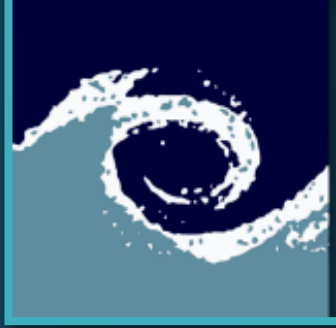


# Building Aerodynamics



## Sand Erosion Method – Group 6

Effects of building height variability and building gaps

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# Introduction

I. Context

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# Introduction

- Aim of the project : Studying wind conditions and pedestrian wind comfort in a urban square
- Target square : József Nádor Square in downtown Budapest
- Sand Erosion Method
- Used Softwares : Ara Sand Erosion and Tecplot



Introduction

# I. Context

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IV. Interpretation

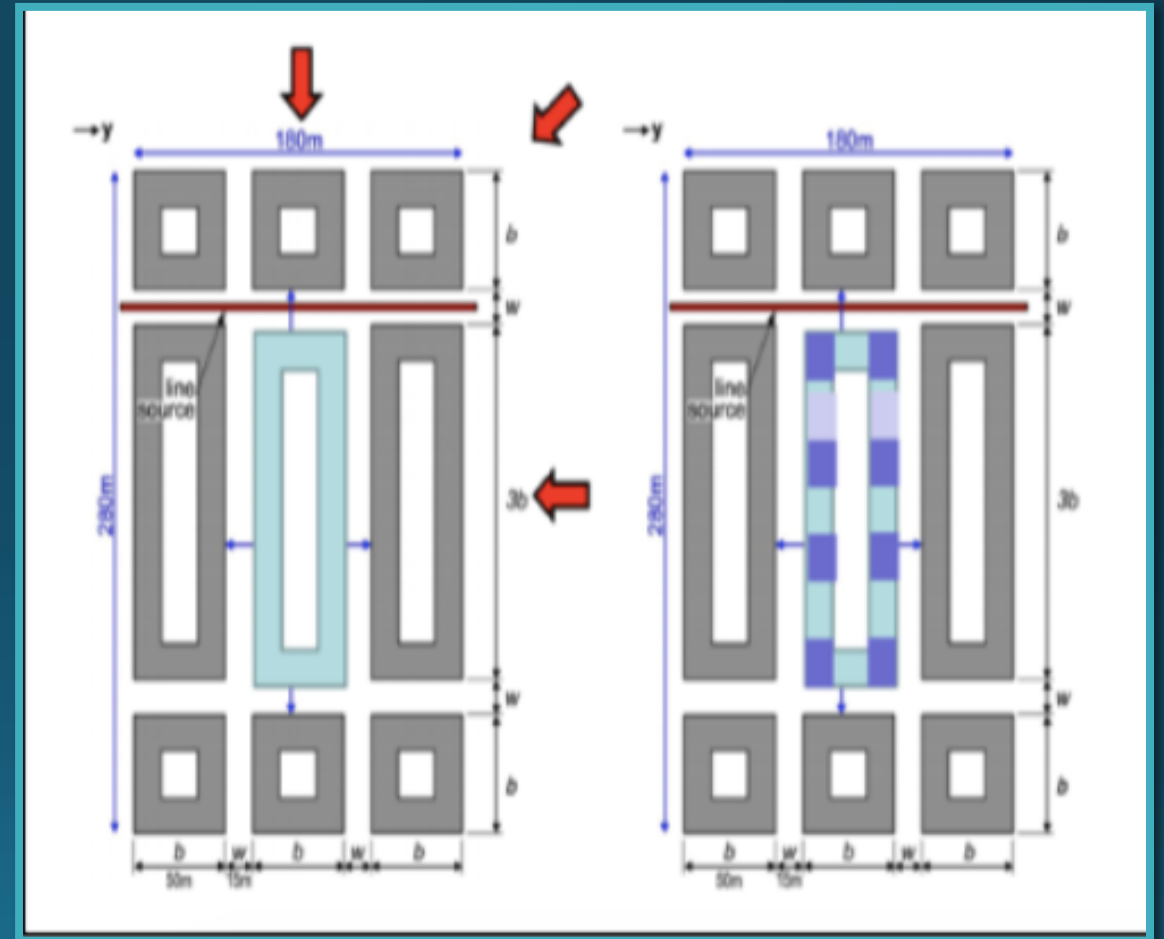
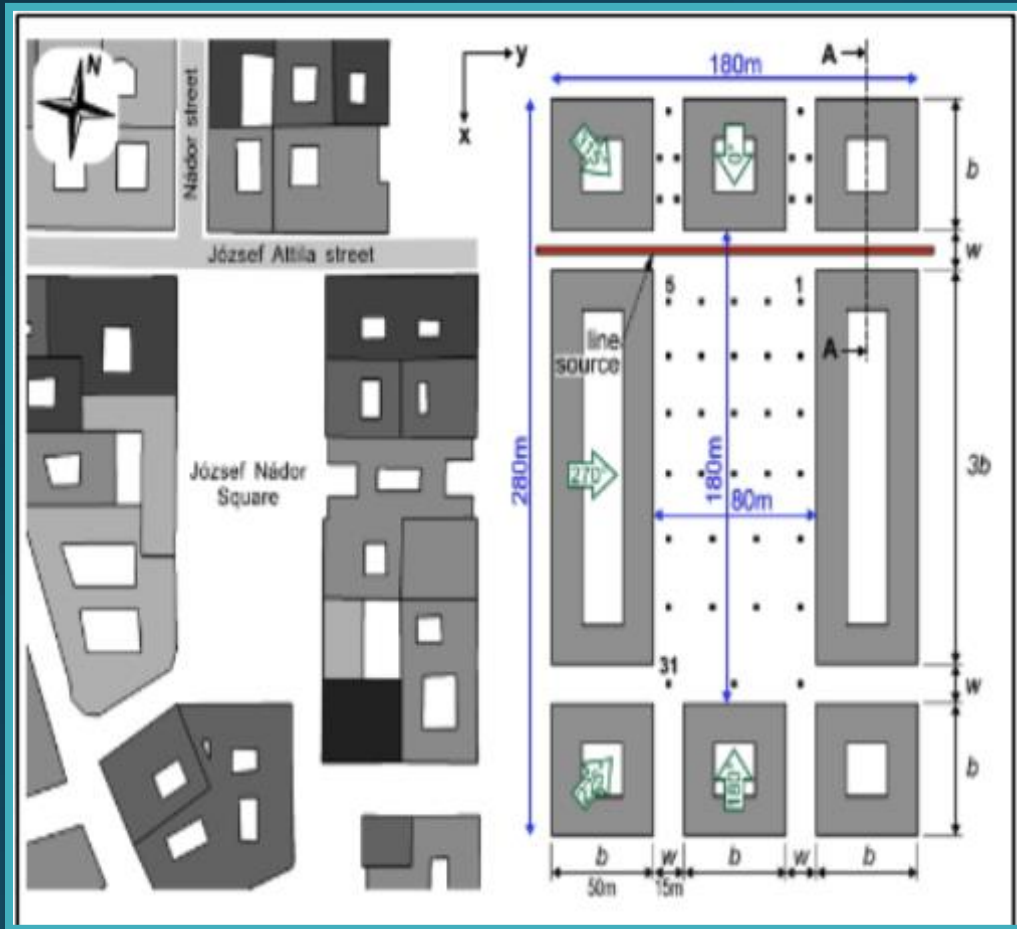
Conclusion

