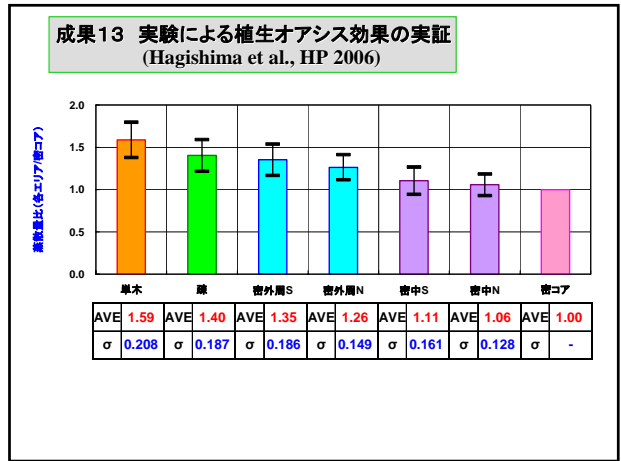
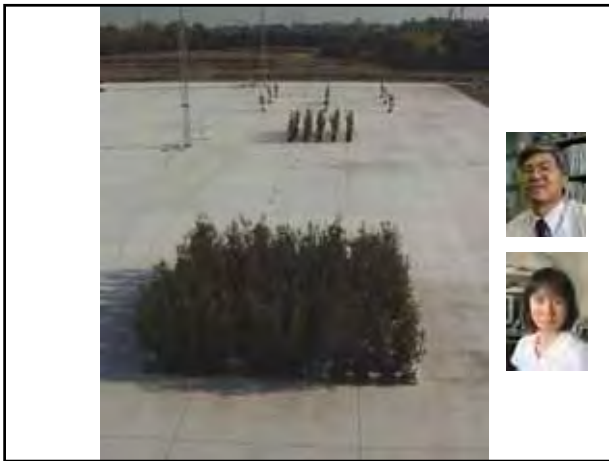








2. スケールモデル関連 都市陸面パラメーターの進展

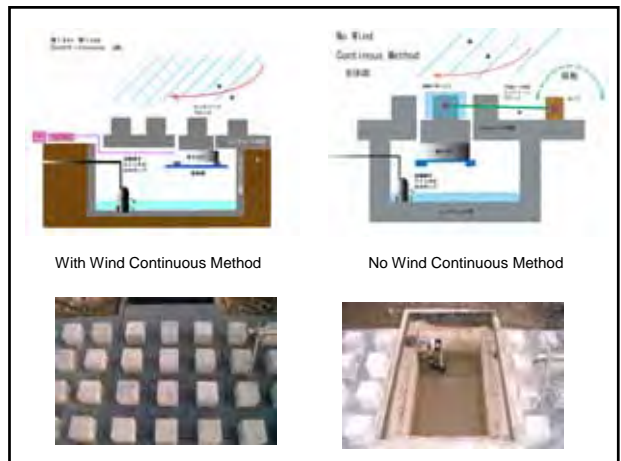
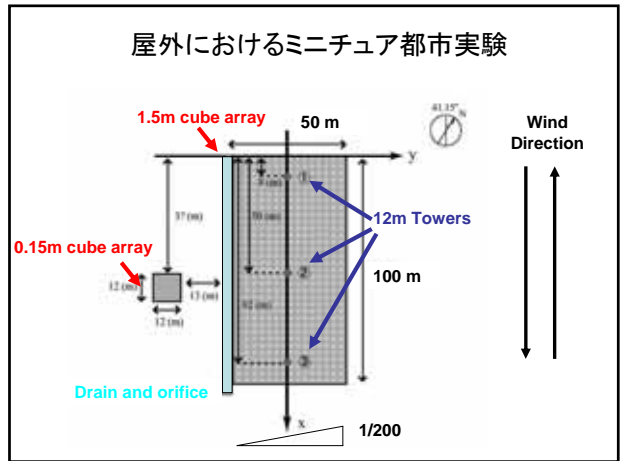


