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A different approach on the onset of separation in the flow around a circular cylinder. NIKOLAOS MALAMATARIS, George Mason University / ATEI of Thessaloniki, I. SARRIS, TEI of Athens, D. PAZIS, Aristotle University of Thessaloniki, A. LIAKOS, US Navel Academy — The onset of separation in the flow around a cylinder is revisited with new insight. The goal of the research is to compute the smallest Reynolds number where the separation actual occurs rather than computing small eddies and extrapolating to the value of the Reynolds number where separation may occur. To this purpose, an accurate home made code is designed with Galerkin finite elements. The computational domain is chosen as the laboratory experiments by Taneda. It is found that in all six different choices of Taneda's diameters of the cylinders he used, separation is not observed for $Re < 6.1$. Actually, separation is computed in all of his six cases for $Re = 6.14$. Images of this smallest eddy are shown for the first time where all characteristics of eddies are recognisable (vortex centre, separation length etc). The vorticity of the flow is computed along the cylinder surface and it is shown that, at separation, vorticity changes sign. Byproducts of this research is the computation of the drag coefficient for Reynolds numbers starting from $1 \cdot 10^{-5}$ up to 40. In addition, the separation angle (point where vorticity changes sign) is computed for $6.14 \leq Re \leq 40$. This research aims to be the most thorough work done on that subject so far.

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