# I. Context

## Sand Erosion Method :

- Gives an effective image of the zones where local wind speed will be higher
- Creation of a model placed in a wind tunnel, recovered with sand grains
- Observation of the places where the sand is blown away
- The erosion patterns give an impression of the zones where the wind speed will be higher, thus the wind comfort will be lower

# I. Context



Introduction

I. Context

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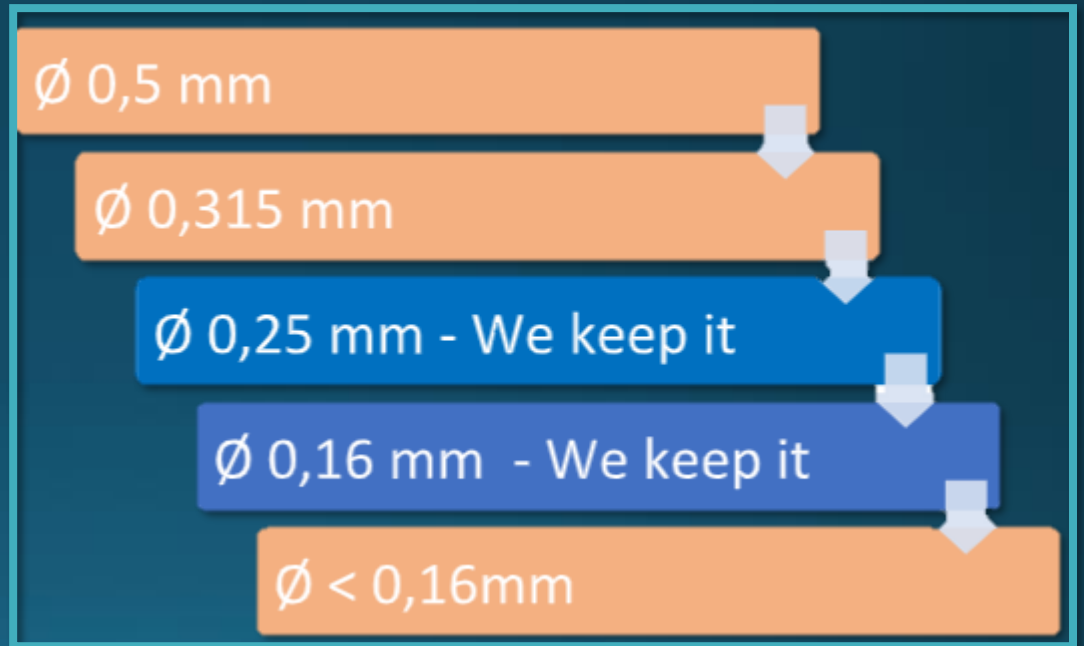
# II. Experiments

5 steps:

1. Models creation
2. Fractioning of the sand
3. Preparation of the wind tunnel
4. Wind speed calibration
5. Experiments

# II. Experiments

Fractioning of the sand:



# II. Experiments

- Preparation of the wind tunnel:

