



The hiding-exposure effect revisited: implications for the mobility of sand and gravel on the seabed

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Predicting seabed mobility is hampered by the limited accuracy of sediment transport models when the seabed is composed of mixed sediments, which is often the case. Through a comprehensive series of laboratory experiments underpinned by an integrated study of offshore geophysical and sedimentological data, we quantify how the presence of one grain size fraction influences the mobility of another. This hiding-exposure effect on the threshold of motion of different grain sizes in a mixture remained to be fully quantified for a range of natural seabed sediment mixtures. The strength of the hiding-exposure effect varies with sediment composition, but in sand and gravel mixtures typically found in coastal and shelf seas, the critical shear stress needed to mobilise the sand fractions increases by up to 56% compared to that needed to mobilise uniform sediment of similar size. In the same comparison, to mobilise the gravel fractions in these mixtures, the critical shear stress needed decreases by up to 96%. This implies that gravel in this mixture moves at 20% of the current speed needed to mobilise uniform gravel. This currently unanticipated level of increased mobility of coarse sediments not only threatens the stability of seabed infrastructure, but it changes the way the seabed supports marine habitats and the way coastal geomorphology is maintained and recovers from large storm events.