A Comprehensive Outdoor Scale Model Experiment for Urban Climate (COSMO)

- (1) エネルギー収支
- (2) 物理相似則
- (3) 乱流構造

1.5 m cube model

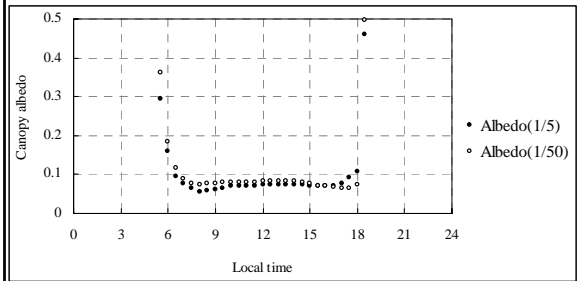
0.15 m cube model



物理相似則のチェック

- 放射 ----- ●
- 流れ ----- ▲
- 熱慣性 ----- ×

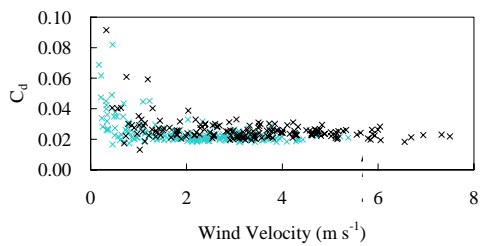
(1)放射の相似性(アルベド)



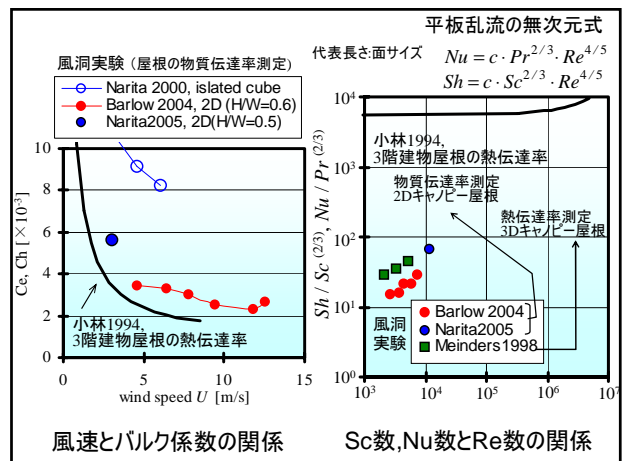
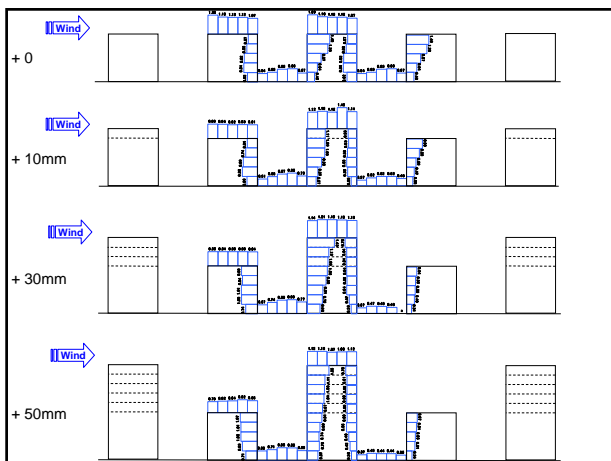
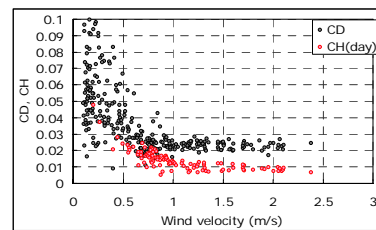
(2)流れの相似性(抵抗係数)

