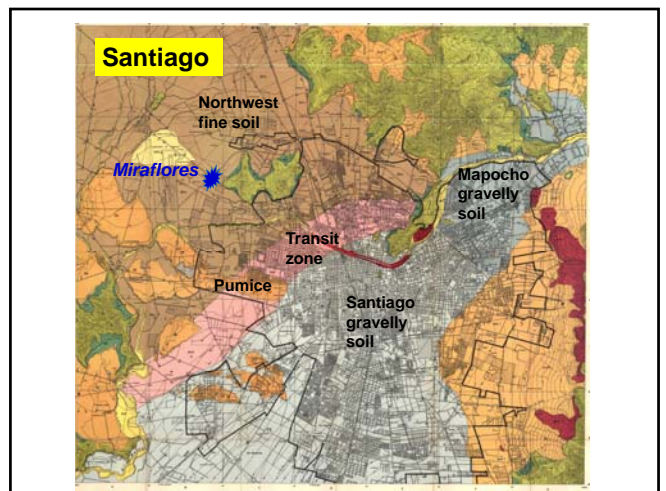
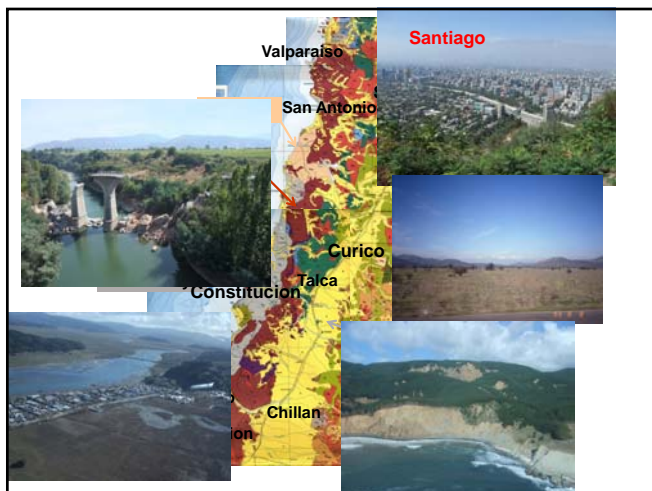
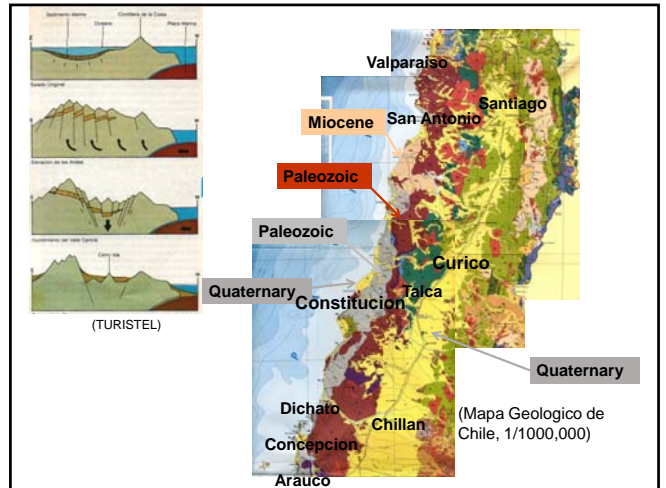
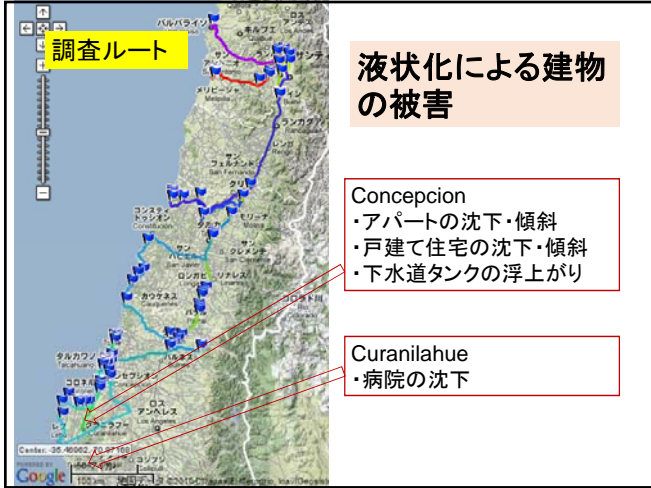
