Hydro Québec Production

Une division d'Hydro-Québec

Assessment of the internal stability of a dam core

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Context

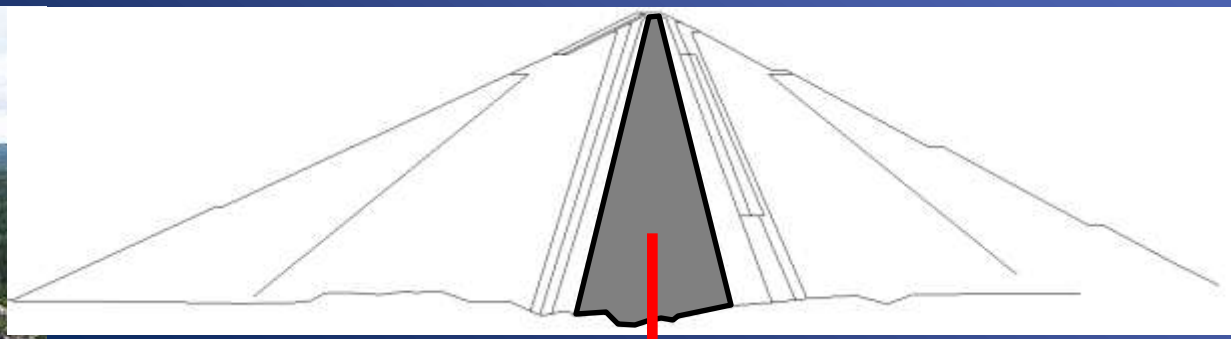
Hydro Québec (Canada) is a public utility which operates more than 400 embankment dams

Assessment of internal stability of soils (impervious core) is of utmost importance for dam owners

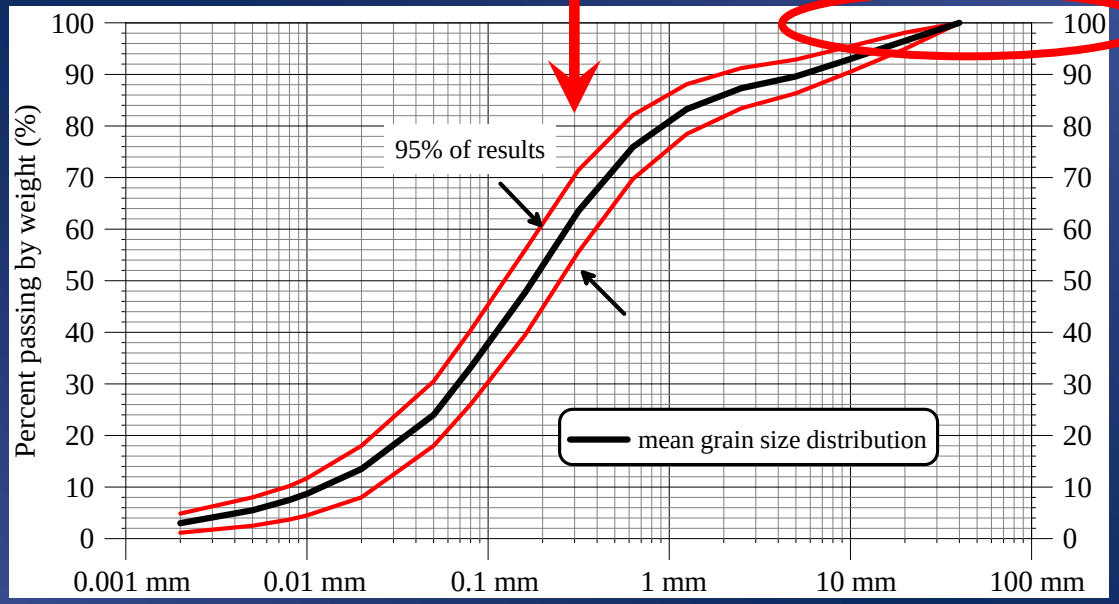
Future projects

Existing structures
(after seepage detection investigations?)

