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AN ALGORITHM FOR THE GENERATION OF BIOFOULED SURFACES FOR APPLICATIONS IN MARINE HYDRODYNAMICS

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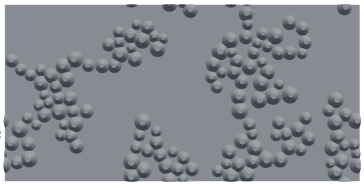
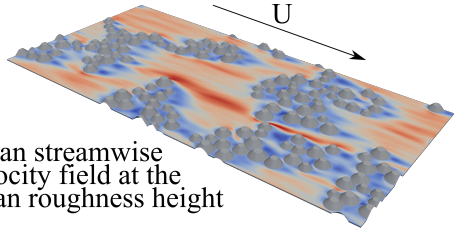
Marine biofouling increases the frictional drag of sea-faring vessels, greatly impacting the environment and marine economy. Several different forms of biofouling can occur, with calcareous macrofouling often imposing the heaviest penalty [1]. Research on the drag penalties associated with macrofouling has mainly relied on biofouled metal plates, obtained after long exposure to the fouling environment [2]. However, these specimens can be hard to obtain, as the required time of exposure usually needs to be long, and the settling of marine organisms is hard to regulate. Therefore, a numerical method for the generation of realistic rough surfaces due to calcareous biofouling has been developed.

In this biologically inspired algorithm, barnacles are modelled as simple conic frustums distributed across a flat surface with a method that mimics the barnacle settling behaviour, thus producing realistic colonies for a given surface coverage. The generated surfaces have been enforced as boundary conditions in DNS of turbulent flows [3] over surfaces with increasing level of fouling, in order to investigate the frictional drag as a function of surface coverage. In addition, detailed information about the turbulent flow over, around and between the barnacle colonies is obtained (see example figures below).

a) Surface with 30 % barnacle coverage





b) Mean streamwise velocity field at the mean roughness height

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