



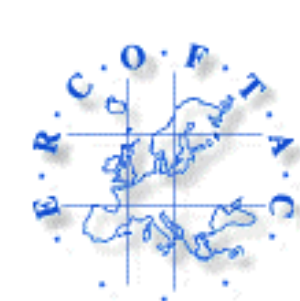
a Benchmark on the Aerodynamics of a Rectangular 5:1 Cylinder



under the umbrella of:
International Association
for Wind Engineering



with the support of:
Associazione Italiana
di Ingegneria del Vento



in cooperation with:
European Research Community On
Flow, Turbulence And Combustion

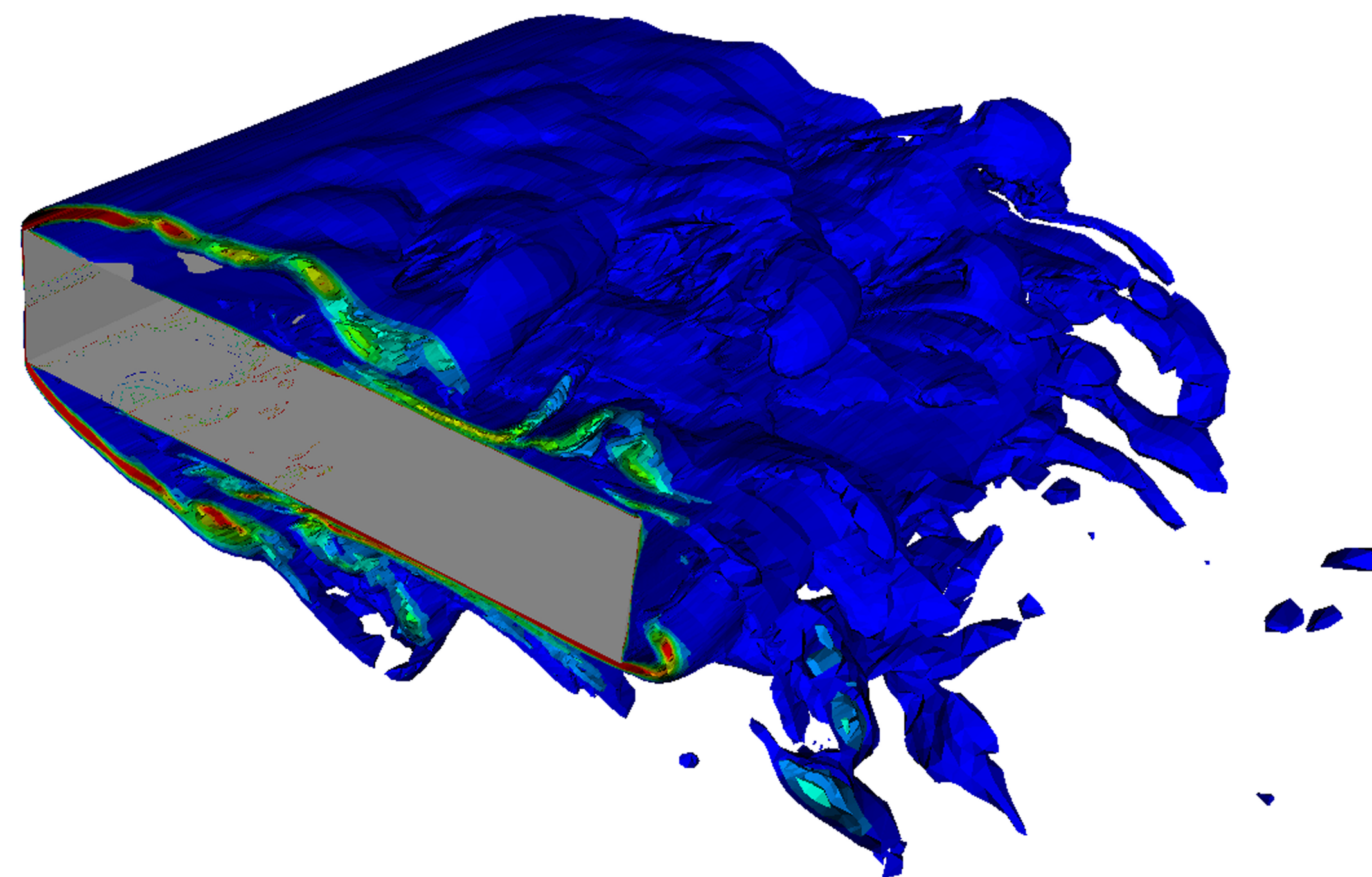
BENCHMARK OVERVIEW

PROBLEM STATEMENT

BARC addresses the high Reynolds number, external, unsteady flow around a stationary, sharp-edged **rectangular cylinder**, and the associated aerodynamic actions. The breadth (B) to depth (D) ratio is set equal to 5. Given the possible interest of Research Institutions and Industries operating in different fields of Engineering, BARC addresses both the **numerical** and **experimental** approaches.

AIMS

- to deeply investigate **one specific problem in the aerodynamics of bluff bodies**;
- to assess the consistency of **wind tunnel measurements** carried out in different facilities;
- to assess the consistency of **computational results** obtained through different approaches;
- to **compare** experimental and computational results;
- to develop **integrated procedures** relying on both experimental and computational outcomes;
- to develop **Best Practices** for experiments and computations.



TIME FRAME

The activities will be scheduled with the following time frame:

