EVALUATION OF INTERNAL EROSION BY THICKNESS OF FLOWED WATER

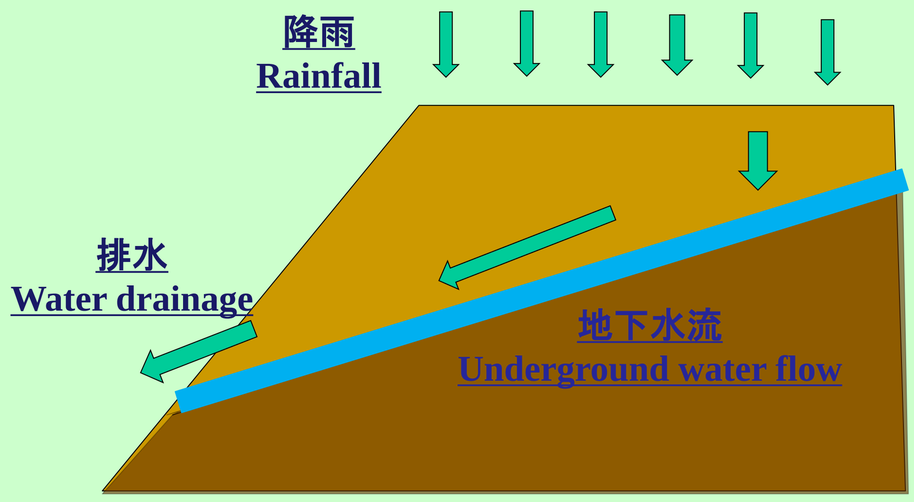
地排水の濁度による土砂流出評価

Internal erosion causes various ground disaster such as a cave-in accident, which is supposed to happen due to water penetration under the ground with rainfall. Especially in fine-graded material, finer particles flow out first and this flow makes drained water turbid, which has been considered as a warning of the ground disaster. However, relationship between turbidity of drained water and internal erosion is not yet clear. In this research, characteristics of internal erosion was evaluated from turbidity of drained soil by one dimensional column test.

地盤内土砂流出は空洞の形成、陥没事故の発生や内部浸食等様々な土砂災害を引き起こします。こうした土砂流出は降雨に伴う地中の水の浸透で発生すると考えられており、粒度の良い地盤においては細粒分が卓越して流出すると予想されます。細粒分の流出は地排水を濁らせ、地排水の濁りは地滑り等の地盤災害の前兆現象とされているもののその実態については殆ど明らかとなっていません。本研究では一次元円筒カラム内に地盤を作成し地中への水の浸透による土砂流出状況を、排水の濁度により評価しました。

水みちと内部浸食
Situation of increasing of air pressure under the ground

沢筋等の水みちへの浸透と排水の繰り返し
Repetition of water flows through



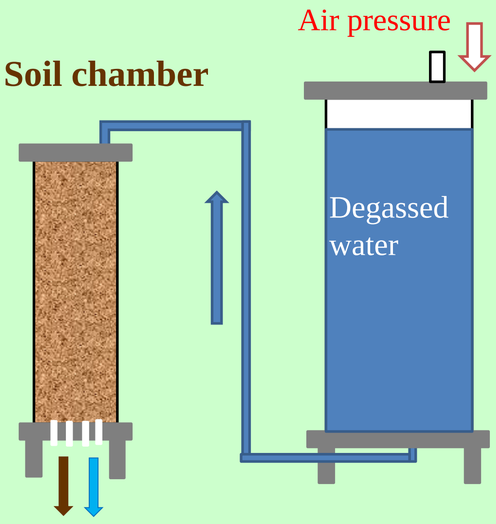
雨水は地盤内の水みちを通り排水され、細粒分流出による排水が濁る時がある
Water is drained through water pathway, and some times drained water is turbid

To clear…

- 排水の濁りの起きうる条件
- 細粒分流出による水みちでの強度
- Conditions which cause thickness of drained water
- Influence of internal erosion on stiffness

浸透圧をコントロールしたアクリル円筒実験
Model test simulating soil drainage surrounding an underground structure

アクリル円筒上端部から浸透圧を掛け水を流入させ、底部の穴から土と水の排出を調べる。
Pressurized water flows from the surface ground and investigate .



Soil and water is draind

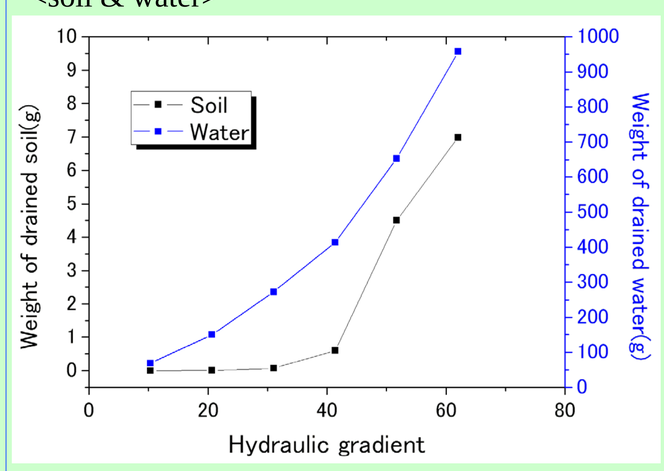
<Turbidimeter>

一定時間ごとに排水の濁度・排水量等を計測
Measuring turbidity of drained water, weight of drained water and so on at certain period