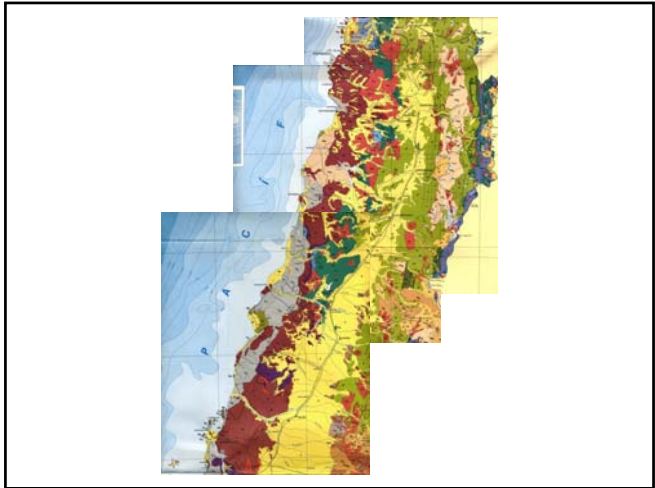
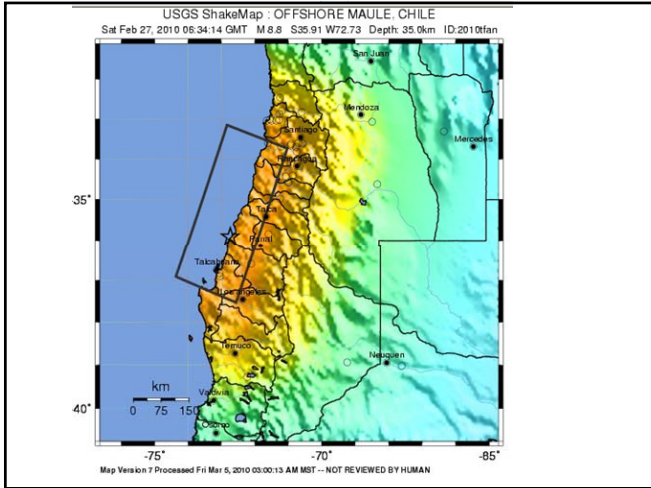
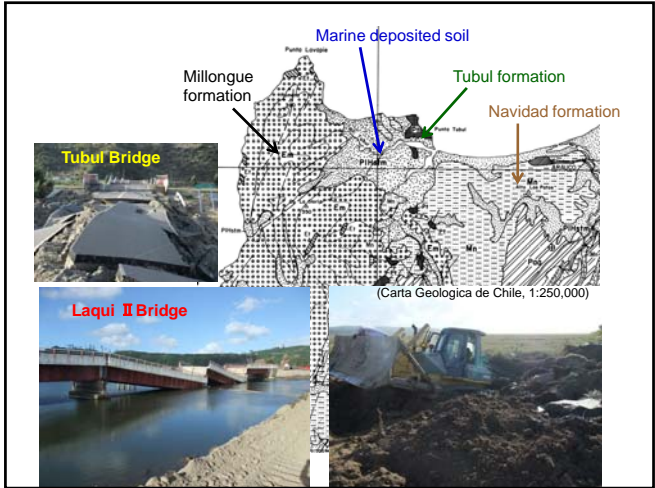
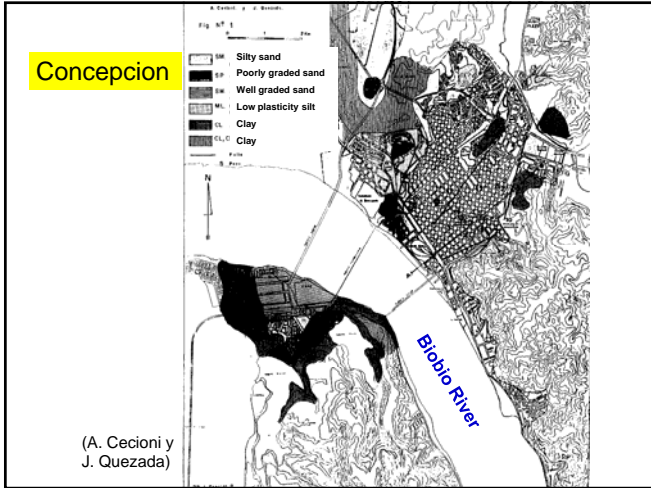


