NEWS | FEBRUARY 02 2024

Taking inspiration from dolphins to develop drag-reducing surface structures FREE

Avery Thompson

Scilight 2024, 051108 (2024)
https://doi.org/10.1063/10.0024821

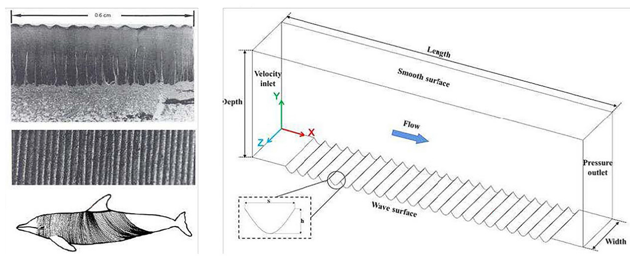
Scilight

2 February 2024

Taking inspiration from dolphins to develop drag-reducing surface structures

Avery Thompson

Understanding the effects of transverse ridges can lead to more efficient ships and underwater turbines.



Dolphins are some of the ocean's fastest swimmers. Much of this speed is attributable to their highly streamlined, aerodynamic bodies. Without these efficiencies, dolphins would need muscles several times more powerful to achieve their high speeds.

The same tools dolphins use to reduce drag could influence new designs for ships and turbines to increase performance and conserve fuel. Zheng et al. developed a numerical simulation to explore the effect of one dolphin-inspired drag reduction method.

While dolphin skin may look smooth, at high speeds the skin tenses, forming small transverse ridges along the surface.

"These ridges will reduce the dynamic force of the water, which will reduce the drag," said author Liguo Qin.

To better understand how these ridges reduce drag, the authors developed fifteen numerical transverse ridge models, varying the spacing and aspect ratios, and used a Reynolds-Averaged Navier-Stokes algorithm to study the flow across their surfaces.

They found the size of the ridges plays a crucial role in reducing drag, and that the optimal drag reduction occurs when the size of the ridges matches the size of the vortices generated by the surface. They defined a novel index, the Friction Pressure Ratio, which can be used to find the maximum drag reduction effect.

The authors will continue to explore the dynamics of flow across these transverse ridged surfaces.

"We plan to look even further using particle image velocimetry to explore how these vortices change and behave on the structures of our surface," said Qin.

Source: "Effect of dolphin-inspired transverse wave microgrooves on drag reduction in turbulence," by Tengfei Zheng, Jianbo Liu, Liguo Qin, Shan Lu, Fagla Jules Mawignon, Zeyu Ma, Luxin Hao, Yuhao Wu, Dou An, and Guangneng Dong, *Physics of Fluids* (2024). The article can be accessed at https://doi.org/10.1063/5.0186898.