EVALUATION OF STRESS DISTRIBUTION IN MODEL GROUND USING BENDER ELEMENTS

ベンダーエレメント法を用いた弾性波測定による模型地盤内応力の推定

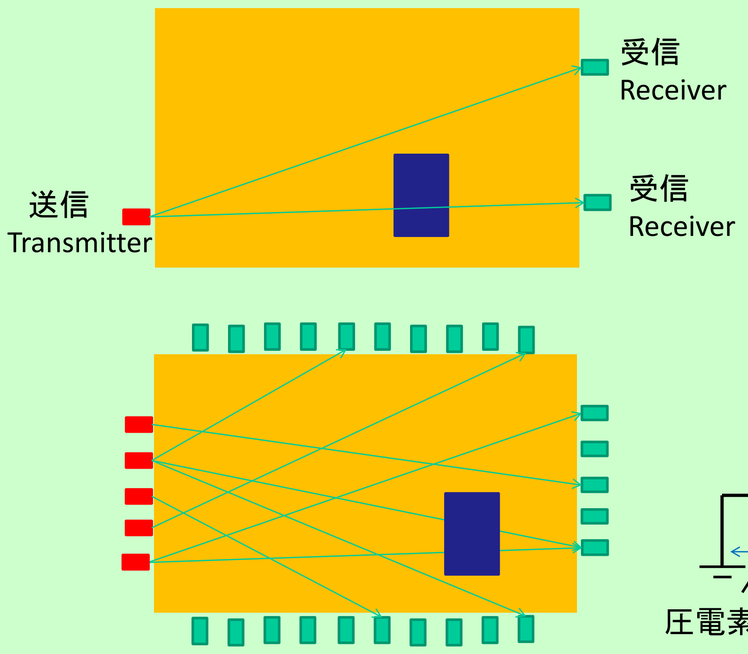
Elastic wave tomography using bender elements was conducted to evaluate stress distribution in a model ground. Bender element method has been widely applied in laboratory soil element testing such as triaxial test, oedmeter test, or direct shear test. When BEs are used in a model test, it was found that the signal processing was essential to obtain clearer waveforms as the amplitude of received signal was not large enough due to generally lower level of confining stress. The effects of chamber side wall should be also taken into account in the arrangement of the elements location.

In a densely compacted model ground in a trapdoor testing soil chamber, the distribution of stress in the ground was estimated using tomography technique and it agreed well with the results of physically measured stresses at the base and shear planes observed.

移動床土槽内でベンダーエレメントを用いた多点送信多点受信のせん断波測定を実施し、トモグラフィ解析を施すことにより内部の応力分布の推定を試みた。ベンダーエレメント法は要素試験装置内への適用は多く報告されている。模型実験に適用する際、一般に応力レベルが低いので受信信号が微弱でノイズの除去などの信号処理が不可欠である。また、素子の配置の仕方によっては土槽壁の拘束の影響を受けるので、配慮が必要であった。移動床実験時の模型地盤内の応力分布をせん断波速度測定のトモグラフィによる逆解析により推定したところ、密詰め地盤において、土槽底版分で測定した境界部の応力とせん断により生成するすべり面と矛盾しない結果が得られた。

弾性波トモグラフィを利用した内部構造の推定

Estimation of internal structure using elastic wave tomography

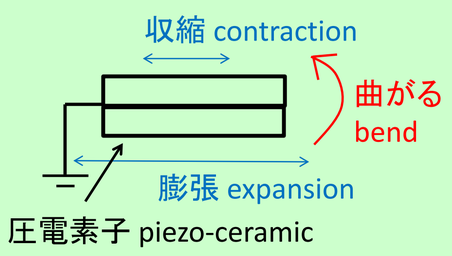


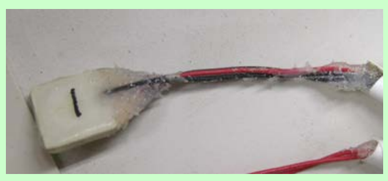
複数の送受信間の伝達時間を計測し，
逆解析により内部の速度分布を求める.

Shear wave velocities between multiple transmitters and receivers are measured. The distribution of wave velocities are then estimated using tomography analysis.

