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Analyzing Transient Turbuelnce in a Stenosed Carotid Artery by Proper Orthogonal Decomposition LEOPOLD GRINBERG, Brown University, ALEXANDER YAKHOT, Ben-Gurion University of the Negev, GEORGE KARNIADAKIS, Brown University — High resolution 3D simulation (involving 100M degrees of freedom) were employed to study transient turbulent flow in a carotid arterial bifurcation with a stenosed internal carotid artery (ICA). In the performed simulation an intermittent (in space and time) laminar-turbulent-laminar regime was observed. The simulation reveals the mechanism of the onset of turbulent flow in the stenosed ICA where the narrowing in the artery generates a strong jet flow. Time- and space-window Proper Orthogonal Decomposition (POD) was applied to quantify the different flow regimes in the occluded artery. A simplified version of the POD analysis that utilizes 2D slices only - more appropriate in the clinical setting - was also investigated.

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