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HORIZON EUROPE  
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### **CARE - Roughness-induced secondary currents in arterial flows with stents**

Stents are tubular nets of varied materials and geometries that are installed in narrowed (stenotic) arteries to preserve their restored diameter following surgical procedure (e.g., angioplasty). Stents add a roughness element to the otherwise smooth walls of arteries, thus altering the hemodynamic environment and the flow characteristics. CARE is inspired by recent results in wall-bounded flows, which have shown that roughness patterns of height much smaller than the flow size may generate secondary currents (SCs), large-scale streamwise vortices (comparable to the artery diameter) that alter flow structure, transport mechanisms, wall shear stress distributions and flow drag, among others. Due to their geometrical properties, stents are ideal candidates for the generation of SCs within the flow, with potentially significant effects on biological processes, e.g., restenosis. CARE will aim at advancing our understanding of SC dynamics in arterial flows by assessing their effects on key hemodynamic parameters and analysing energy exchanges. General guidelines for improved stent designs that control and modulate SCs, by preventing or promoting their generation, will be outlined. At present, roughness-induced SCs in stented arteries are largely unexplored, making the proposed research particularly timely. CARE will be based on laboratory experiments covering a range of flow conditions similar to those that can be found in the main body arteries. Different roughness patterns will be studied, including the reproduction of an actual stent. An advanced stereoscopic particle-image velocimetry system, capable of non-intrusive planar velocity measurements, will be used to study the SC patterns and their effects on wall shear stress distribution, as well as their contribution to momentum and energy exchanges.

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**Total EU Contribution:** Euro 188.590,08

**Call ID:** HORIZON-MSCA-2022-PF-01

**Project Duration in months:** 24

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