せん断波の送受信にベンダーエレメントを使用

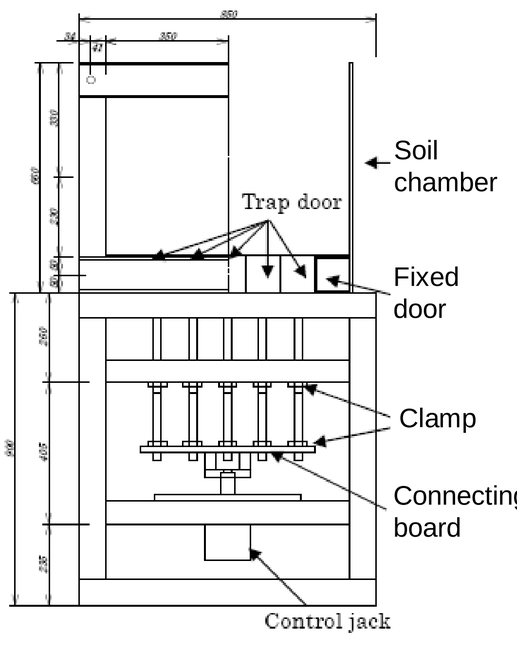
Bender elements are used for the shear wave measurement.





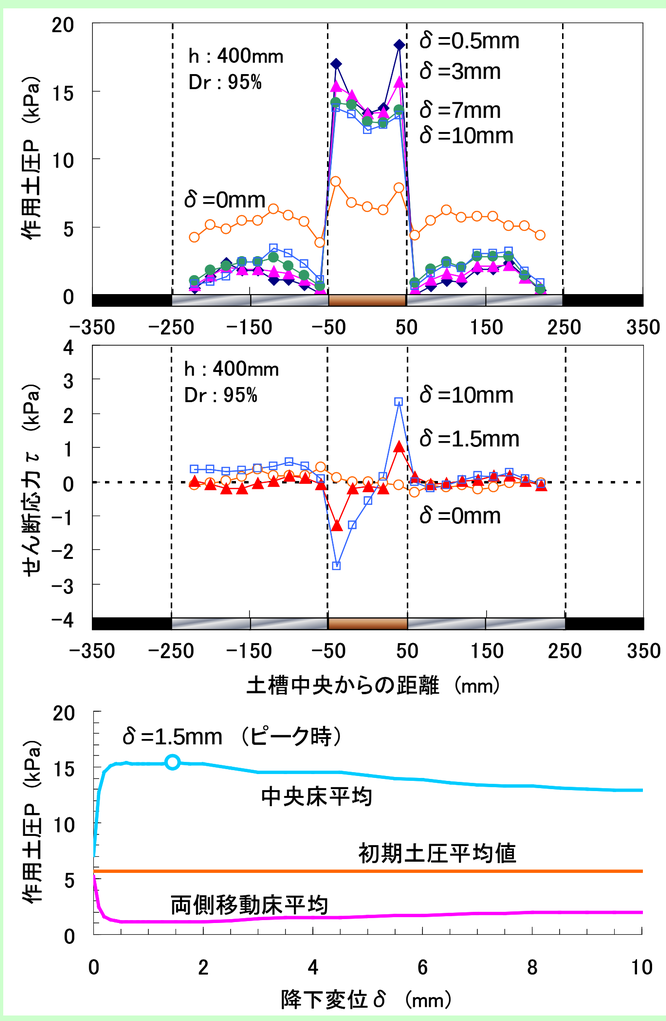
移動床実験土槽

Trapdoor testing chamber



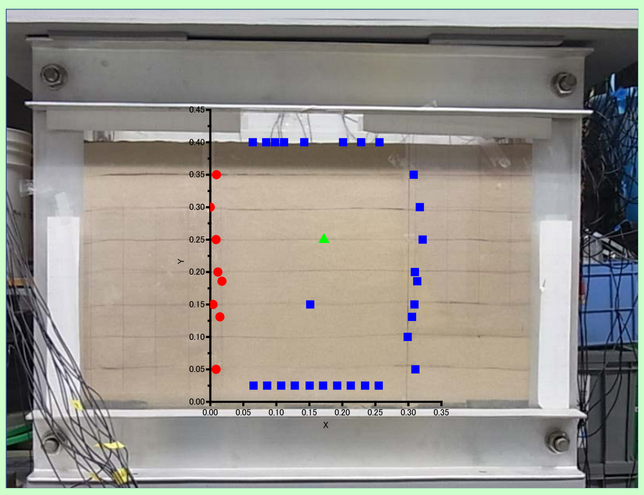
移動床実験における弾性波トモグラフィの適用

Application of elastic wave tomography in trapdoor test



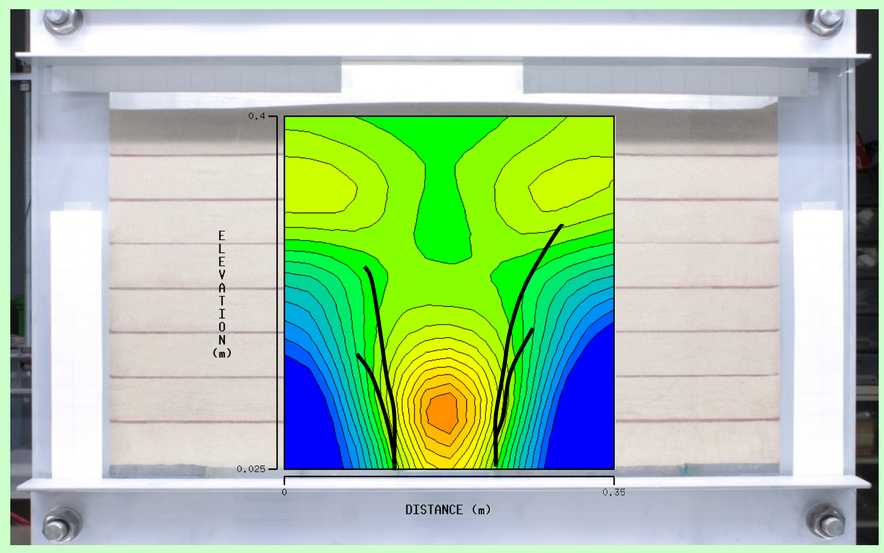
移動床実験における底版の作用土圧（豊浦砂密詰）

Trapdoor test results on densely compacted Toyoura sand



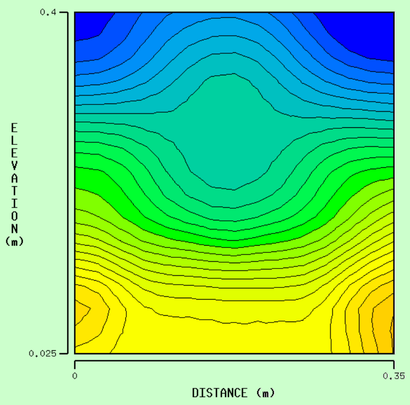
ベンダーエレメントの配置

Arrangement of bender elements