- July 2008** First announced during the VI Colloquium on Bluff Body Aerodynamics and Applications (BBAA VI) - Milan (Italy).
- Summer 2009** Workshop and/or thematic session within the 5th European and African Conference on Wind Engineering (EACWE) - Florence (Italy).
- Summer 2010** Workshop and/or thematic session within the 5th International Symposium on Computational Wind Engineering (CWE) - Chapel Hill (USA).
- Summer 2011** Workshop and/or thematic session within the 13th International Conference on Wind Engineering (ICWE) - Amsterdam (The Netherlands).
- Closure of the Benchmark problem.

REQUIREMENTS FOR THE MAIN SETUP

Common requirements for both wind tunnel tests and computational simulations:

- Reynolds number:** $2 \times 10^4 \leq Re = U \cdot D / \nu \leq 6 \times 10^4$
- Intensity of turbulence:** $I_u \leq 0.01$
- Radius of curvature of the model edges:** $R/D \leq 0.05$
- Incidence:** $\alpha = 0^\circ$
- Spanwise length of the obstacle:** $L/D \geq 3$
- Sampling frequency:** $f_s \cdot D/U \geq 8$

SENSITIVITY ANALYSES

Common sensitivity analyses for both wind tunnel tests and computational simulations are suggested:

- angle of incidence** $\alpha = 1^\circ, 3^\circ, 6^\circ$
- Reynolds number** $Re = 1 \times 10^3, 1 \times 10^4, 1 \times 10^5, 1 \times 10^6$
- turbulence intensity** $I_u = 0.02, 0.05, 0.10$

