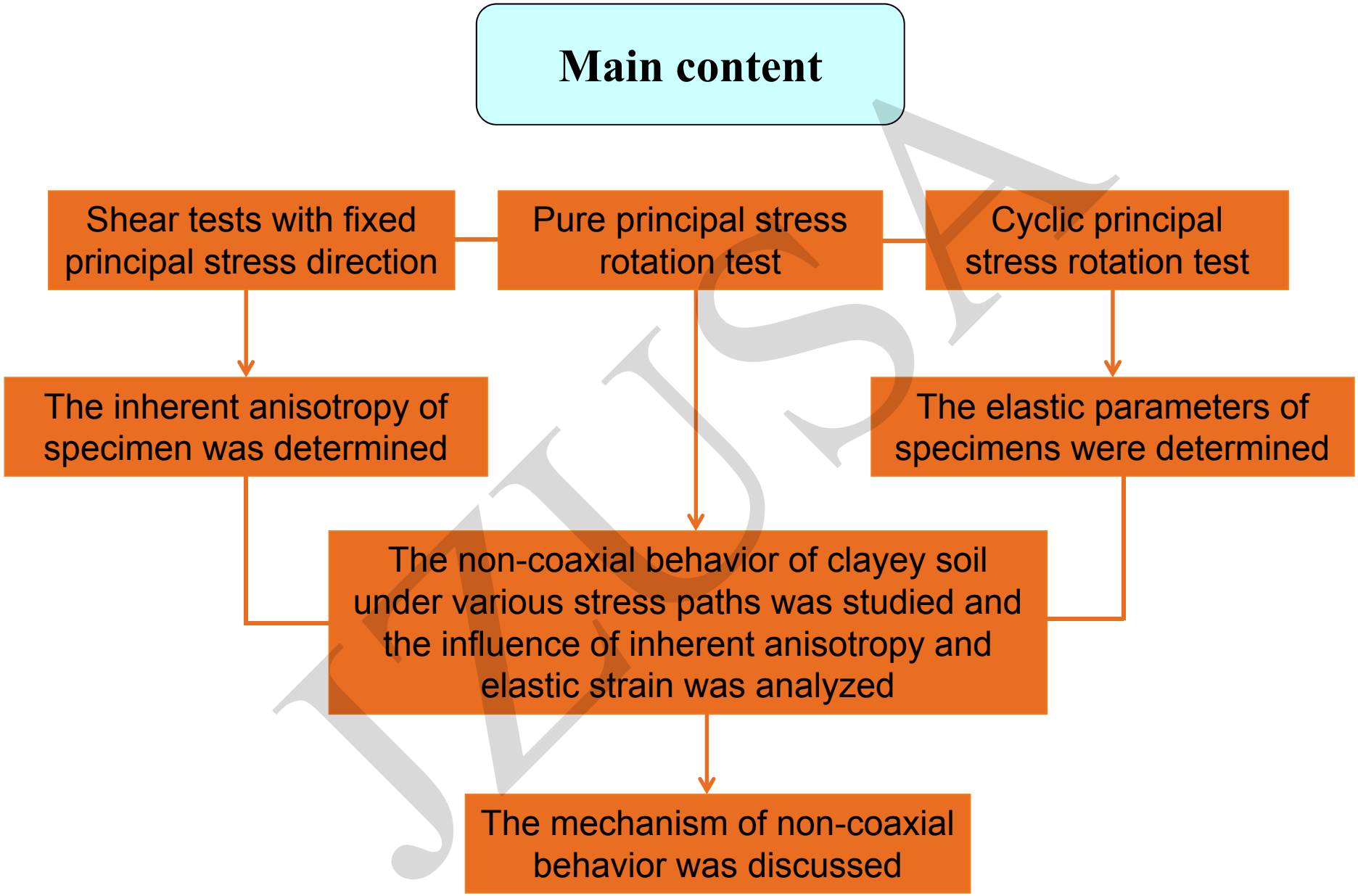
Undrained anisotropy and non-coaxial behavior of clayey soil under principal stress rotation

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Main content
Shear tests with fixed principal stress direction
Pure principal stress rotation test
Cyclic principal stress rotation test
The inherent anisotropy of specimen was determined
The elastic parameters of specimens were determined
The non-coaxial behavior of clayey soil under various stress paths was studied and the influence of inherent anisotropy and elastic strain was analyzed
The mechanism of non-coaxial behavior was discussed
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Key objective

To study the non-coaxial behavior of soft clay subjected to principal stress rotation and the mechanism, analyses the influence of anisotropy, intermediate principal stress and shear stress on the non-coaxial behavior.

