

LifeV

NSPC and NSIP: preliminary analysis



MOX (Modeling and Scientific Computing)

Dipartimento di Matematica

Politecnico di Milano

`mox.polimi.it`

Context: simulation data for Carotid Bifurcation

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1. Incompressible Navier Stokes Equations

- ☛ Fluid density $1g/cm^3$
- ☛ Fluid viscosity $0.035poise$

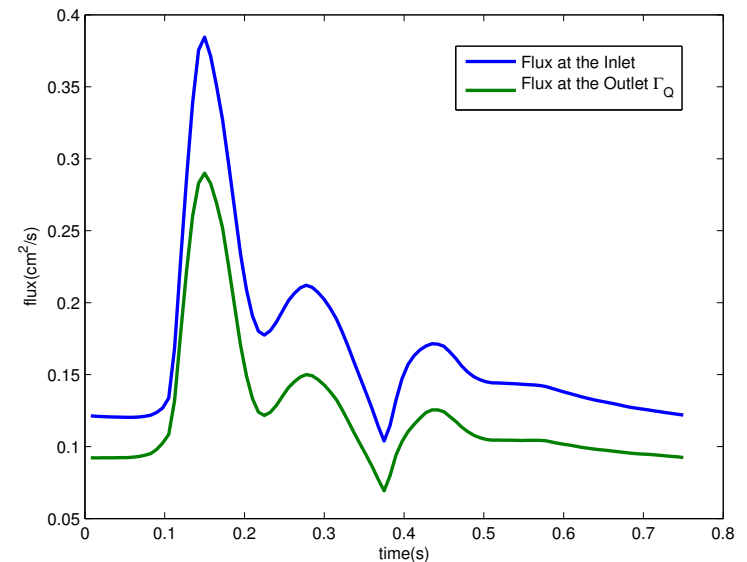
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- ☛ Fluid viscosity $0.035poise$

2. Boundary Conditions:

- ☛ **Inlet**
Flux conditions (Common Carotid Artery)
- ☛ **Outlets**
Flux conditions (Internal Carotid Artery)
+ Homogenous Neumann conditions (External Carotid Artery)



