



# **Modeling and Simulation of** the physical world (SIM) S. Labbé (UJF – LJK) B. Penz (Grenoble INP – G–SCOP)

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## Physical world simulation: In-Silico to In-Vivo and return







# Modeling and simulation: Key-points







# PERSYVAL-Lab main assets



Illustration through some examples

# **Complex systems and uncertainties**



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# Computations must be validated through comparisons with the physical world. Tools are

#### Uncertainties quantification

#### Data assimilation

1. Image produced by the INRIA/LJK team MOISE, specialized in data assimilation and uncertainties quantification.

2. Image produced by the TIMC team BCM specialized in computational biology and mathematics.

<sup>(1)</sup> Visualization and identification of flood lowering of the Pearl River.

# Tools for understanding the virtual world



# The study of the model's behavior is a key-point of the convergence between the two worlds: physical and virtual

1. Work realized by P.-O. Lamare, PhD student GIPSA-LAB/LJK recruited thank's to the previous year Persyval-lab PhD campaign.

2. Work realized by the VERIMAG Team, Timed and Hybrid Systems.

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# **Efficient simulations**



(1) Numerical study of the fluid transfer from Atlantic Ocean to Indian Ocean.

Simulation creates links thanks to high performance computing optimizations





(k)  $Re_{h} = 11317 L/D = 1.2$ 

(1)  $Re_{2} = 11317 L/D = 53$ 

(2) Computation used to illustrate the turbulence transition phenomena.

1. Image produced by the INRIA/LJK team MOISE, specialized in data assimilation and uncertainties quantification.

2. Image produced by the GIPSA-LAb team Gestes phonatoires, Analyse et Modélisation Acoustique.

## PERSYVAL-Lab The SIM action scientific committee

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