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Numerical study of non-breaking and breaking surface waves over viscous mud flow YI HU, Tsinghua University, XIN GUO, YI LIU, LIAN SHEN, ROBERT A. DALRYMPLE, Johns Hopkins University — It is well known that water surface waves can be drastically damped over a muddy seabed. To understand the mechanism of wave-mud interaction, we perform DNS of the NS equations for wave propagation over mud, which is modeled as Newtonian fluid with larger density and much higher viscosity than water. A level set method is used to capture water surface and water-mud interface. From the simulations, the velocity and vorticity and the energy budget terms in water and mud are analyzed. The energy flux from water to mud and the dissipation in mud are found to play an important role in the energy budget. For non-breaking waves, despite the wave nonlinearity, the wave dissipation rate is found to be comparable to the predictions of existing theories. For breaking waves, before the impingement of plunging jet on the wave surface and then after about 2.5 wave periods when most of the wave energy is lost, dissipation in mud dominates that in water. During the wave breaking itself, the dissipation rate in water increases sharply and exceeds that in mud. In the presence of mud, the intensity of breaking is reduced compared with the non-mud case.

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