

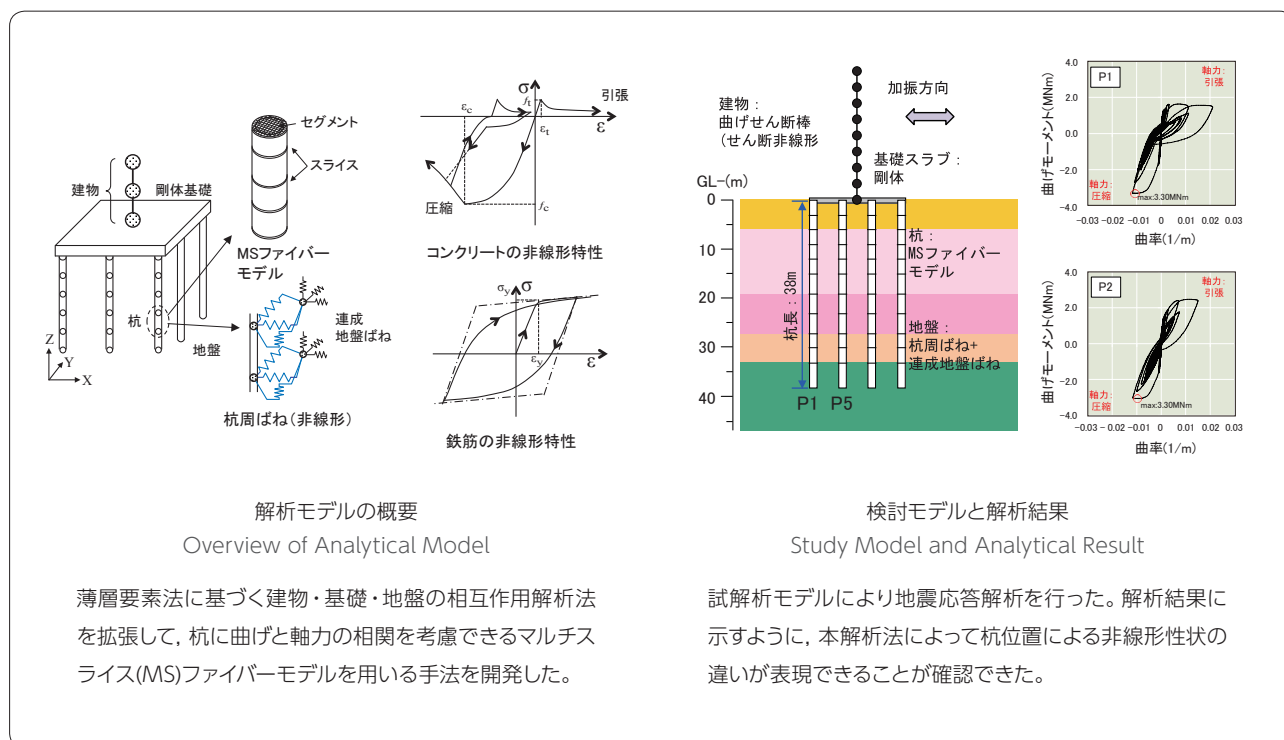
変動軸力を考慮した杭基礎の非線形相互作用解析法

Nonlinear Soil Structure Interaction Analysis Method
that Takes Account of the Fluctuating Axial Force on Piles

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杭支持建物の非線形相互作用を詳細に考慮するには、上部構造に加えて基礎や地盤の非線形挙動も同時に評価する必要があるが、杭の曲げ強度の軸力依存性や、地盤のひずみ依存性など非線形特性に関わる影響因子が多いこともあり精度の高い挙動評価は容易ではない。今回、薄層要素法に基づく相互作用解析法を拡張して、杭のモデル化にファイバーモデルを用いる手法を開発した。本手法を用いて、変動軸力が杭の非線形性状に与える影響を解析的に検討するとともに、試験解析建物を用いて地震応答解析を実施し、入力地震動の大きさが杭の非線形挙動に与える影響を検討した。検討の結果、建物の転倒モーメントにより生じる変動軸力のため、杭の塑性化状況が杭の位置によって異なること、および入力地震動が大きくなると杭の応答に与える変動軸力の影響が大きくなること分かった。



To take detailed account of the nonlinear interaction of a pile foundation building, the nonlinear behavior of the building foundation and the soil, in addition to that of the superstructure, must be evaluated. However, because nonlinear characteristics depend on many factors, it is not easy to evaluate nonlinear behavior accurately. One of the most important factors is the fluctuating axial force applied to the pile head. The authors have developed an analytical method which uses a fiber model to take account of the fluctuating axial force. The pile group effect was considered using a thin-layer method. The main purpose of this paper is to investigate the effect of fluctuating axial forces on the nonlinearity of the piles using pile group foundation building models. The effect of the input level of an earthquake was also examined. The main conclusions of the study are shown below. In the case of a fluctuating axial force due to the overturning moment of the building, the plasticity of the pile differs in accordance with the position of the pile. As the input level of the earthquake increases, the effect of the fluctuating axial force applied to the pile head becomes greater.