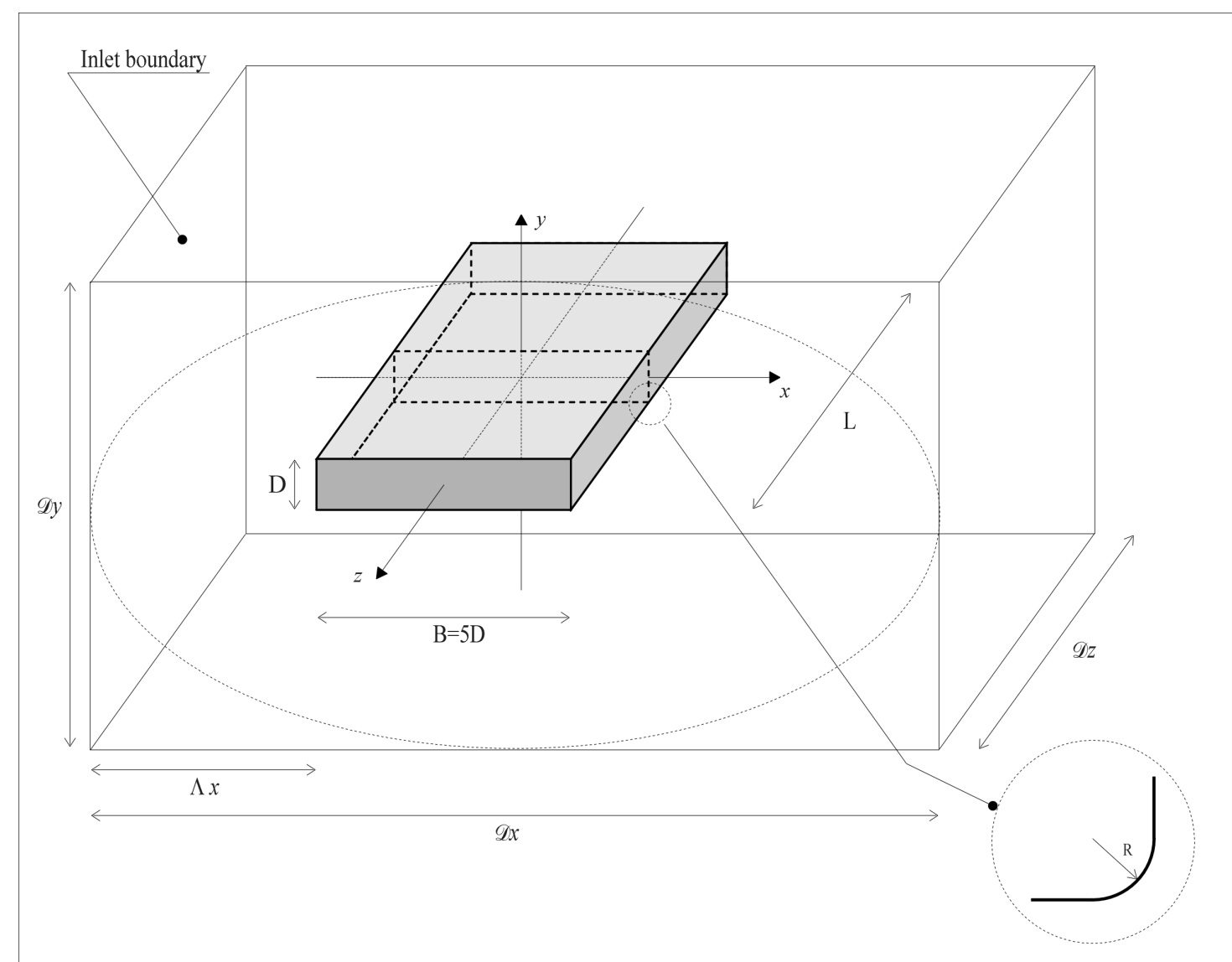
HOW TO CONTRIBUTE TO THE BENCHMARK

- ✓ The participants should register on the BARC web page <http://www.aniv-iawe.org/barc>;
 - ✓ The setup information and output data should be provided by the participants through upload on the BARC web database;
 - ✓ The database will be available to all participants for download, to allow comparison among results;
 - ✓ The setup information and output data requests are reported in the documents
- “**Requests for Computational Simulations**” and “**Requests for Wind Tunnel Tests**”;
- ✓ Both setup information and output data are classified as “**required**” and “**encouraged**”. Any further data can be provided by the participants.