Key methodology

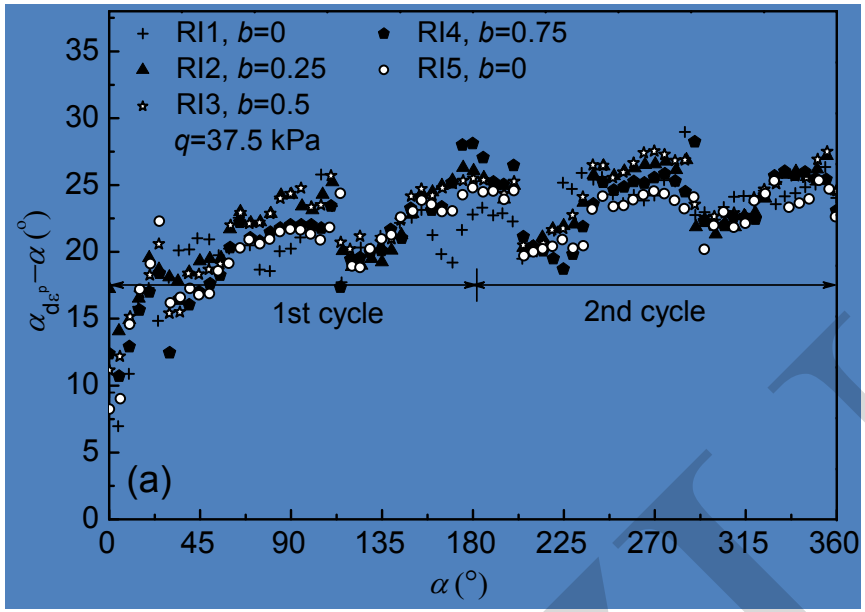
An automatic hollow cylinder apparatus was used, tests with pure principal stress rotation were carried out on both intact and reconstituted clay samples. The inherent anisotropy of reconstituted clay samples was controlled.

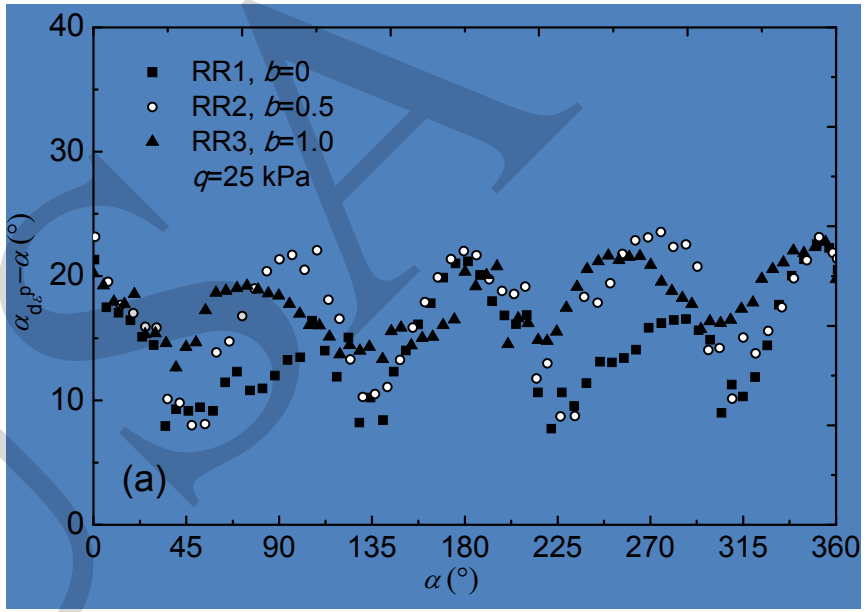
Major aspects investigated

1. To investigate the inherent anisotropy of intact and reconstituted clay samples
2. To study the deformation behavior of clayey soil to principal stress rotation
3. To study the non-coaxial behavior of clayey soil to principal stress rotation and illustrate the influence of anisotropy, intermediate principal stress and shear stress
4. To analyses the mechanism of non-coaxial behavior of clayey soil