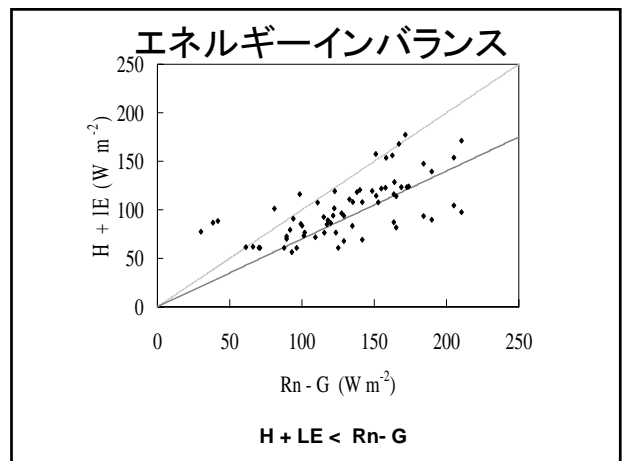
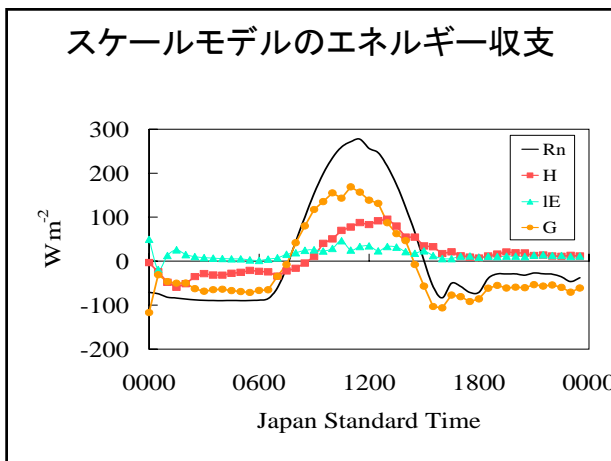
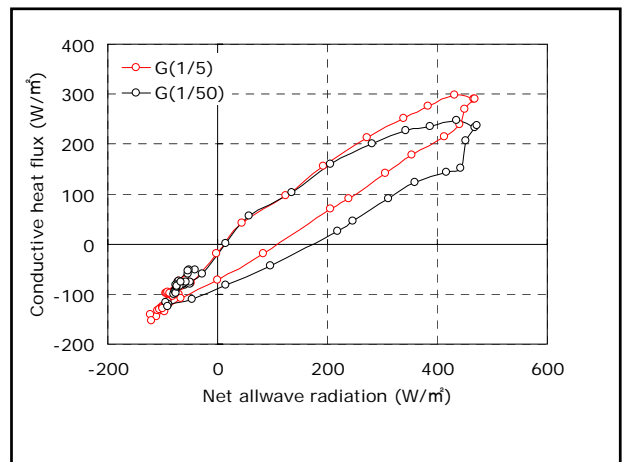