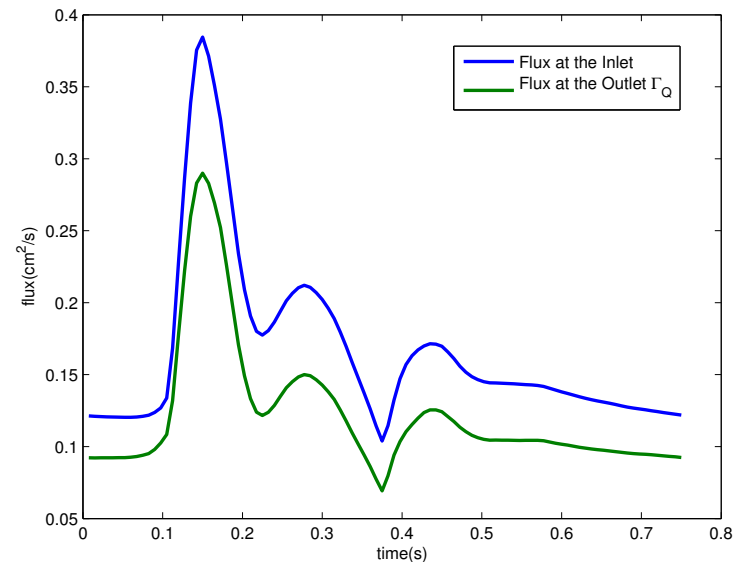
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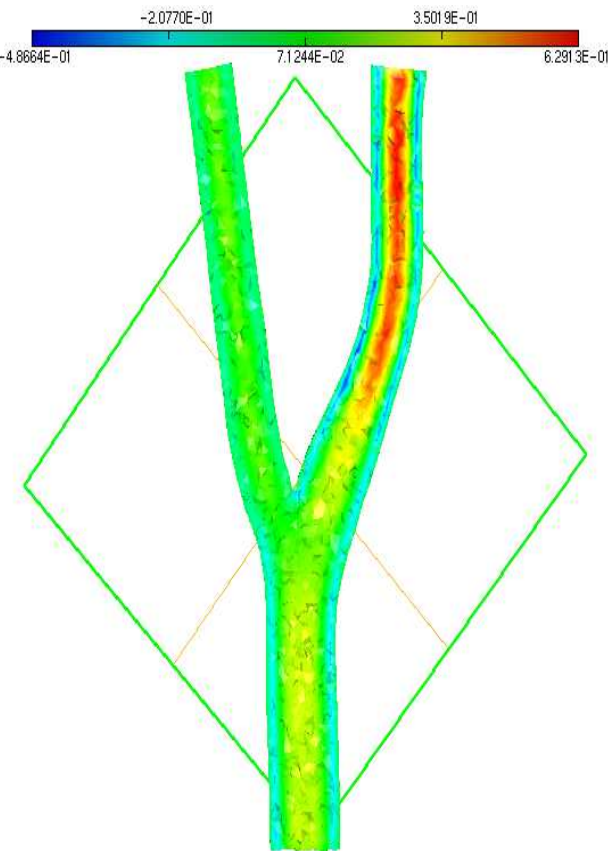
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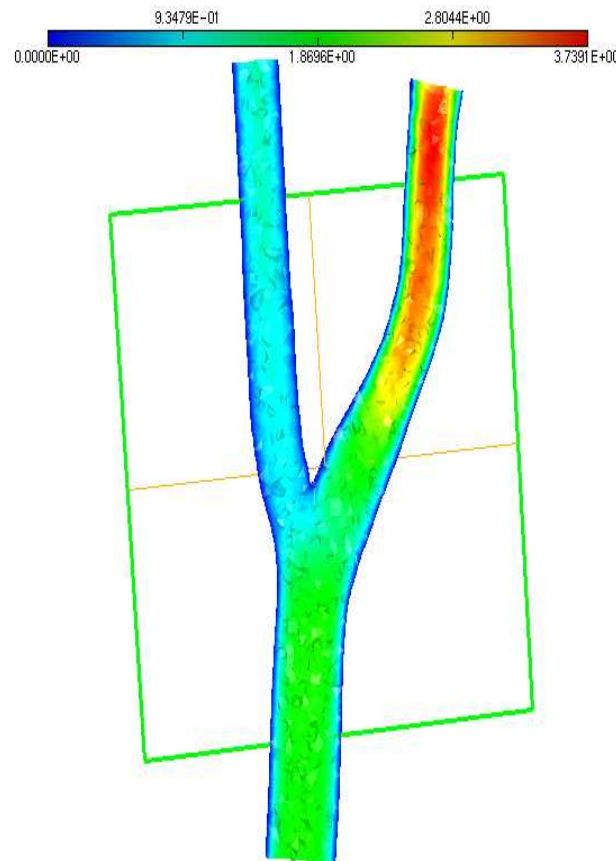
3. Initial Conditions:

