

Review of paper “Enhanced bed shear stress and mixing in the near wake of an offshore wind turbine monopile”

Summary:

The aim of the paper is to investigate how the signature of the turbulent wake from an offshore wind turbine monopile differs from that of the background flow. They used ADCP high frequency flow analysis, in a rectilinear tidal flow and in and outside from the wake of a pile, and measured the average velocity, the Turbulent Kinetic Energy and dissipation, and analyse and compare vertical profiles for both ebb and flood tidal periods.

Vertical profiles upstream or downstream of the pile show an increase in turbulence downstream the turbine. The Seabed Drag Coefficient increased from 3.5×10^{-3} to 7.8×10^{-3} within the wake, indicating greater seabed mobility, and eddy viscosity is increased by an order of magnitude, suggesting enhanced water column mixing.

Implications of the monopile wake are an alteration of the vertical structure of the water column and an increase in turbulence and stress alongside an increase in column mixing that could impact seasonal stratification and have an ecological impact. Change in seabed mobility can imply changes in seabed morphology. They recommend considering the wake-induced turbulence in Environmental Impact Assessment for Offshore Wind Farm and introducing accurate calculation of bed shear stress within the wake in numerical model such as Telemac or FVCOM.

The paper is well presented, concise and features informative figures. I have only minor comments, most of them being typo or a comment that I hope may help the reader comprehending the paper.

Minor comments:

Page 2, section 2.1. Is there any scour protection at the monopile and where Observations were measured? Or did the scour reach an equilibrium stage? How homogeneous is the grain size over the area?

Page 2, line 54: Please indicate the formulation you have used?

Page 2, line 57: Please refer to Figure 2d or say full date/add the year (2022).

Page 2, line 57: I would not use a comma after energetic

Page 4, line 59: do you know if this was a one-off event in 2018? Or stratification pattern is always like that over the period/tidal cycle indicated?

Page 4, line 65: was this reported from the Device manufacturer?

Page 4, line 67 : TKE in full please for the time: Turbulent Kinetic Energy (TKE).

Page 4, line 81: The parameters were measured by the ADCP, not observed. And those measurement are observations. Please re-phrase.

Page 4, line 78: In Figure 3a, I read +0.8 m/s; -0.6 m/s. Not +/-0.8 m/s

Page 5, caption Figure 2: Please add “equation” before (A3)

Page 6, line 117: no dash in “breaks-down”, breaks is the verb and down is an adverb.

Page 8, line 121-122: Can you please indicate to which Figure those comment refer to (3d or 3e?).

Page 8, line 124-125: Similar to previous comment, are you referring to Figure 3b-3e?