Model fixation



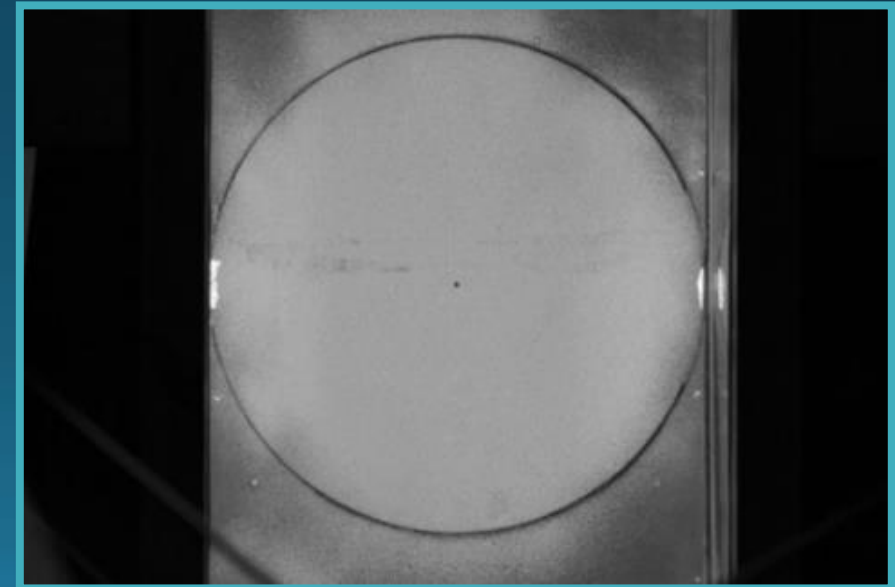
Camera setup



# II. Experiments

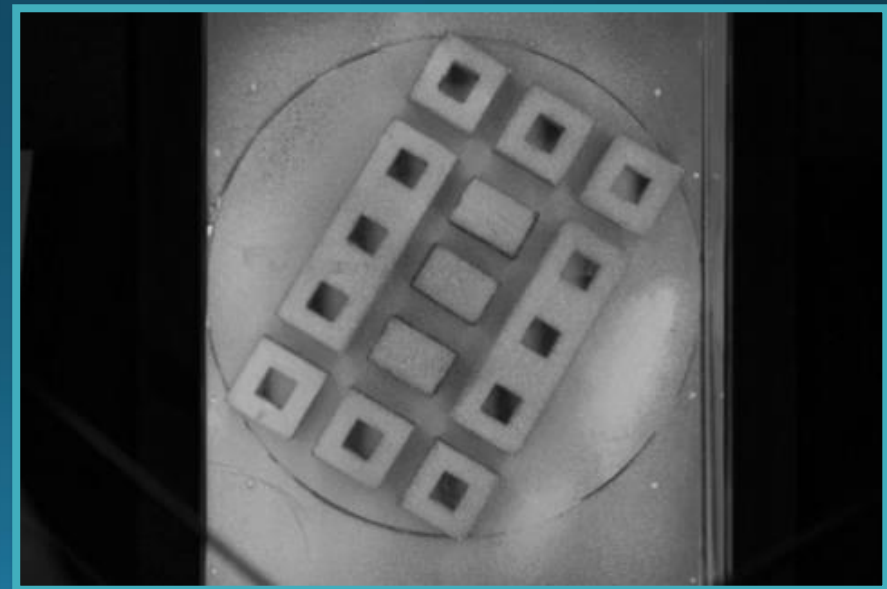
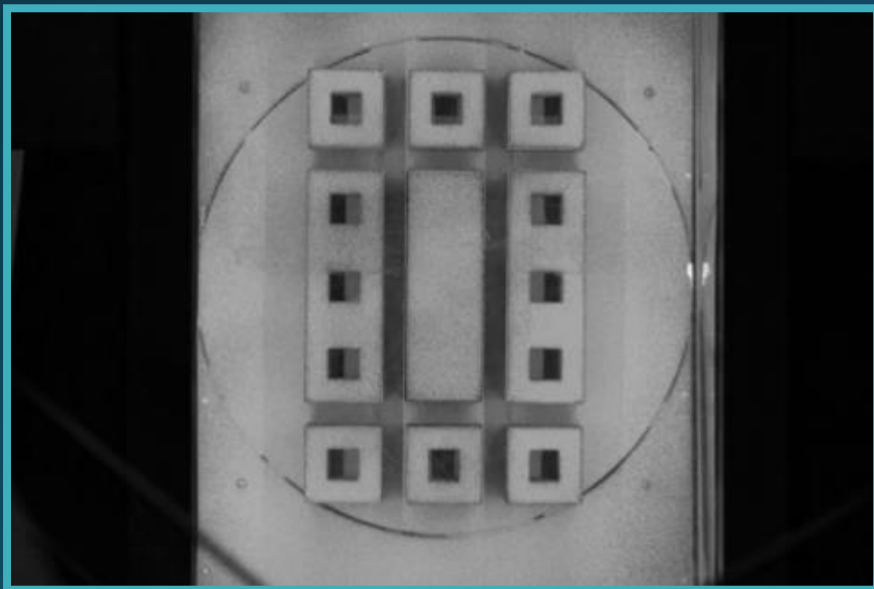
## Wind speed calibration:

- Model used: Flat plate
- Target: **Critical wind speed**
  - Threshold value of wind speed for which the sand is blown away
- Critical speed value : 7,91 m/s
- Used for following computations



# II. Experiments

- 8 configurations – 4 models with 2 wind directions
- 3 main steps:
  - Picture at 0 m/s
  - From 3 to 8 m/s by 0,5 increments
  - From 8 to 10 m/s by 1 increment



Introduction

I. Context

II. Experiments

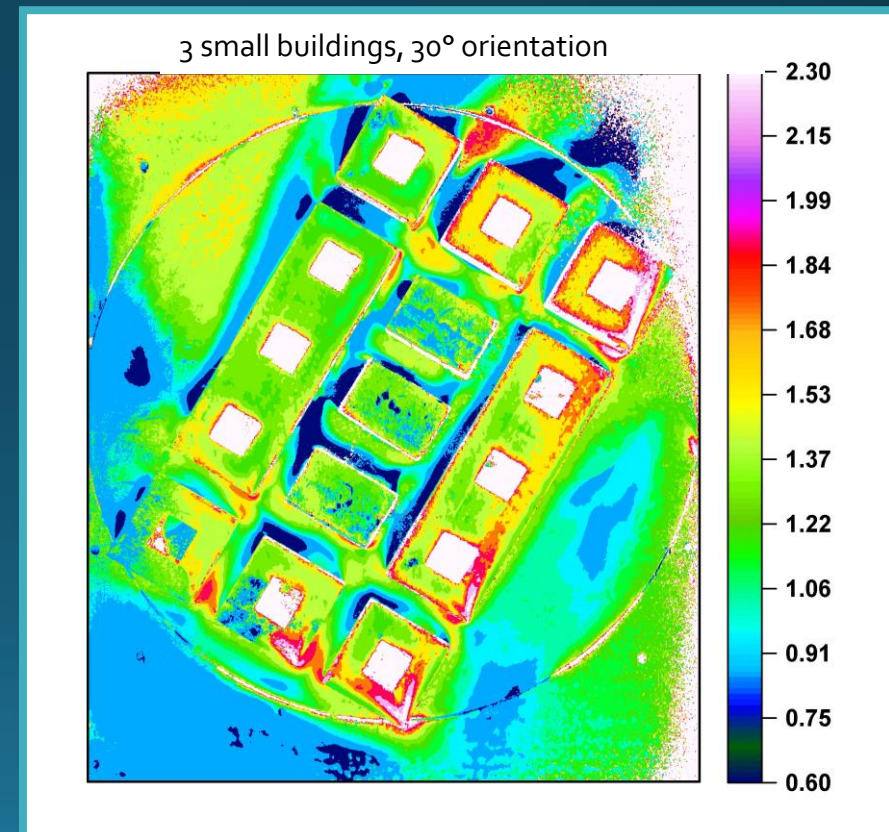
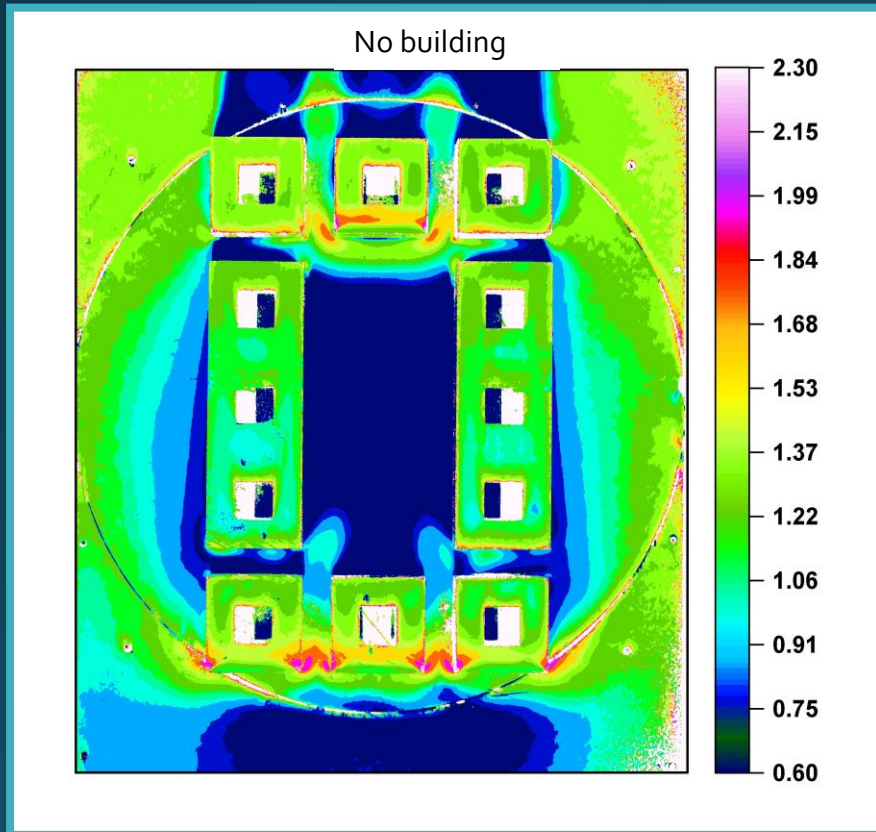
# III. Computation of the results