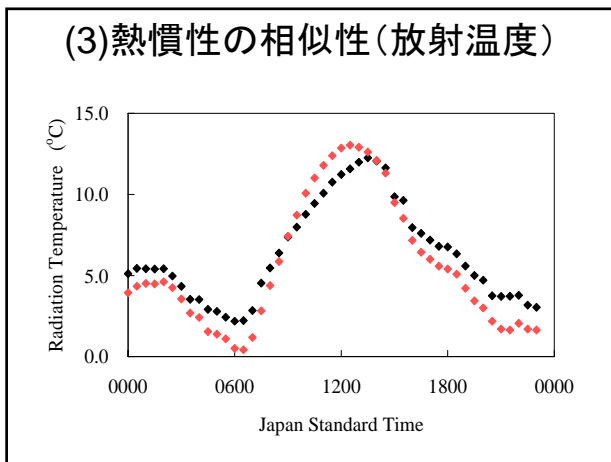
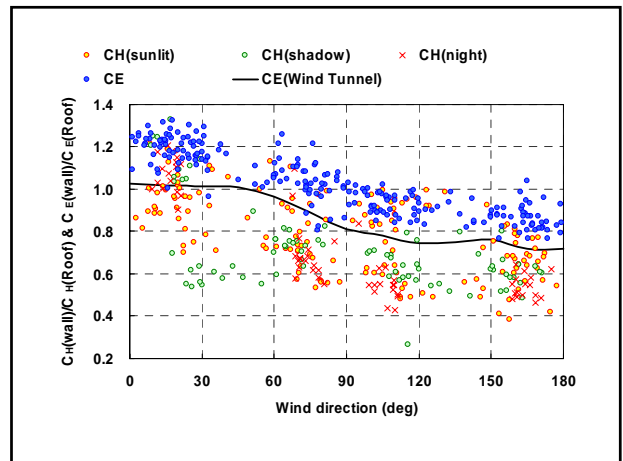
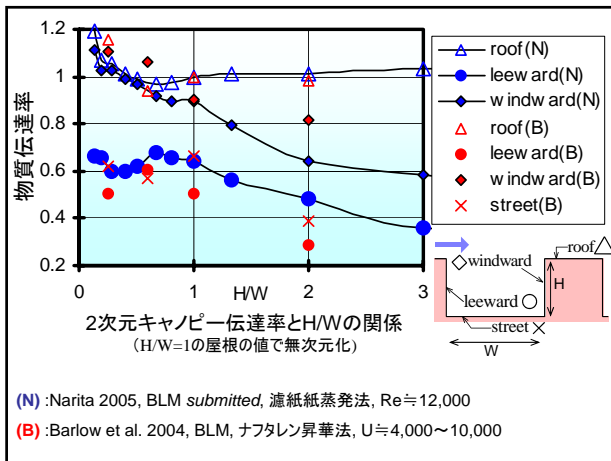
$$\frac{\tau}{\rho} = u_*^2 = C_d U^2$$