Description of dam



regraded



Internal stability assessment methods

Use of methods based on geometry of grain size distributions (construction control data)

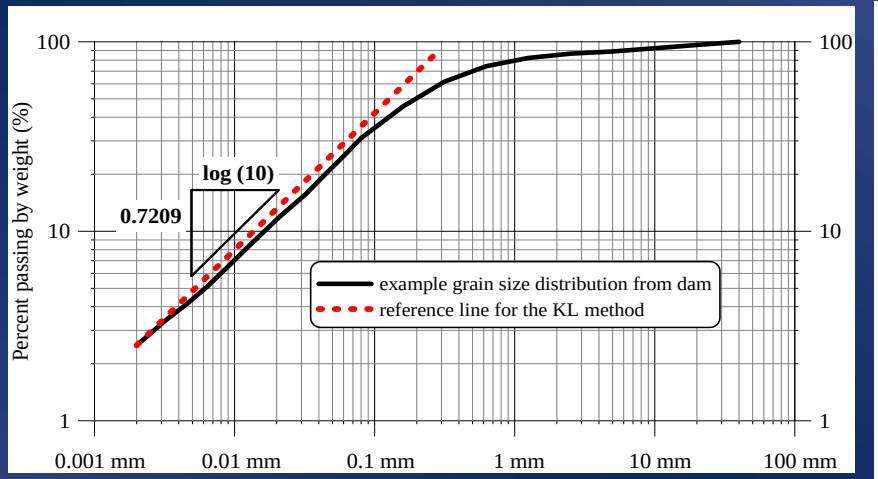
Kenney and Lau (1985, 1986) : shape of grain size distribution curve

Wan and Fell (2008) : diameter ratios

Lafleur (1999) : specific tests

Results compared to field monitoring data to judge representativeness

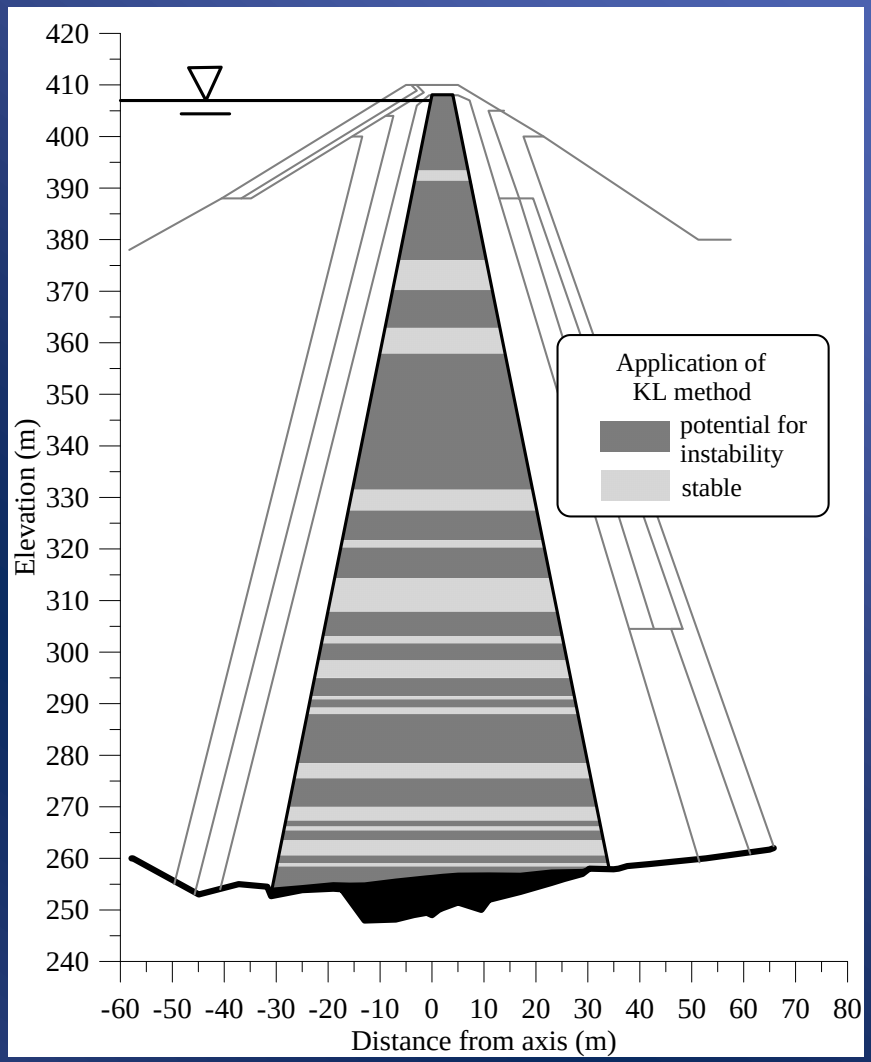
Kenney and Lau (1985, 1986)