IV. Interpretation

Conclusion

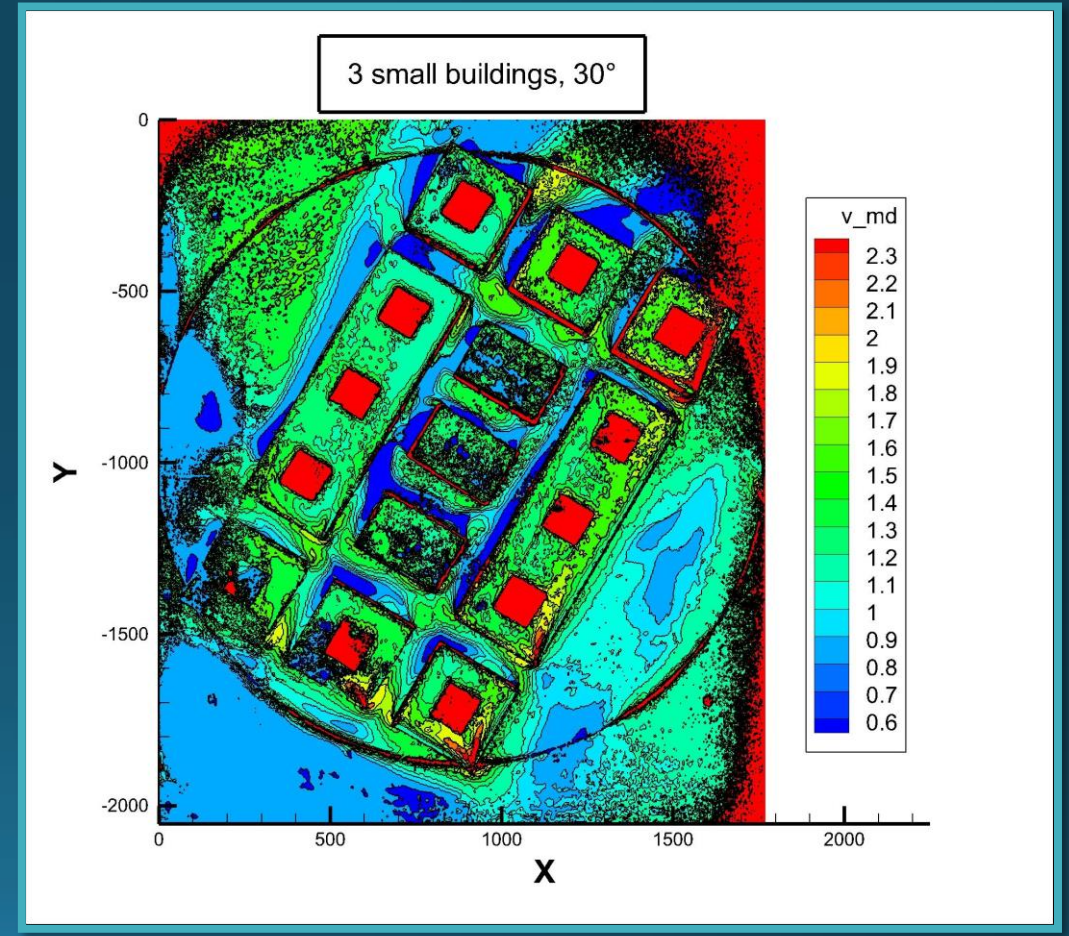
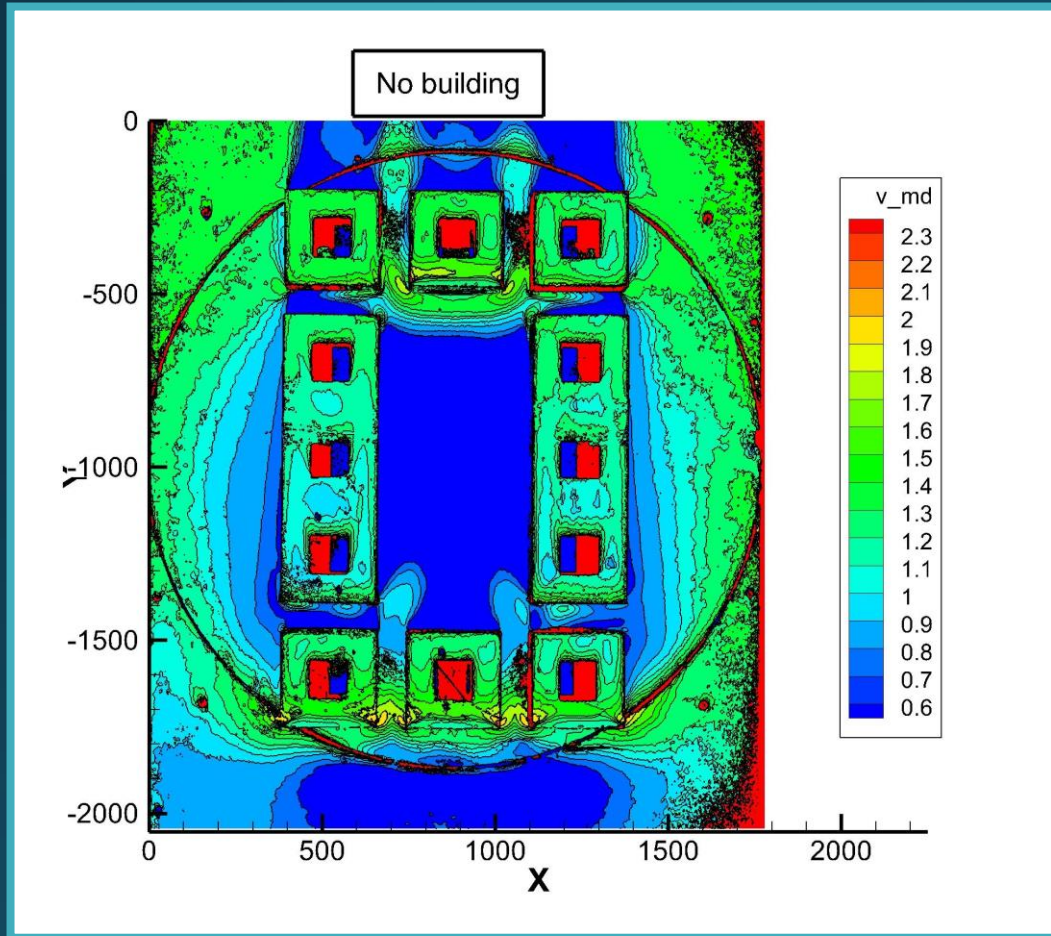
# III. Computation of results