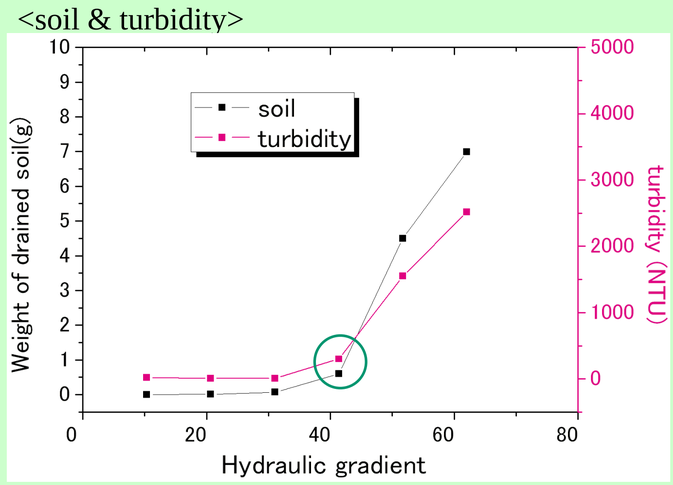
実験結果
Test Result

排水量、排土量と濁度の関係
Relationship between drained soil, drained water and turbidity

<soil & water>

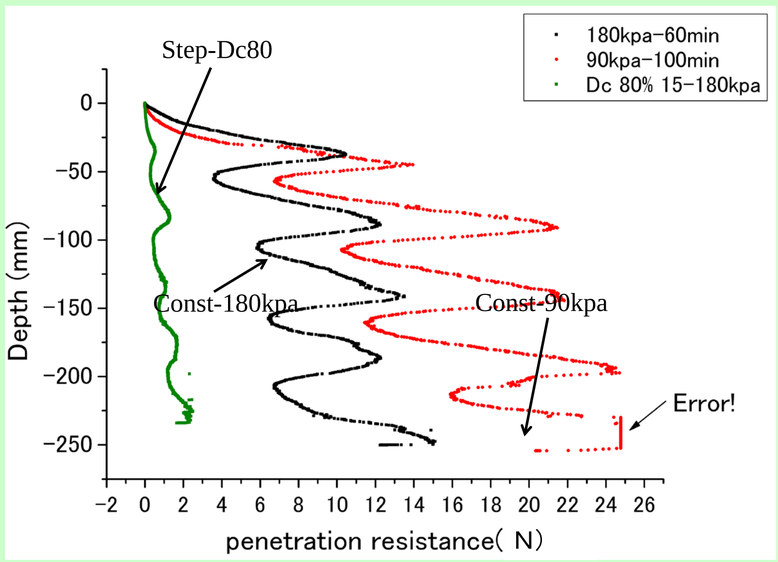


<soil & turbidity>



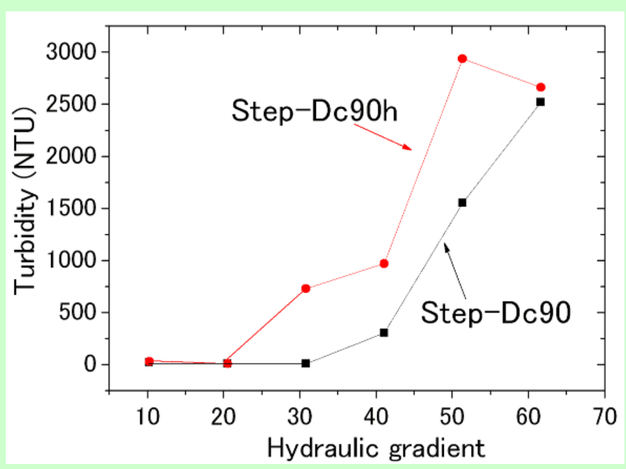
- Weight of drained water increased acceleratory with rise of seepage pressure.
- Turbidity was relative to weight of drained soil and increased rapidly over the threshold pressure
- 排水、濁度、排土量は動水勾配上昇と共に増加
- 濁度、排土量はある動水勾配を境に増加

コーン貫入試験
Cone penetration test



排土量が少ない程貫入抵抗は大きい
(強度低下していない)
Test case with small seepage pressure and small amount of drained soil has larger penetration resistance

<Effect of soilpipes>



- Small soil pipes accelerated internal erosion.
- 200-300times of water was flown through soil pipes as the ground.
- ソイルパイプを模擬した穴を開けたケースでは排水量、排土量、濁度が穴のないケースに比べ増加、ソイルパイプ内を集中して水が流れている可能性が高い

Photos of sample cells
Hydraulic gradient: high→low

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佐藤真理 (2013)