- ☛ $\mathbf{u}_0 = \mathbf{0}$

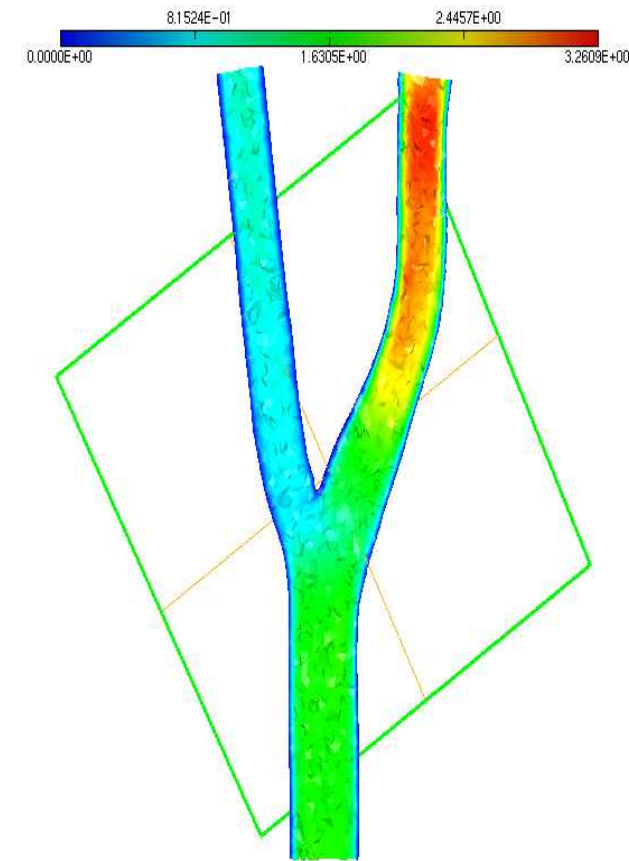
Results: Karotis



Difference



IP



PC

Solution at $t = 0.15$ s (20 time steps with $dt = 0.0075$ s). The flux is imposed exactly both on inlet and outlet. However, the two solutions differ by an order of magnitude of $\sim 10\%$.

Context: simulation data for ICA Aneurysm

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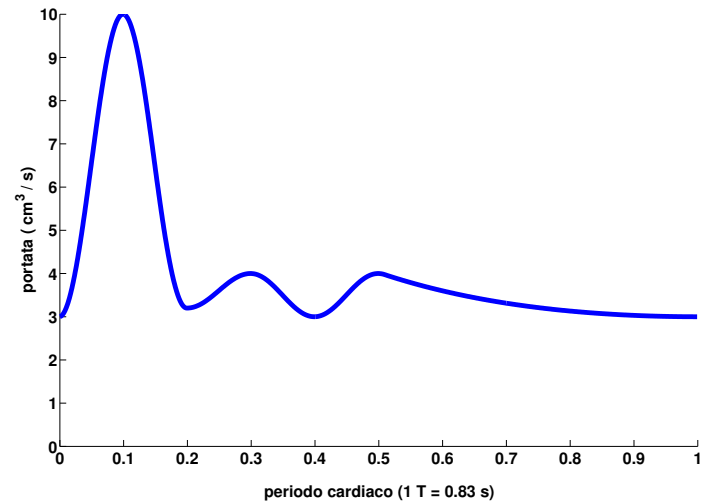
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2. Boundary Conditions:

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Flux conditions (Internal Carotid Artery)
- ☛ **Outlets**
Homogenous Neumann conditions