2010年Chile, Maule地震

2010年
2月27日
Mw=8.8

現地調査を行った
のは2010年3月28
日~4月4日







Parque Central

Damage due to liquefaction:
 Tilting of 8 story apartment building (Parque Central)
 One out of four apartment building was tilted by, possibly, liquefaction of backfill.
 The area was **swampy**.

For construction of foundation;
 •Native soft soil was excavated 4 m deep.
 •Well point method was used to lower the GW depth for compaction.
 •Backfill was compacted every 35 cm

•Splashed sands on the wall indicate occurrence of liquefaction
 •No glasses were broken
 •Buildings are not heavily tilted (0.77 deg) = Liquefaction was minor.

Native ground: Swamp

Settlement of the buildings of the Hospital Principal in Curanilahue due to liquefaction of backfilled sand?



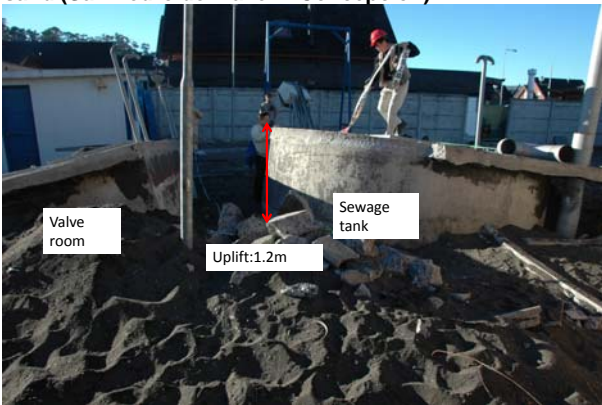
Pushed about

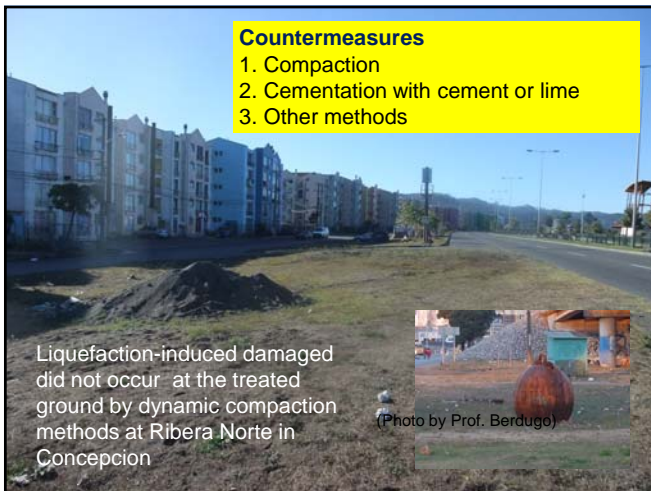


Bayona



Uplift of sewage facility due to liquefaction of backfilled sand (San Pedro del Valle in Concepcion)

