The formation process study of irrigation-induced landslide on Heifangtai loess platform

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Zhao jifei
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2. General situation of the study area
3. Physical and mechanical properties of the soil

1. Irrigation-induced landslide

Case 1: landslide in Baoji Gorge platform
Case 2: landslide in southern platform of Jingyang
Case 3: White Bluffs Landslides in Washington State
Case 4: landslide in Hefangtai

2. General situation of the study area

Jiaojia landslide in Hefangtai

Photo of Jiaojia landslide

3. Physical and mechanical properties of the soil

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3. Physical and mechanical properties of the soil

- Permeability coefficient
  - Saturated permeability coefficient
  - Unsaturated permeability coefficient

- Strength parameters
  - 1st point
    - $C_q = 8.0 \text{kPa}$
    - $\tan \phi_q = 0.362$
    - $u_{ai} = 0.473$
  - 2nd point
    - $C_q = 7.84 \text{kPa}$
    - $\tan \phi_q = 0.37$
    - $u_{ai} = 0.482$
  - 3rd point
    - $C_q = 13.3 \text{kPa}$
    - $\tan \phi_q = 0.362$
    - $u_{ai} = 0.473$

3. Physical and mechanical properties of the soil

- Permeability coefficient
  - Saturated permeability coefficient
  - Unsaturated permeability coefficient

- Simulation process:
  - Begun in 1967
  - Irrigation:
    - 1967.5
    - 1967.6-10
    - 1967.11
  - Irrigation stopped:
    - 1967.12-4

When will stop? What will happen?
4. Element simulation for seepage and stability analysis

- Simulation result

Seepage analysis

The change of water level

The initial year

The change of water level

The third year

The sixth year

The tenth year

The twelfth year

The fifteenth year

Stress analysis

Model

Result

- Simulation result

Stress analysis

Hypsometric curve of sliding surface

Stress/kPa

0

100

200

300

400

500

600

0 20 40 60 80

滑面长度/m

- Simulation result

Model

Result

Landslide happens

Analysis stopped!

5. Conclusions

Irrigation-induced loess landslide is not an instantaneous process, but a continuous process of accumulation. With the growing of the irrigation time, the pore water pressure in the slope is changing for years, or even decades, the slope turns to landslide.

THANKS

Zhao jifei
Japan, 2012