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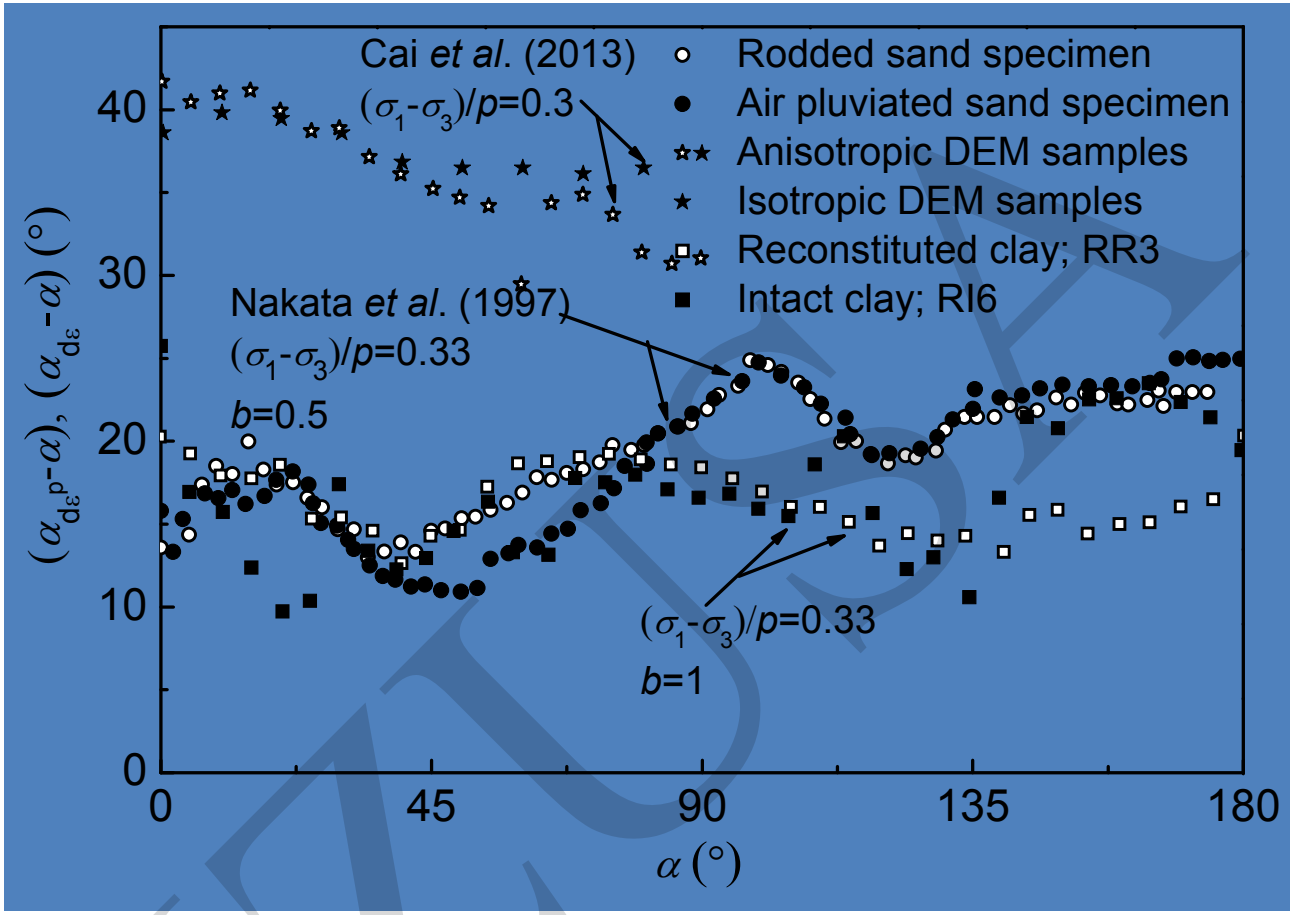
Key conclusions





A significant deviation was observed between the directions of the principal plastic strain increment and the principal stress in both intact and reconstituted clay (Figs. (a) and (b)). The influence of the intermediate principal stress parameter on the non-coaxial behavior was found not as obvious as on the strains.

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The non-coaxial behavior of soil cannot be attributed to inherent soil anisotropy alone. The direction of the principal plastic strain increment was highly dependent on the direction of the principal stress increment, thus, the stress path has an important influence on the non-coaxial behavior of clayey soil.