REQUESTS FOR COMPUTATIONAL SIMULATIONS

TOPICS ADDRESSED

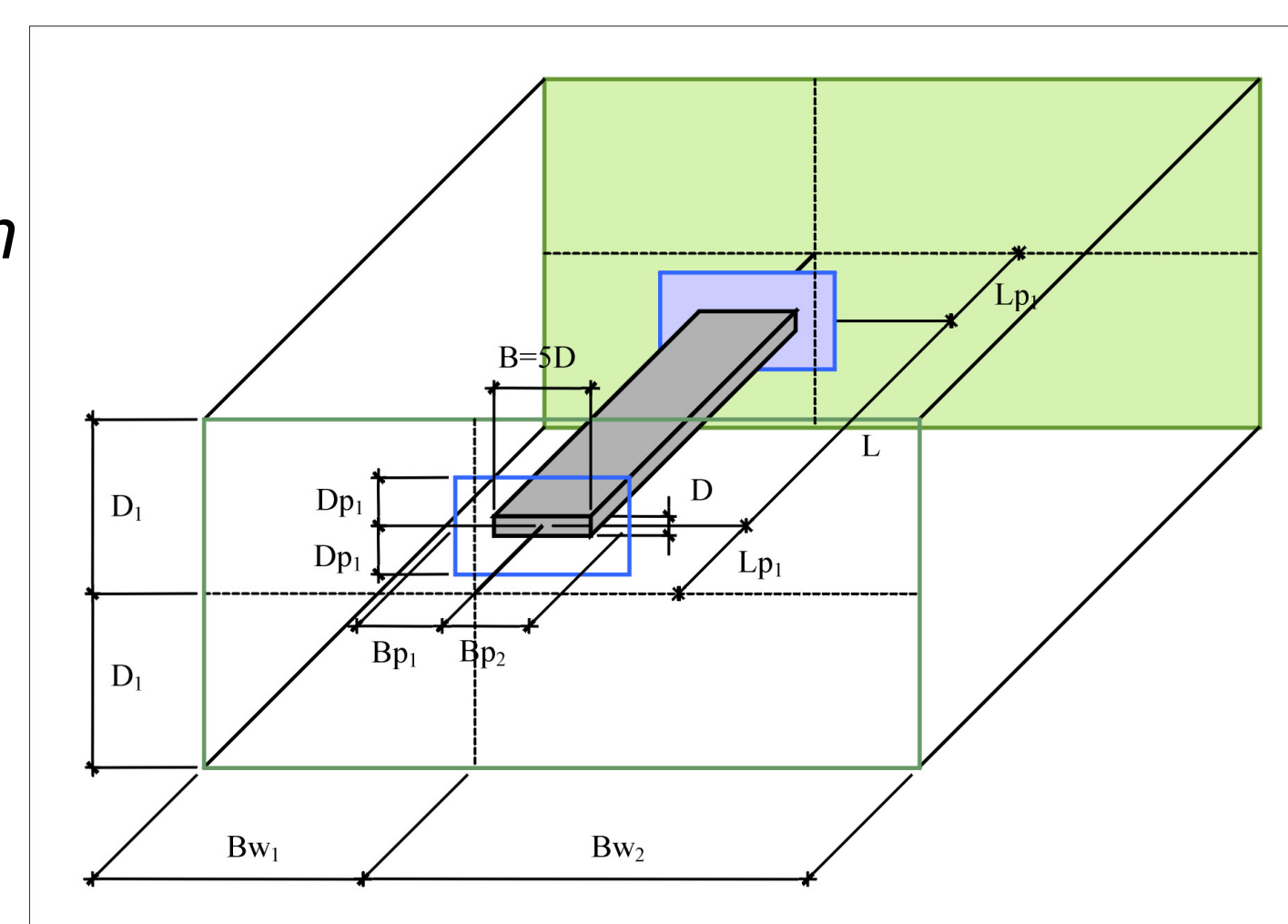
Physical Model
Model Geometry
Space and Time Grid
Boundary and Initial Conditions
Numerical approach
Convergence and Computation
Results for preliminary check
Results for comparisons
Encouraged Sensitivity Studies



REQUESTS FOR WIND TUNNEL TESTS

TOPICS ADDRESSED

Wind Tunnel characteristics
Wind Tunnel setup and instrumentation
Model Characteristics (rigid model)
Incoming flow characteristics
Organization of the tests
Preliminary data treatment
Results for preliminary check
Results for comparisons



COMMITTEES & CONTACTS

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