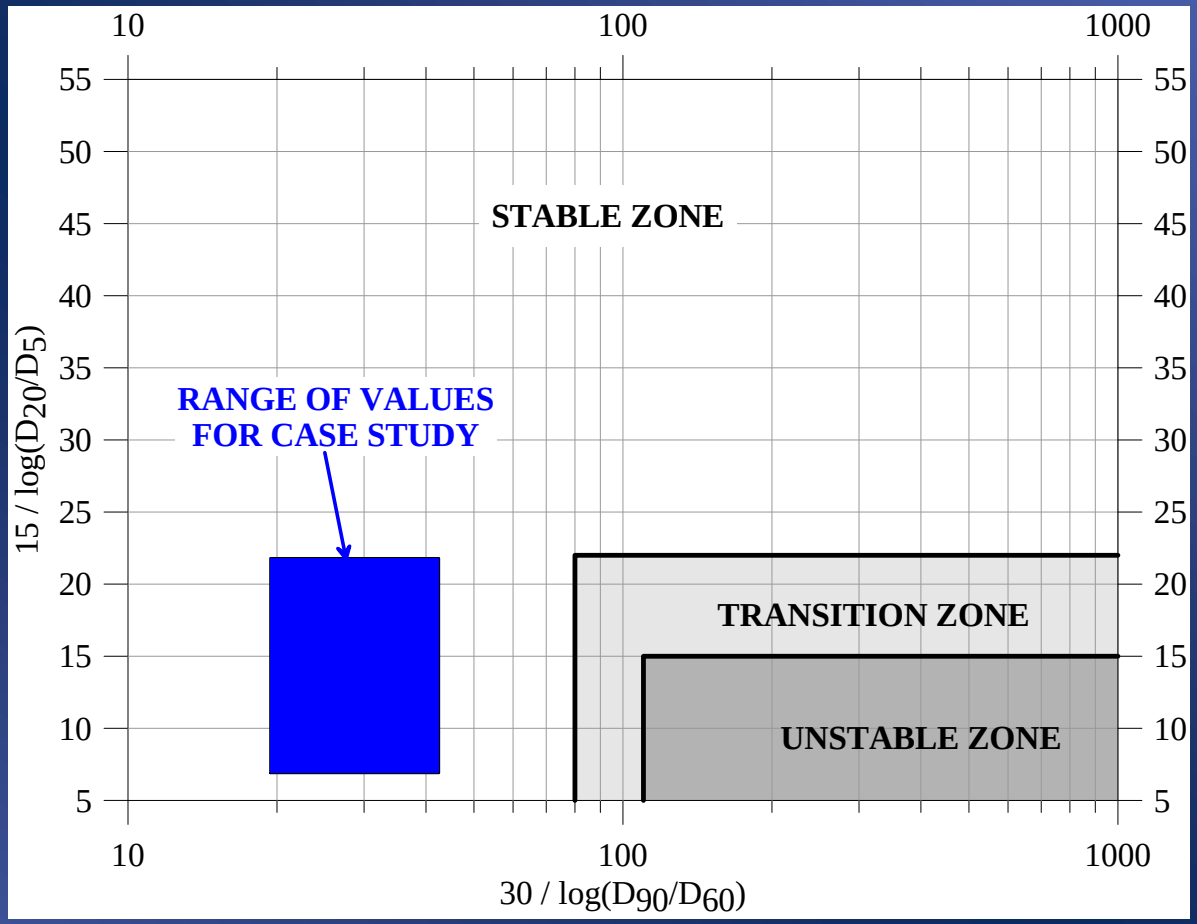
Method developed using sandy soils

Sample vibration and high seepage velocities

