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Shaping stress fields with spreading bubble streams: applications for biofouling prevention[1] JAMES BIRD[2], MARK MENESSES, C. FREDERIK BRASZ, Boston University, JESSE BELDEN, Naval Undersea Warfare Center — Hard fouling organisms require significant shear stresses to be removed from a ship hull. Recently it has been shown that more frequent grooming requires less shear stress to remove these fouling organisms. By introducing a stream of air bubbles beneath a submerged surface, one can prevent marine biofouling through a continuously applied average shear stress of approximately 0.01 Pa; however, recent studies have shown maximum shear stresses applied by a bubble can be on the order of 200 Pa. Additionally, it has been shown that the period between critical shear stress events rather than an average stress value may be significant in determining the recruitment of settling marine organisms. Considering these recent developments, we investigate the effect of varying aeration flow rate on the antifouling ability of bubble streams. We find that by decreasing the frequency of bubble production the extent of biofouling prevention also decreases. Using a combination of field data, multiphase PIV, and integral plume theory, we find the shape of the areas influenced by the bubble plumes is related to the lateral spreading of bubbles as they rise.

[1]We acknowledge support from ONR and NSF GRFP
[2]There has been confusion in the past regarding another James Bird in our community. This is the only talk in which James C. Bird from Boston University is the presenter

James Bird
Boston University

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