- Pictures treated with ARA Sand Erosion



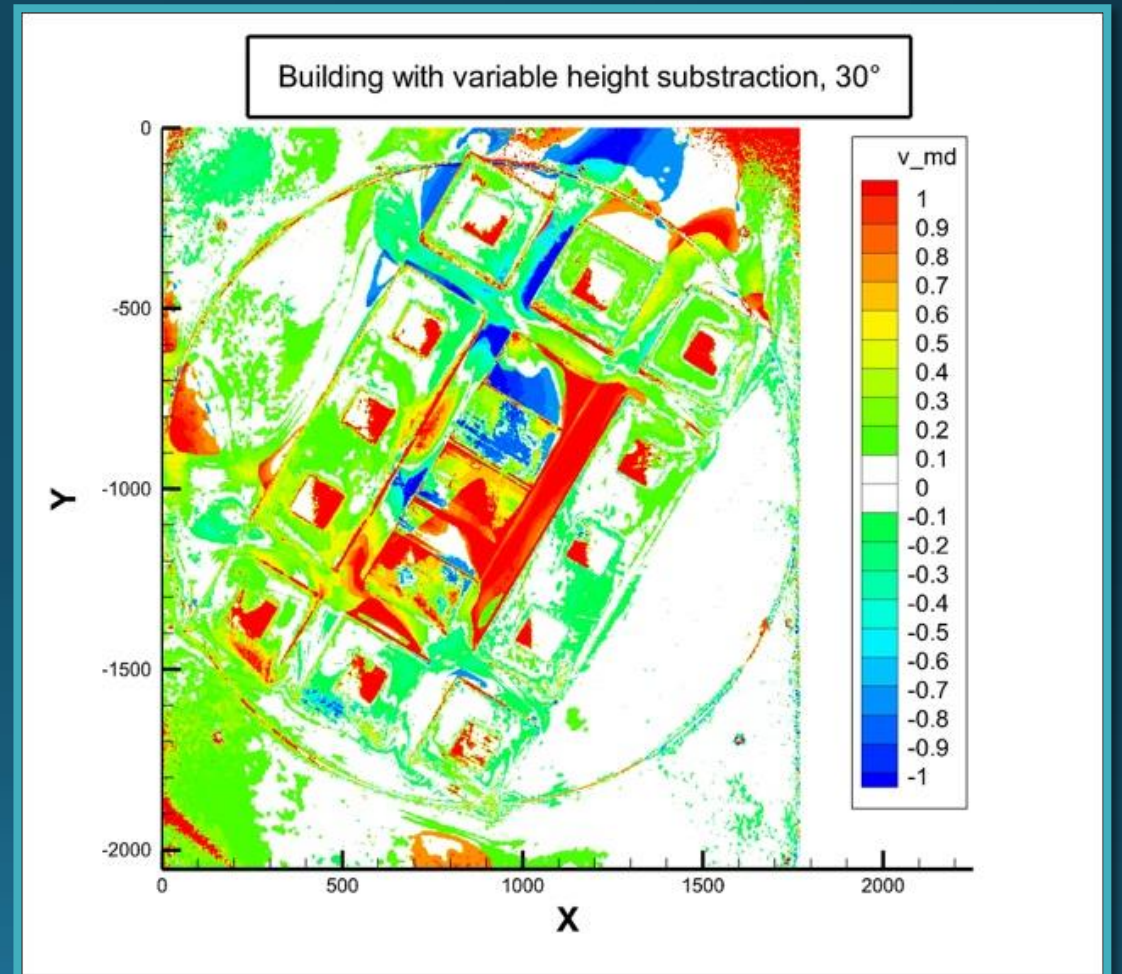
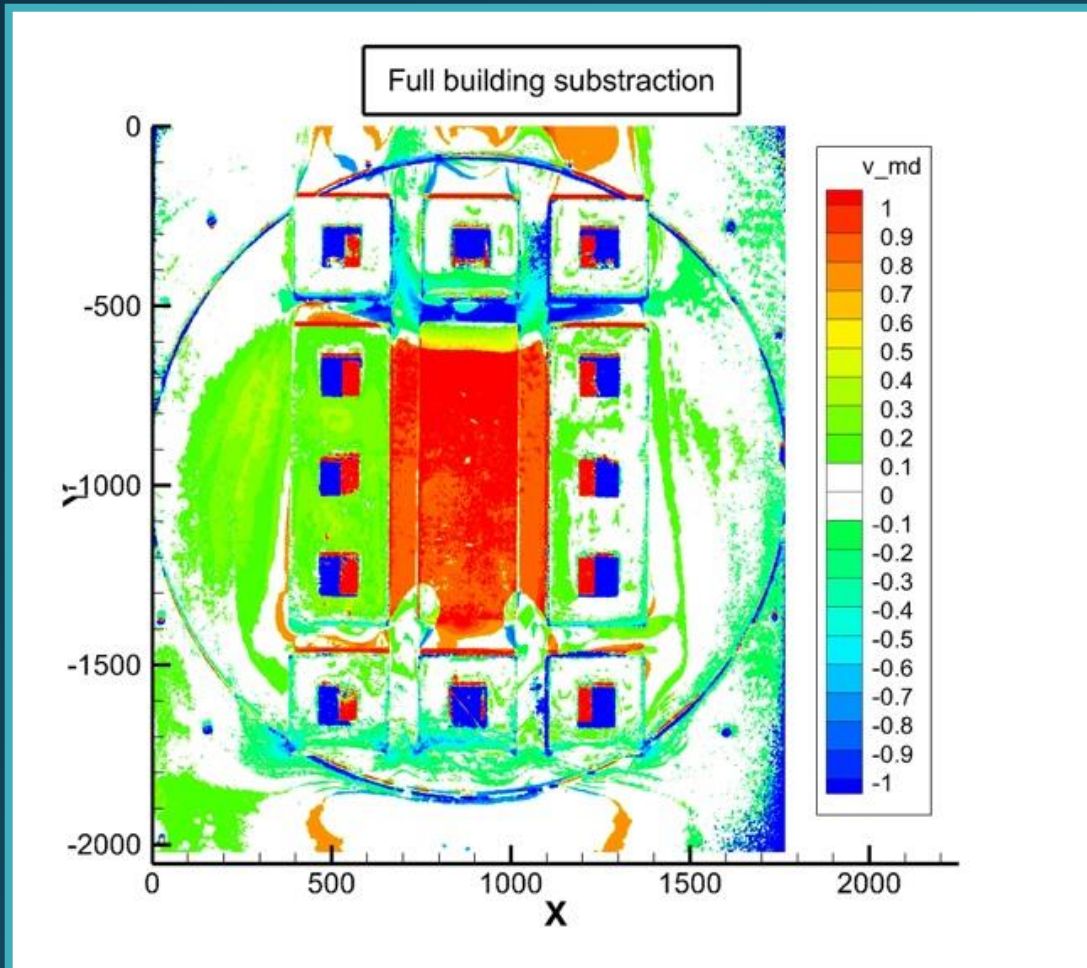
# III. Computation of results