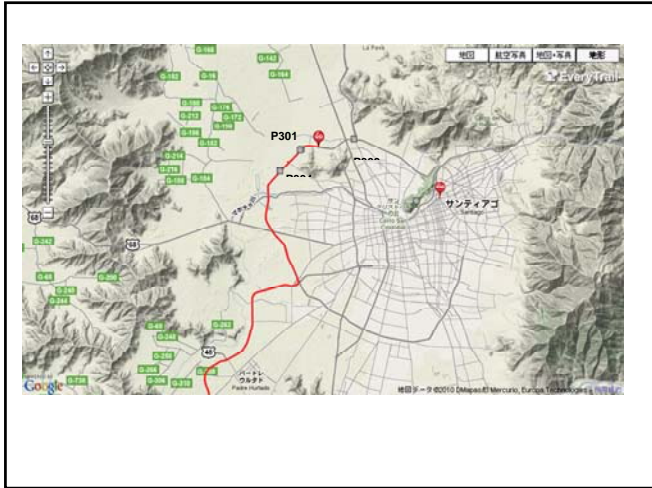


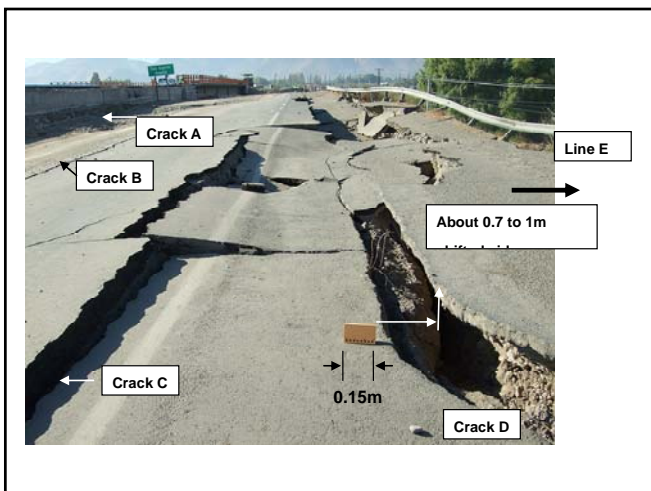
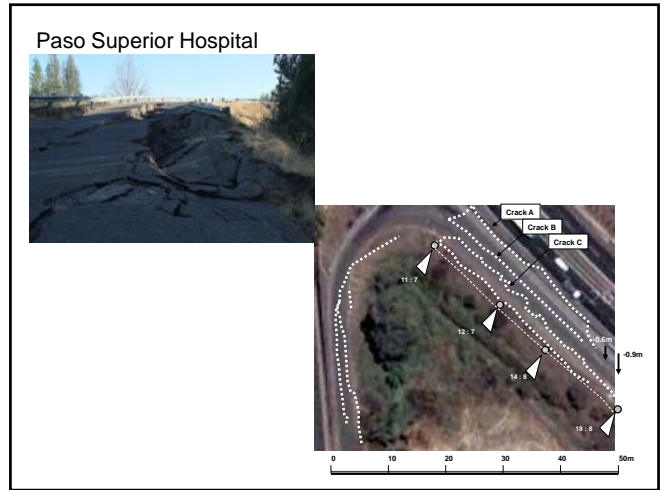












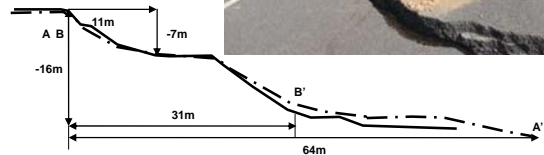


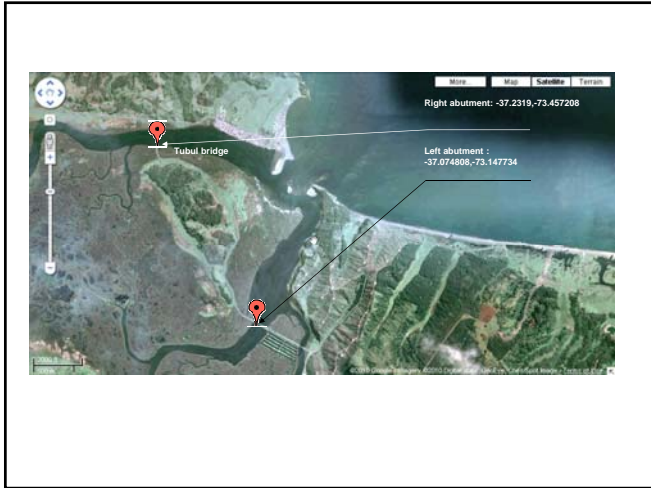


Damage to road embankments and bridges on soft clayey grounds

Lota Norte

Measured cross section







Summary of soil condition of failed road embankments

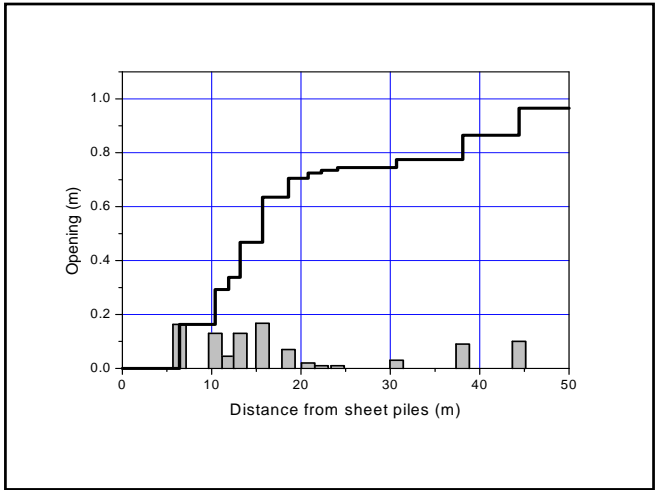
- (1) Filled on swampy ground
- (2) Surface soil is soft and clayey
- (3) Water table is shallow
- (4) Embankment material is clean sand in Lota Norte

