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Air bubbles induce a critical continuous stress to prevent marine biofouling accumulation JESSE BELDEN, NUWC Newport, MARK MENESSES, Boston University, NATASHA DICKENSON, NUWC Newport, JAMES BIRD, Boston University — Significant shear stresses are needed to remove established hard fouling organisms from a ship hull. Given that there is a link between the amount of time that fouling accumulates and the stress required to remove it, it is not surprising that more frequent grooming requires less shear stress. One approach to mitigate marine biofouling is to continuously introduce a curtain of air bubbles under a submerged surface; it is believed that this aeration exploits the small stresses induced by rising bubbles to continuously prevent accumulation. Although curtains of rising bubbles have successfully prevented biofouling accumulation, it is unclear if a single stream of bubbles could maintain a clean surface. In this talk, we show that single bubble stream aeration can prevent biofouling accumulation in regions for which the average wall stress exceeds approximately 0.01 Pa. This value is arrived at by comparing observations of biofouling growth and prevention from field studies with laboratory measurements that probe the associated flow fields. We also relate the spatial and temporal characteristics of the flow to the size and frequency of the rising bubbles, which informs the basic operating conditions required for aeration to continuously prevent biofouling accumulation.

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