- Tecplot analysis :





# III. Computation of results



Introduction

I. Context

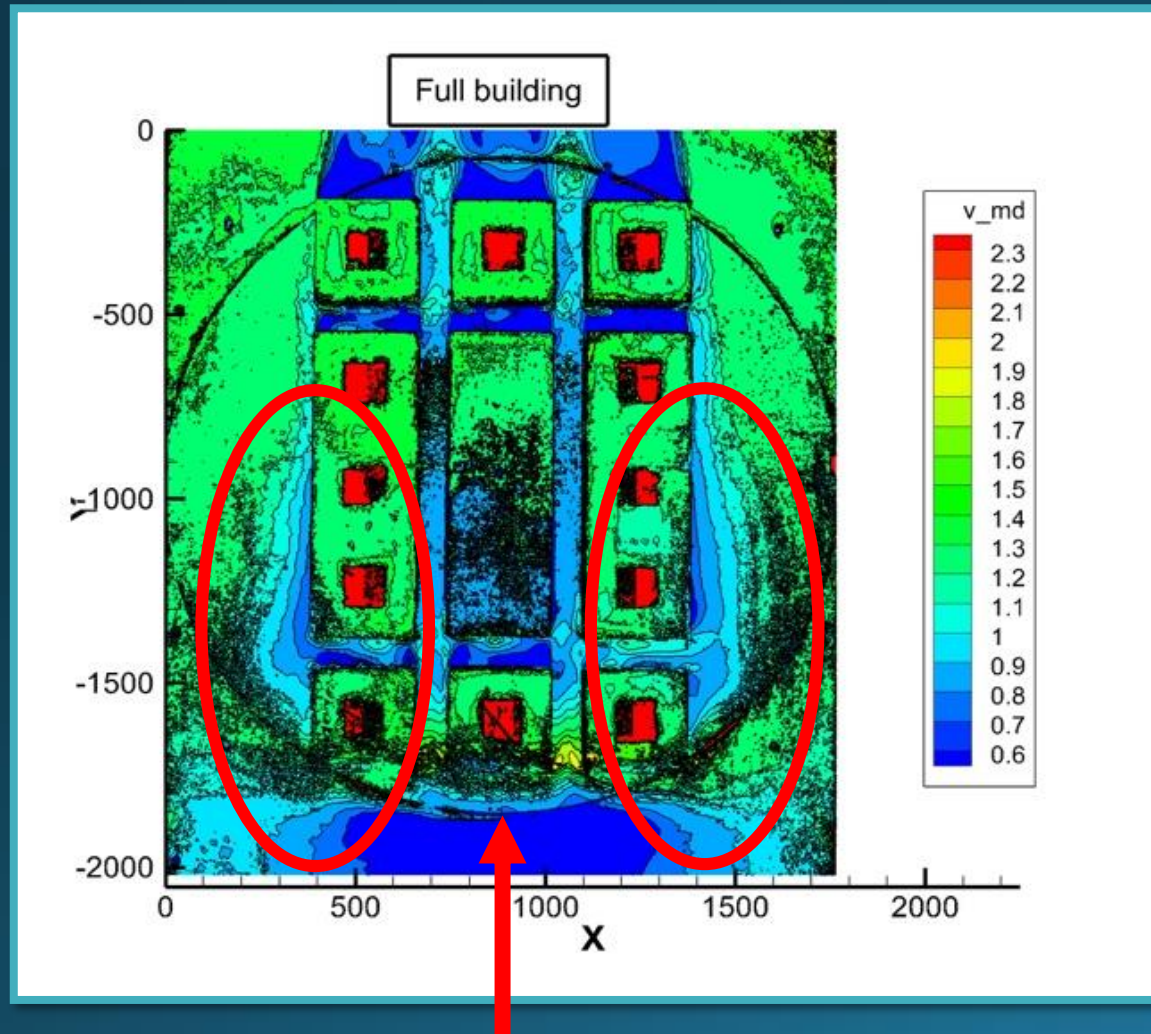
II. Experiments

III. Computation of the results

