First results for the common paper

B. Sauvage

Mesh Adaptation Strategy

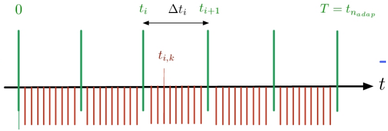
- Application of the Transient Fixed-Point algorithm with one fixed point
- Mesh adaptation every 2 vortex shedding
- The Mach number is chosen as sensor

Information about simulation conditions :

- Roe solver with $\gamma = 0.3$
- V6 MUSCL reconstruction
- Mach number $= 0.3$
- VMS-LES Wale Turbulence Model

Algorithm 1.2 – Transient $\mathbf{L}^{\infty}([0,T], \mathbf{L}^{p}(\Omega))$ fixed-point mesh adaptation algorithm,

```
//- Loop over time subintervalls n_adap
for i = 1, n_adap do
  //- Fixed point adaptation loop
  for i = 1, n_ptfx do
    1. S^i_{0,j} = ConservativeSolutionTransfer(H^{i-1}_j, S^{i-1}_j, H^i_j)
    2. S^i_j = SolveStateForward(S^i_{0,j}, H^i_j)
    3. M^i_j = ComputeFeatureOrientedMetric(S^i_j, H^i_j)
    4. H^i_{j+1} = GenerateAdaptedMesh(H^i_j, M^i_j)
  end for
end for
```



Flow past a cylinder at Reynolds 3900

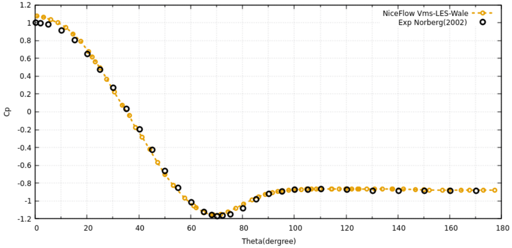


Figure – Distribution over the cylinder surface of the mean pressure coeficient at Reynolds number 3900.

	$\overline{C}_d$	C_l'	l_r	-$\overline{C}_{pb}$	$\overline{\theta}$	St
Present simul.						
VMS-LES Wale	1.02	0.09	1.48	0.85	90	0.20
$k - \varepsilon$/DVMS	0.967	0.11	-	0.85	90	0.20
$k - \varepsilon - \gamma$/DVMS	0.998	0.11	-	0.86	88	0.21
Other simul.						
VMS-LES [?]	0.99	0.108	1.45	0.88	89	0.21
VMS-LES [?] (1)	1.03	0.377	0.94	1.01	-	0.22
VMS-LES [?] (2)	0.94	0.092	1.56	0.83	-	0.22
LES [?, ?, ?]	[0.99-1.38]	-	[1.0-1.56]	[0.89-1.23]	-	[0.19-0.21]
Experiments						
Exp. [?, ?, ?, ?]	[0.94-1.04]	-	[1.47-1.51]	[0.82-0.93]	-	[0.20-0.22]

Table 1 – Bulk coefficient of the flow around a circular cylinder at Reynolds number **3900**.

Flow past a cylinder at Reynolds 3900

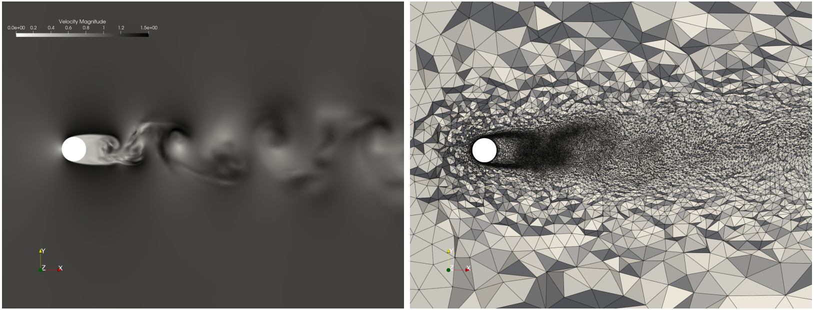


Figure – Cylinder flow at Reynolds number 3900 : velocity field (left) and adapted mesh (right) in cross-section.

Flow past a cylinder at Reynolds 20k

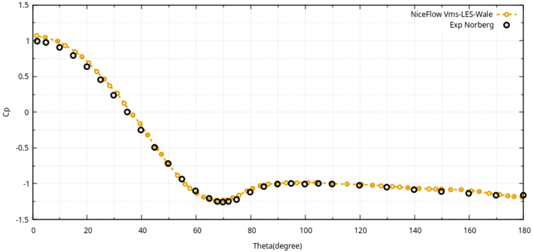


Figure – Distribution over the cylinder surface of the mean pressure coeficient at Reynolds number 20k.

	$\overline{C}_d$	C_l'	l_r	-$\overline{C}_{pb}$	$\overline{\theta}$	St
Present simul.						
VMS-LES Wale	1.24	0.45	-	1.08	-	0.193
$k-\varepsilon$/DVMS	1.102	0.60	-	0.85	85	0.22
$k-\varepsilon-\gamma$/DVMS	1.227	0.48	-	1.19	89	0.21
Other simul.						
VMS-LES [?]	1.27	0.60	0.80	1.09	86	0.19
Experiments						
Exp.	[1.10-1.20]	[0.4-0.6]	-	[1.03-1.09]	-	0.19

TABLE 2 – Bulk coefficient of the flow around a circular cylinder at Reynolds number $\mathbf{20,000}$.

Flow past a cylinder at Reynolds 20k

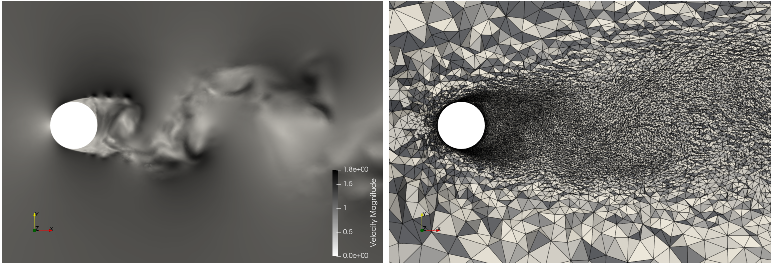


Figure – Cylinder flow at Reynolds number 20k : velocity field (left) and adapted mesh (right) in cross-section.

Flow past a cylinder : Qcriterion