Unusual conditions for a dam core



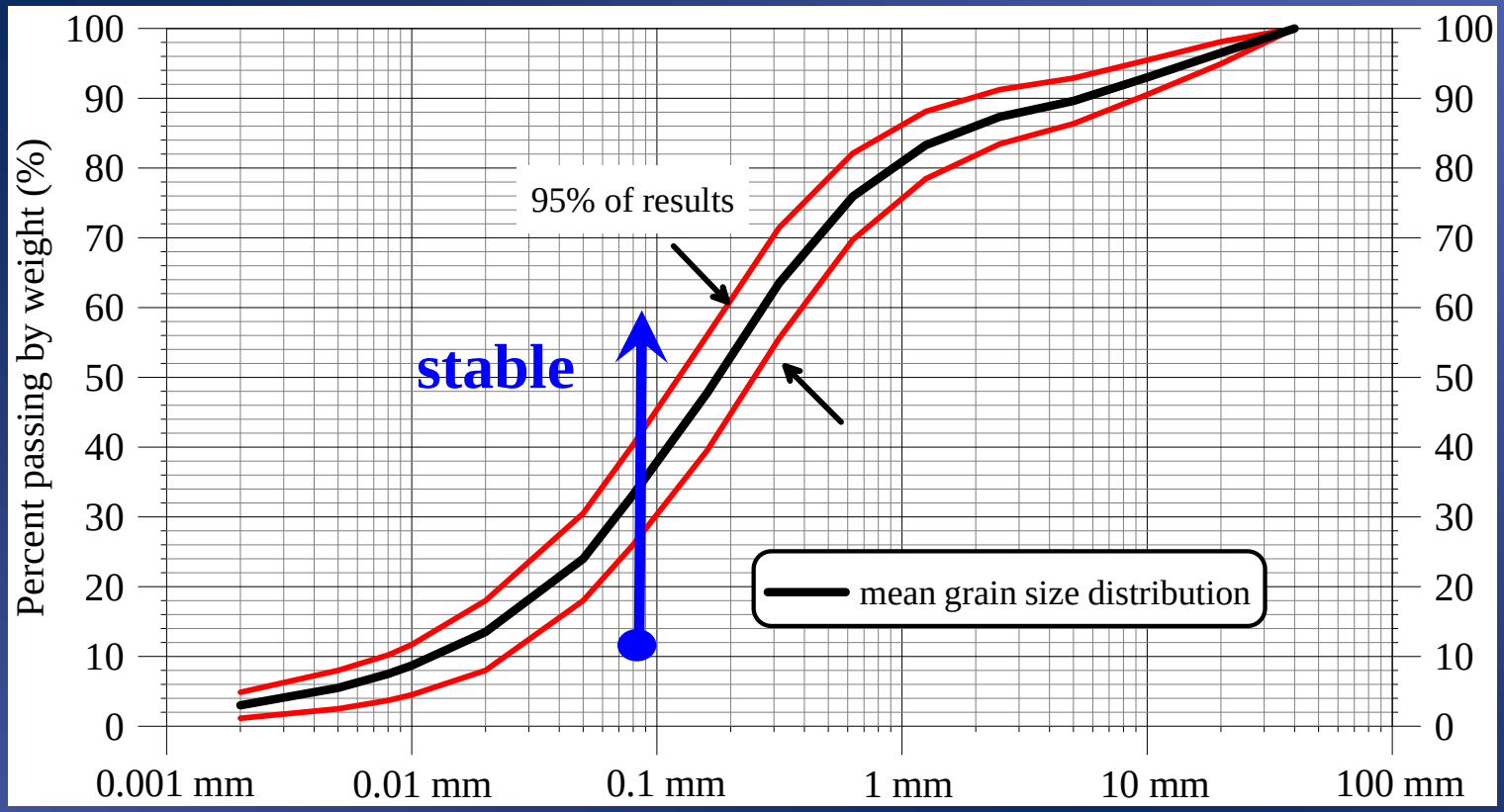
Wan and Fell (2008)



