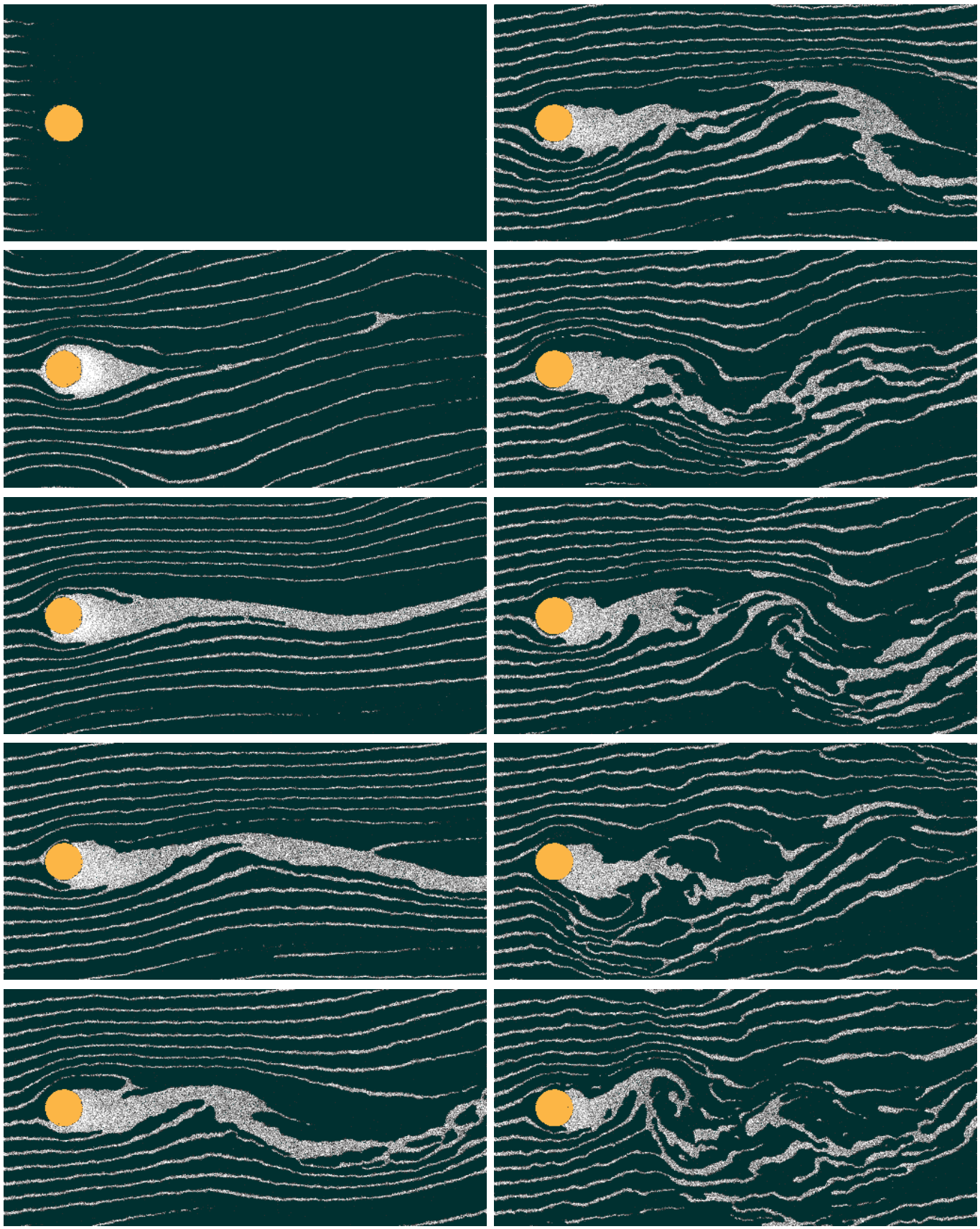

Finite-Integer Lattice-Gases

AFOSR Task 2304CP10 Project Leader: J. Yepez

An intermediate method for complex fluid dynamics inheriting the following features:

Lattice-Gas Automata

Exact conservations
Semi-detailed balance
High order correlations
Unconditional stability
Analytically Treatable
Theoretically Elegant
Physical interactions

Lattice-Boltzmann Gas

Lower viscosity (Higher Re)
Galilean Invariance
Correct equation of state
Simple Collision Operator
Efficient on common MPPs

Vortex Shedding past a cylinder (von Karman Instability)

2048x1024 Triangular lattice

Snaps shots from low to high Reynolds number

2 Fluids Simulated:

Fluid 1:

Finite-Integer lattice-gas
4-bits per direction
2-body collisions
with rest particle collisions

Fluid 2:

Multiphase lattice-gas
(liquid and gas phases)
Local LGA collisions with
long-range attractive interactions

CAM-8
Numerical Experiment