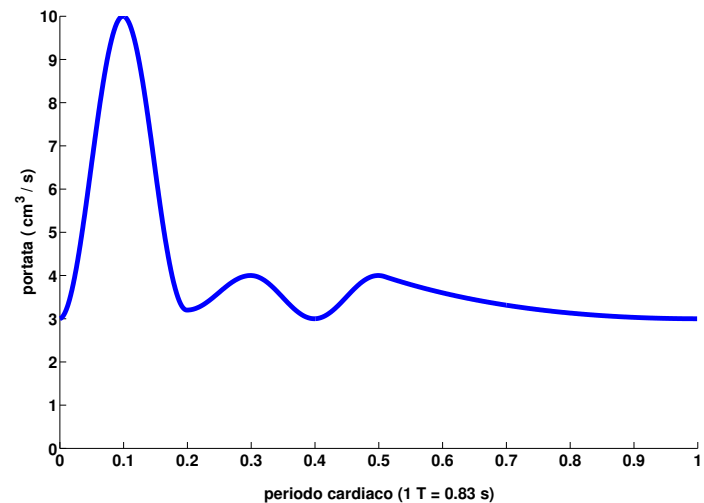
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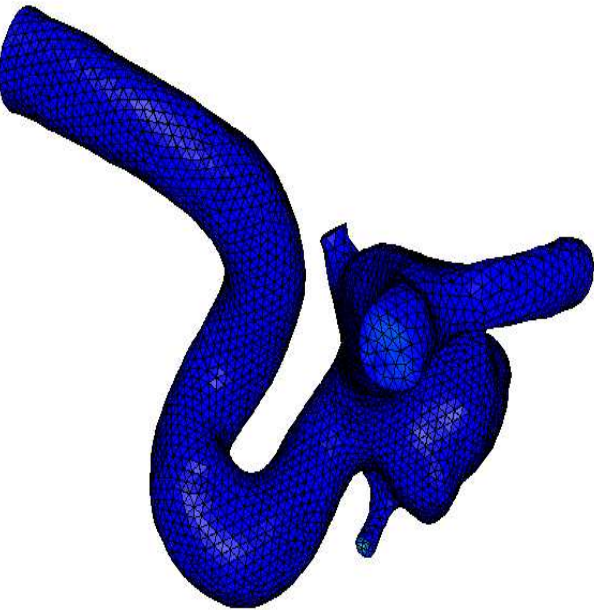
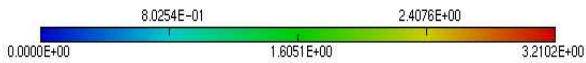
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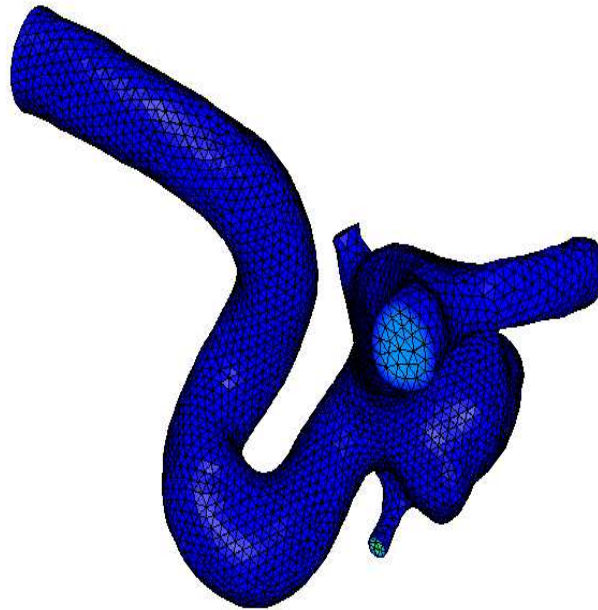
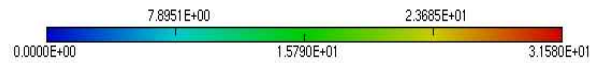
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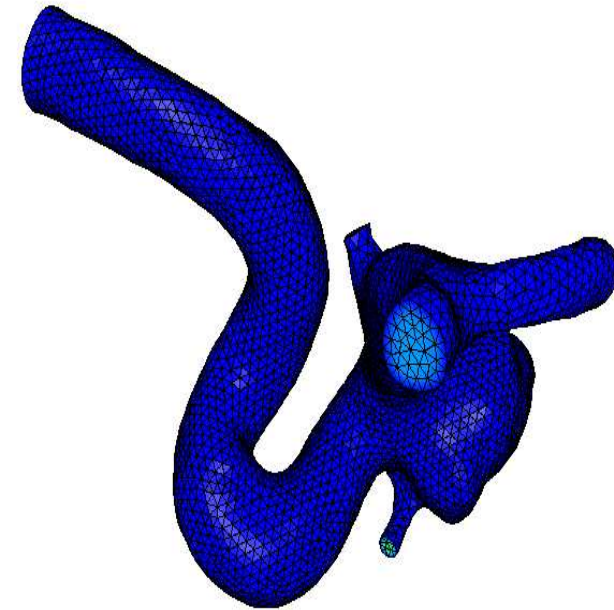
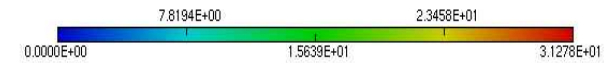
Results: Aneurysm



Difference



IP



PC

Solution at $t = 0.01$ s (1 time step with $dt = 0.01$ s). The flux is imposed exactly on inlet. However, the two solutions differ by an order of magnitude of $\sim 10\%$.