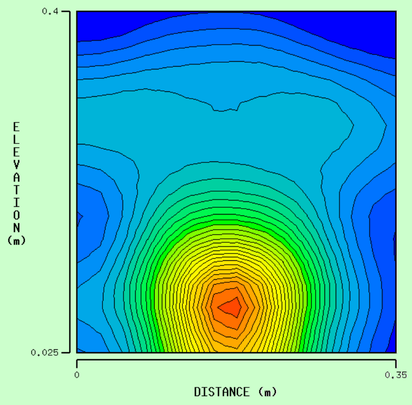
移動前後の速度差分布と地盤のすべり線

Distribution of difference of wave velocities between before and after trapdoor test, shear planes observed in the model ground are also shown



移動前

before trapdoor test



移動後

after trapdoor test

本研究に関する担当研究室は桑野研究室です.
部屋は東京大学生産技術研究所B棟3階のBw-304

電話：03-5452-6843，FAX：03-5452-6844
E-mail: kuwano@iis.u-tokyo.ac.jp

For further information, contact below.
Prof. Reiko Kuwano,
#Bw-304, Institute of Industrial Science

TEL：+81-3-5452-6843，FAX：+81-3-5452-6844
E-mail: kuwano@iis.u-tokyo.ac.jp

福王翔 (2012)