**IV. Interpretation**

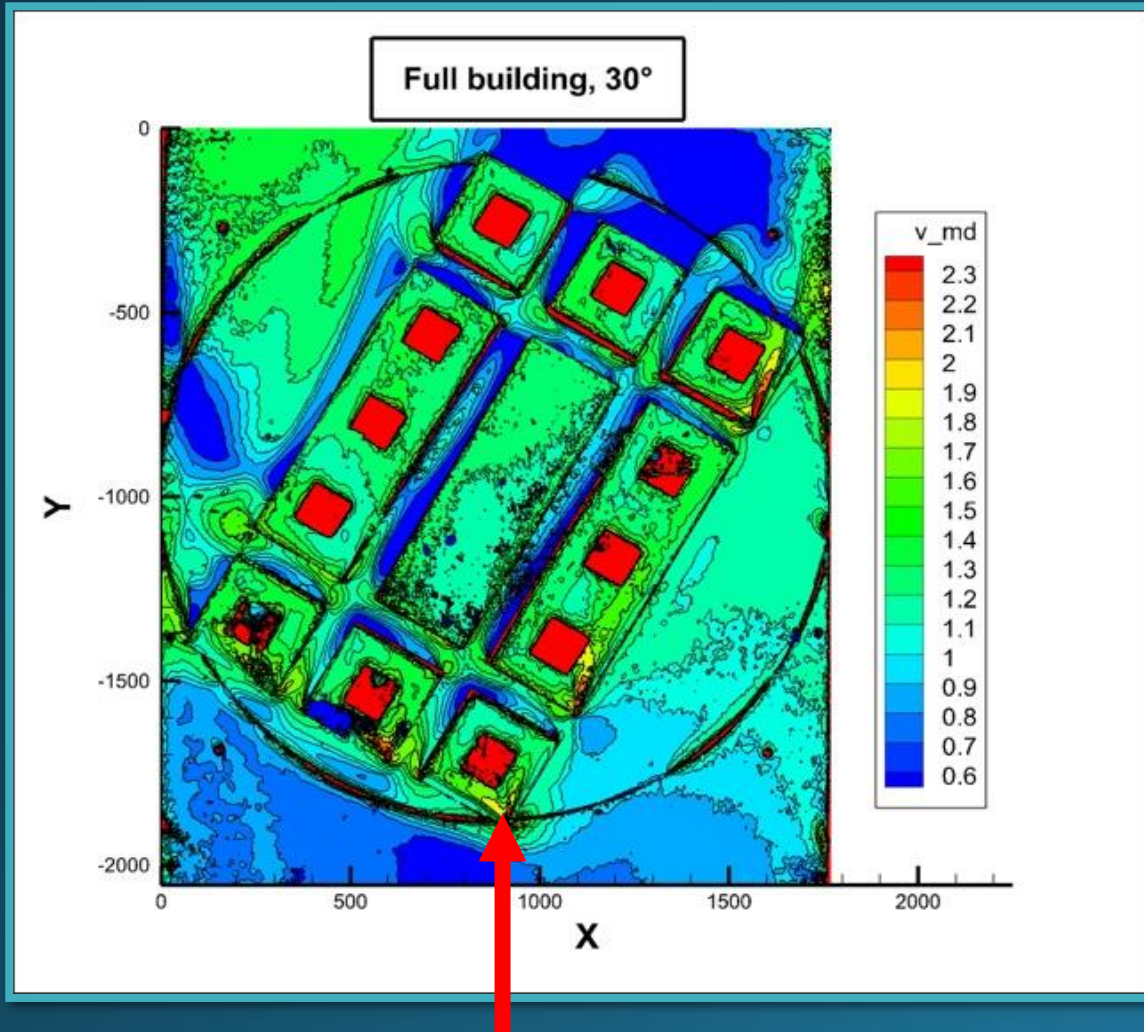
Conclusion

# IV. Interpretation



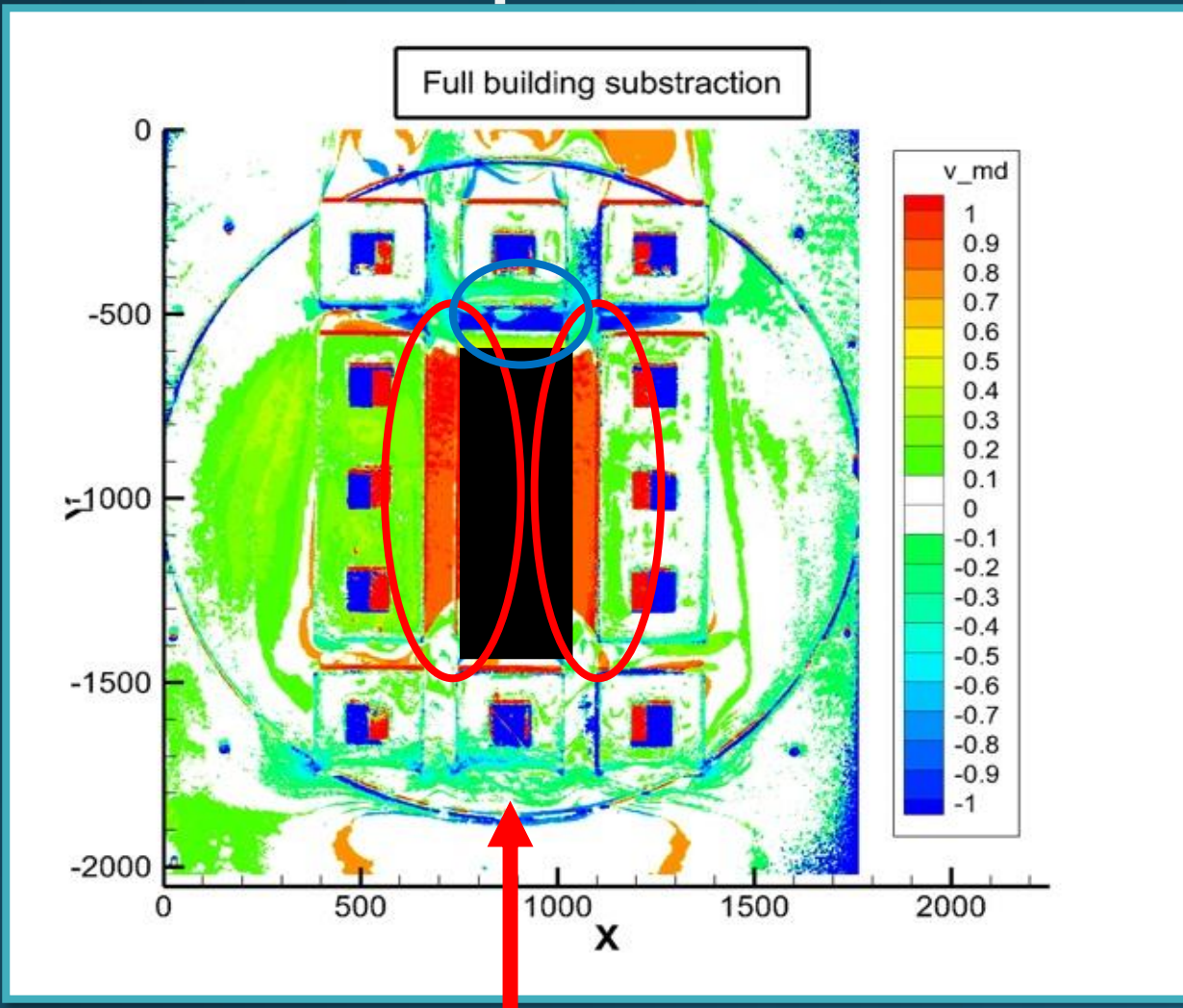
Forward wind  $0^\circ$   
Important flow separation