Comparison of slopes of coarser an finer fractions of a soil

Developed for widely graded silt-sand-gravel soils

Lafleur (1999)

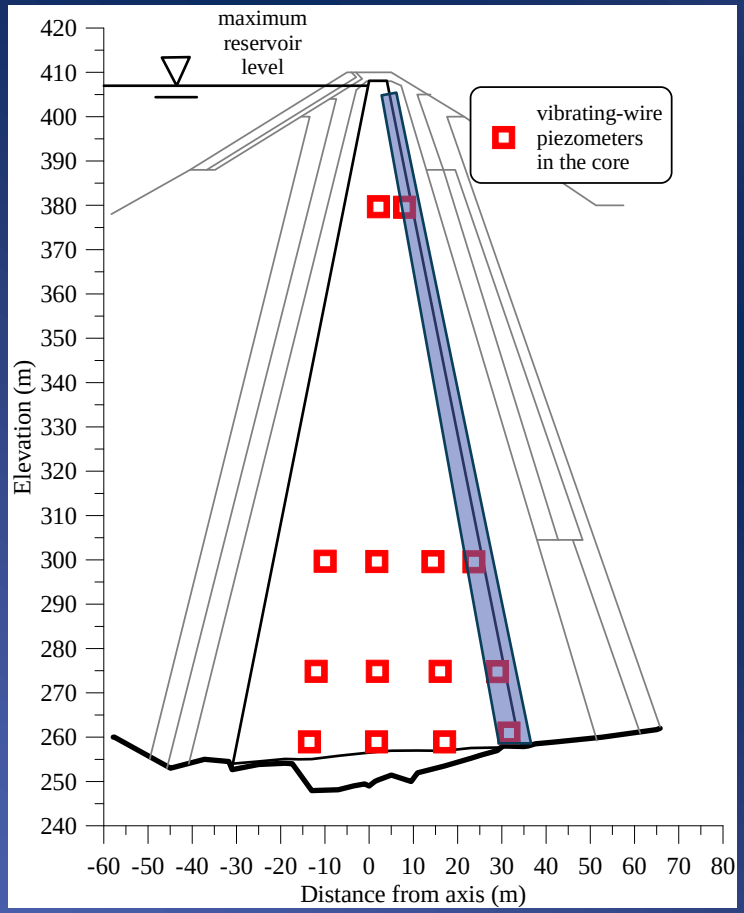


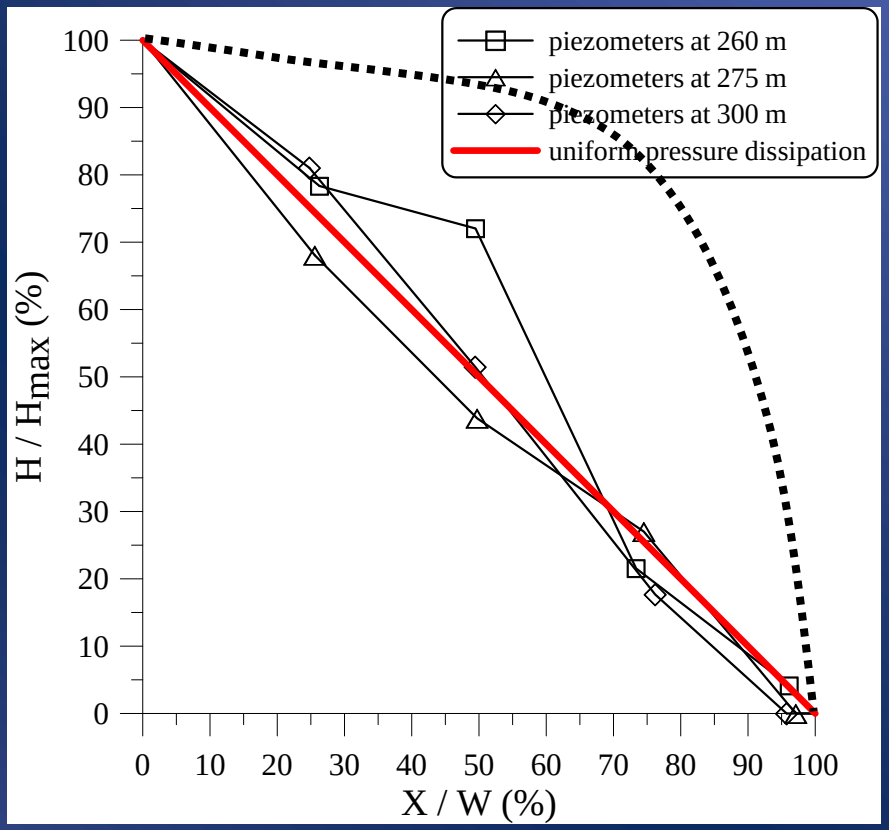
Specific tests for northern Québec tills

