

Dynamic behavior of a reconstituted low salinity soil in seasonally frozen region

Abstract: The western Jilin Province in NE China is located in one of three typical carbonate saline soil regions in the world, the literature related to the dynamic characteristics of saline soil in seasonally frozen region remains rare; whereas there is an urgent demand for the booming infrastructure construction such as railway and highway on the saline soil ground, which needs basic dynamic parameters in the engineering designs. In this study, the dynamic triaxial tests were conducted on a type of low salinity saline soil considering four factors including moisture content, salt content, freeze-thaw cycle and confining pressure, and the variations of dynamic parameters including dynamic strength and dynamic elastic modulus with above four factors were studied and the influential mechanisms of four factors were fully discussed. The results demonstrated that, the variations of dynamic strength (τ_d) versus vibration cycles (N_F) were better fitted by logarithmic functions than linear form. Increasing moisture content, salt content and freeze-thaw cycle all weakened the τ_d and dynamic elastic modulus (E_d); in addition, the E_d decreased significantly when the dynamic axial strain was smaller than 0.2% then began to be relatively stable with increasing dynamic axial strain. There might be a critical salt content which shifted the variation trends of τ_d and E_d , whereas the maximum salt content (2.0%) in this study was lower than the threshold which therefore led to continuous reduction. The dynamic parameters of saline soil became nearly constant after undergoing 5 freeze-thaw cycles, and increased greatly with increasing confining pressure. Moreover, the relationship between the maximum dynamic elastic modulus (E_{dmax}) and four factors could be described as power functions.

Keywords: dynamic strength, dynamic elastic modulus, carbonate saline soil, seasonally frozen region, freeze-thaw cycles