# IV. Interpretation



Inclined wind 30°  
Smaller flow separation

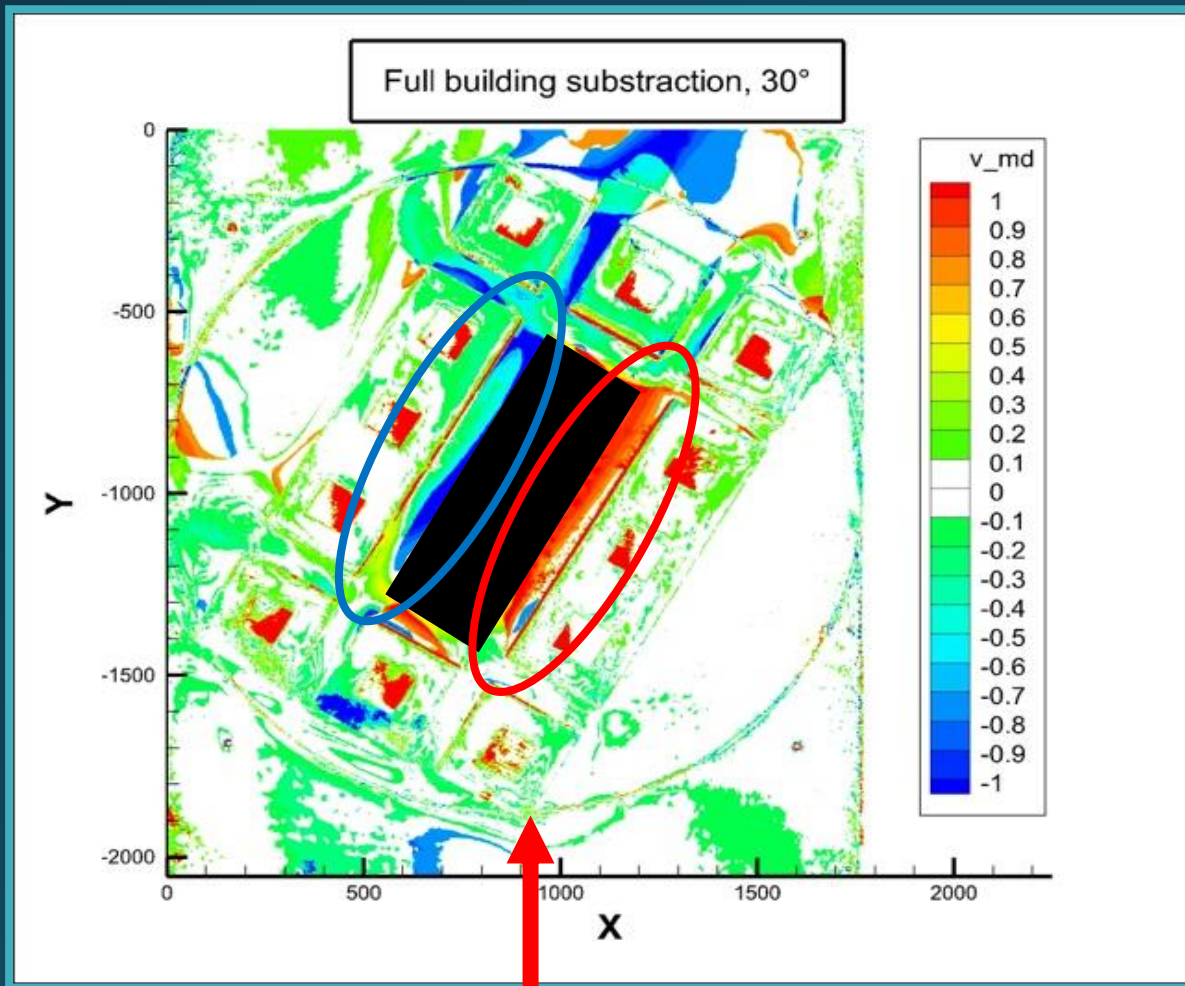
# IV. Interpretation – Comparison



Monobloc compared with empty space  $0^\circ$

- Flow acceleration
- Flow deceleration

# IV. Interpretation – Comparison



Monobloc compared with empty space 30°

- Flow acceleration
- Flow deceleration

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# Conclusion

# V. Conclusion

- Qualitative and quantitative ideas of the wind stream on floor level
- Observation of the main flow separations
  - Easier to recognize them in the  $0^\circ$  situation than on the  $30^\circ$
- Limits:
  - We didn't use the same 1 bit BW filter's value for every photo
  - Some imprecision with the sand repartition and thickness
  - Sand diameter not perfectly constant



# Questions ?