τ : Reynolds Stress
 ρ : Air Density
 u_* : Friction Velocity
 C_d : Drag Coefficient
 U : Wind Velocity

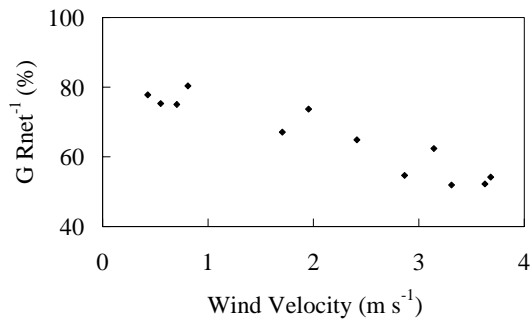


運動量と熱のバルク係数

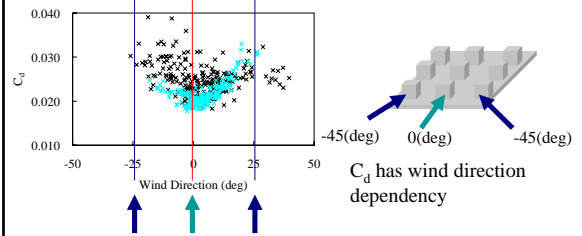




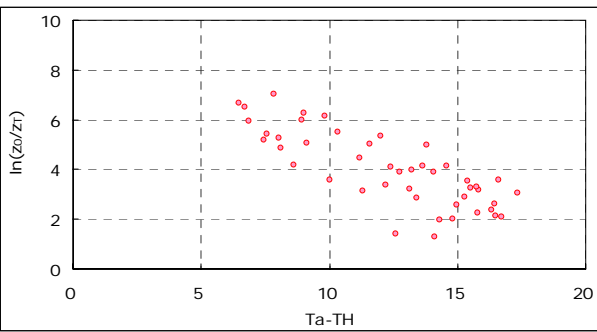
熱収支の風速依存性



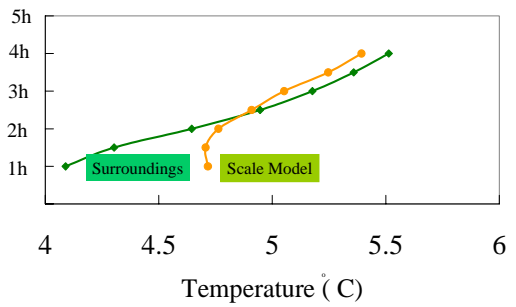
抵抗係数の風向依存性



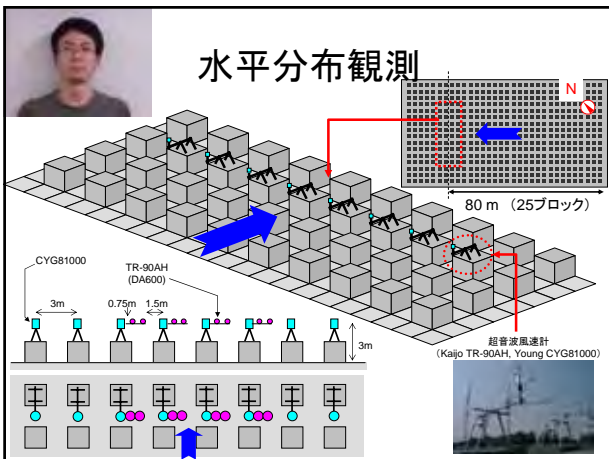
運動量と熱の粗度比—温度依存性



クロスオーバー現象

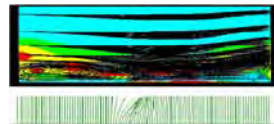


水平分布観測

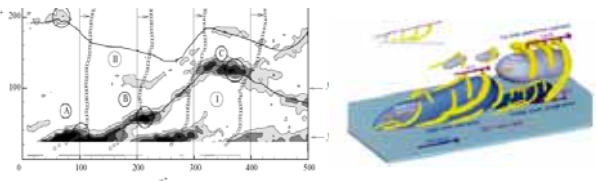


TOS COMPARISON

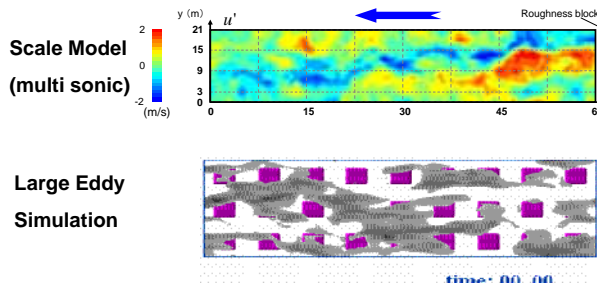
(1) Vegetation layers (Kanda and Hino., 1994 BLM)



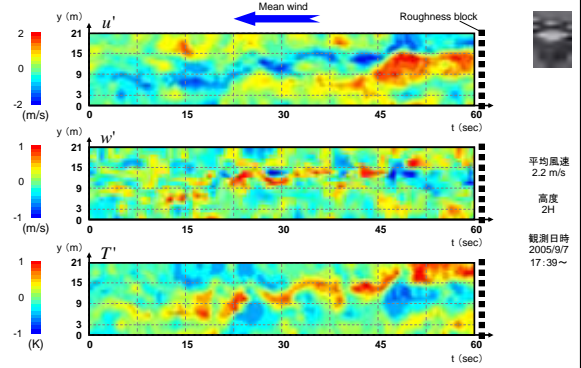
(2) Surface layers (Adrian et al., 2001 JFM)



大規模乱流構造



大規模乱流構造



まとめ

(1) 観測 都市表面特有の物理現象の発見

(2) 実験 都市面パラメータのデータベース

都市からのフラックス(大気圏+水圏へ)
算定のためのモデル化