

Characterisation of the behaviour of soils in stress space

The design of geotechnical structures necessitates the use of increasingly sophisticated calculation tools. These new methods are based on constitutive models which take into account the main rheological characteristics of the soils and necessitate mechanical parameters obtained along particular stress paths and at particular strain rates levels.

Soil is a highly non-linear material the behaviour of which depends, among other things, on its stress history, the solicitation paths and the accumulation of irreversible deformations. The characterisation of its mechanical behaviour calls for the study of the influence of these different parameters.

In the framework of the study of soil rheology, the LSM is carrying out projects for the characterisation and identification of soil behaviour. Thus, using Bishop-Wesley triaxial cells which allow the user to follow the entire stress path in axisymmetric conditions, it is possible to simulate experimentally different in situ stress states ranging from anisotropic consolidation to triaxial compression, including observable extensions during unloading of slopes or excavations.

Among the possibilities offered by the experimental tools at the LSM (Fig. 1), it is possible to determine the parameters necessary for more highly-developed constitutive models, especially the "true" elastic moduli by the measurement of radial and vertical deformations at strain rates on the order of one thousandth. The determination of dilatancy using tests with a constant average effective stress is also possible, as well as the verification of the homogeneity of specimens using measurements of pore pressures at mid-height and at the exterior of the specimen, and the determination of cyclic parameters.

The LSM also has the possibility to carry out tests on unsaturated soils using adaptations

which allow the application of suctions and to carry out mechanical tests at constant suction.

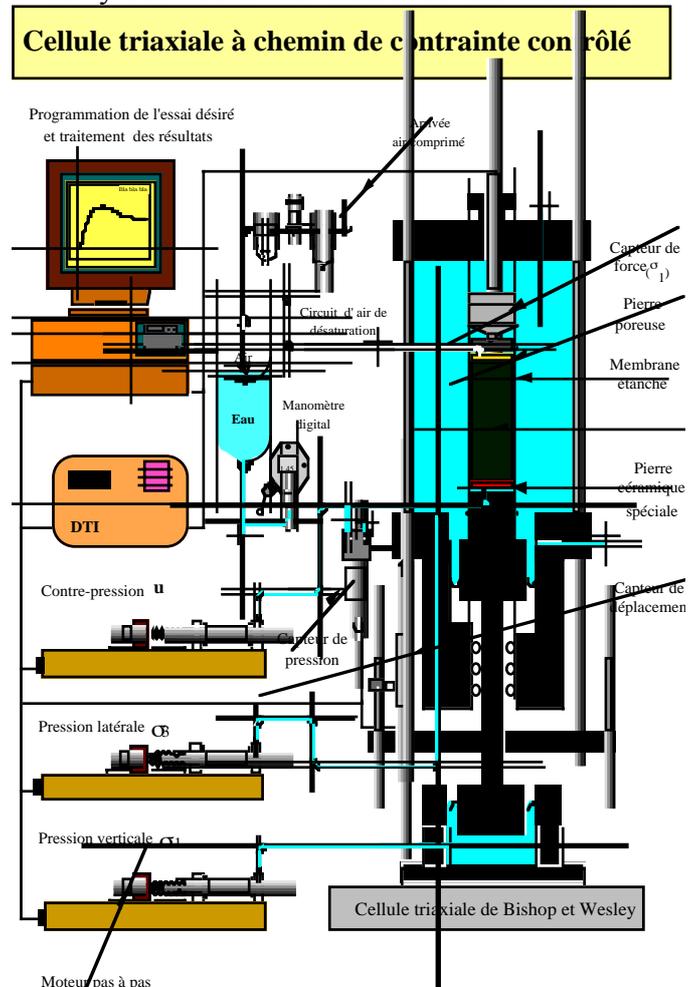


Fig. 1: GDS Triaxial cell

Publications

- L. Laloui, F. Geiser, L. Vulliet, X. Li, A. Bolle & R. Charlier. 1997. Characterisation of the mechanical behaviour of an unsaturated sandy silt. *Proceedings of XIVth International Conference on Soil Mechanics and Foundation Engineering, vol. 1, pp 347-350; Edition Balkema/Rotterdam/Brookfield.*
- L. Laloui, L. Vulliet & G. Gruaz. 1995. Influence of suction on the mechanical behaviour of sandy silt. *Unsaturated soils. E.E. Alonso & P. Delage (eds), Balkema, pp 133-139.*