Internally stable (fraction passing 40 mm) when fines content (< 0.08 mm) is greater than 12%

Representativeness of results

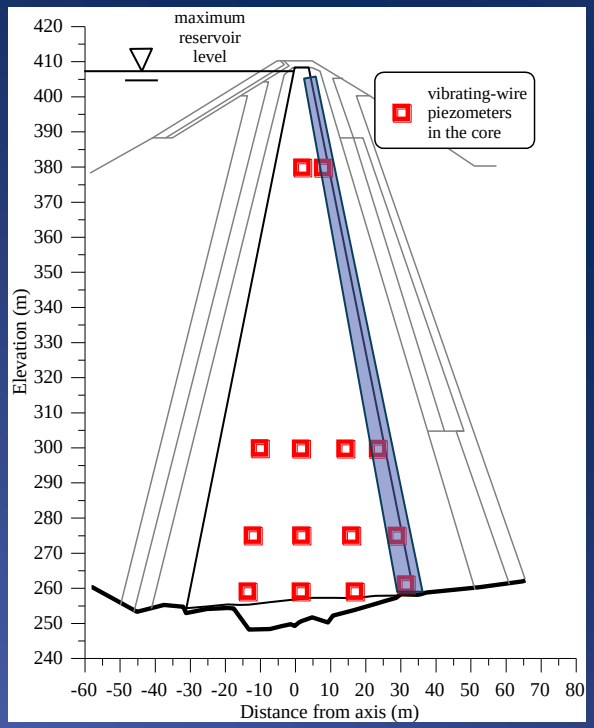
Widespread instability of dam core
+ adequate downstream filter = increase in core piezometric levels

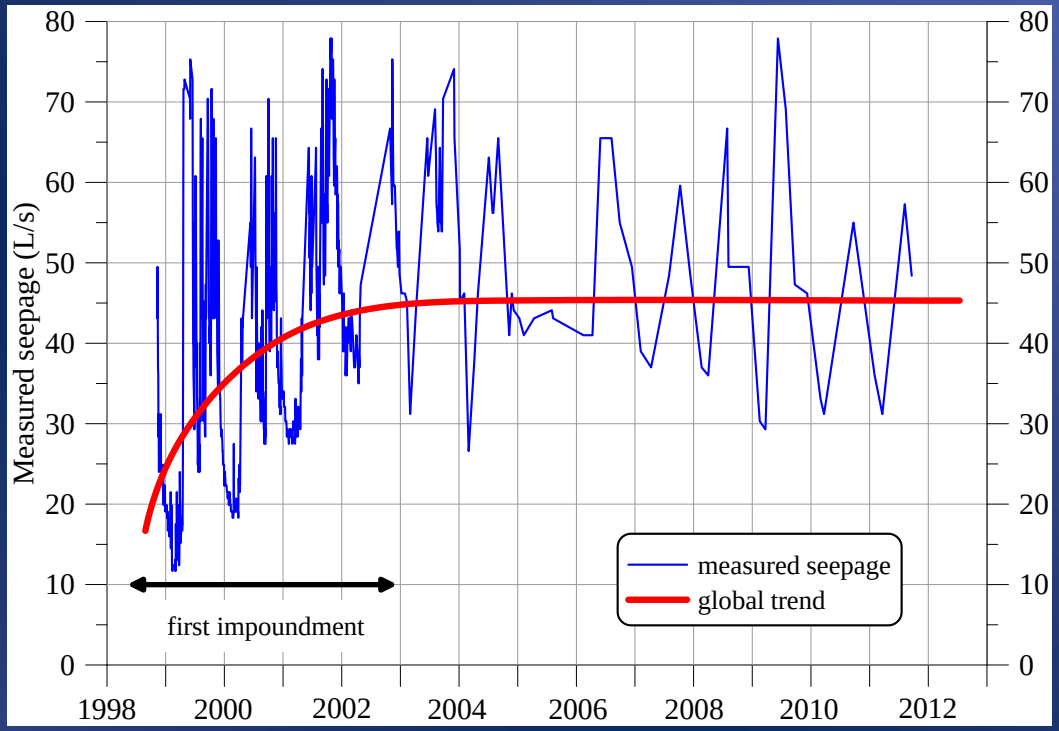




Representativeness of results

Widespread instability of dam core
+ adequate downstream filter = decrease in seepage





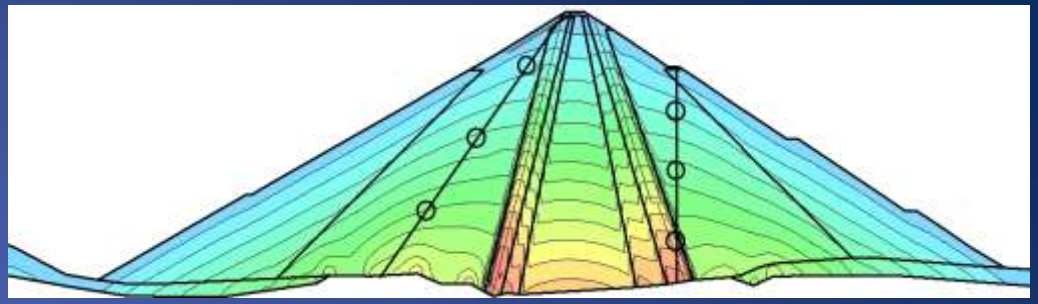
Widespread instability of dam core
+ inadequate downstream filter = increase in seepage

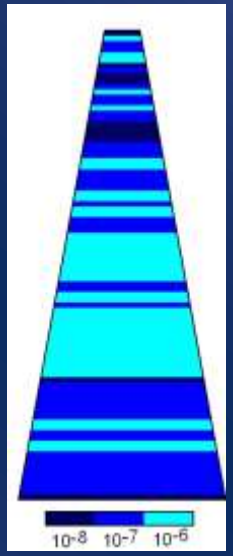
Conclusions

Assessment of an existing dam : consider monitoring data and applicability of methods

Dificult to compare on a common basis the various laboratory testing procedures and instability criteria

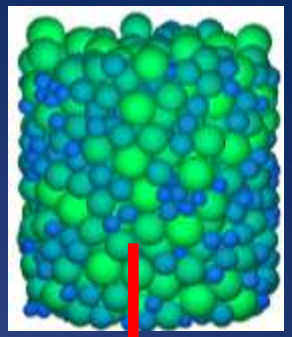
Interactions of geometric, hydraulic and mechanical susceptibilities to internal stability have to be considered in assessments and research





Conclusions

Biggest challenge : considering scale effects and variability in in situ soil properties



from Göltz (2008)