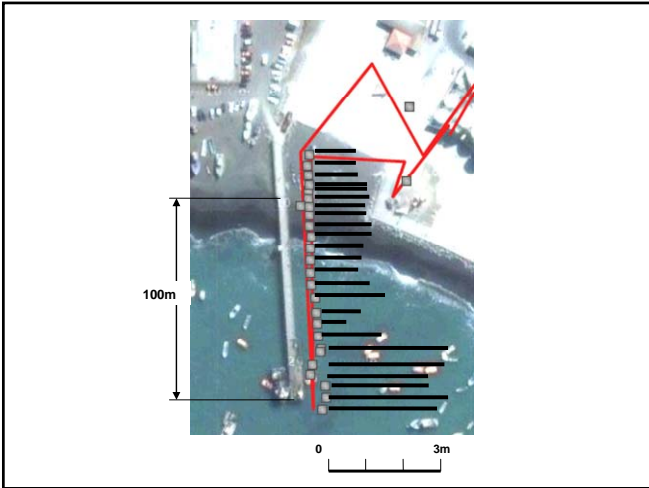
RECOMMENDATION
 In design of road embankments

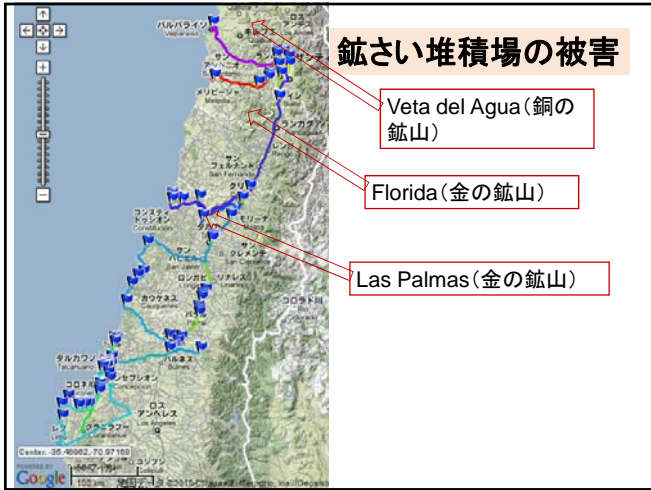
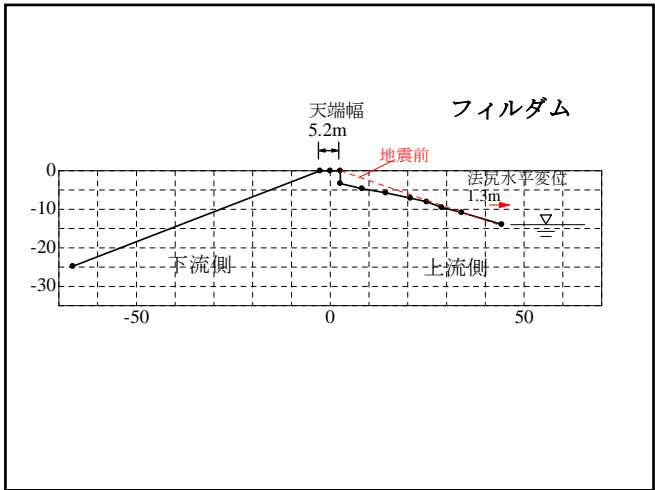
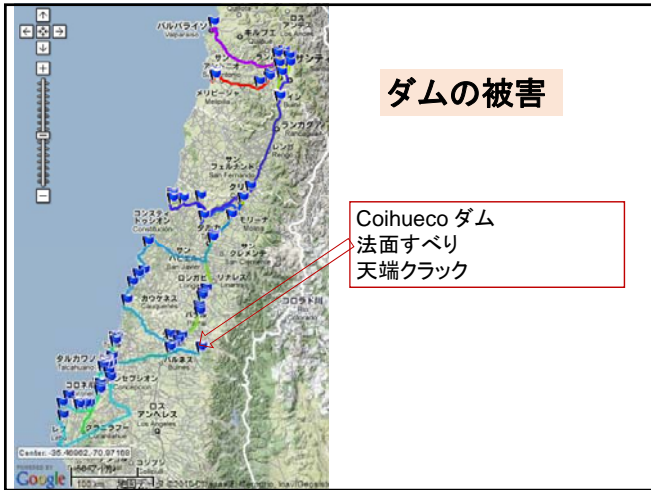
- (1) Improve the ground by cementation etc.
- (2) Appropriate slope angle
- (3) Selection of appropriate banking material

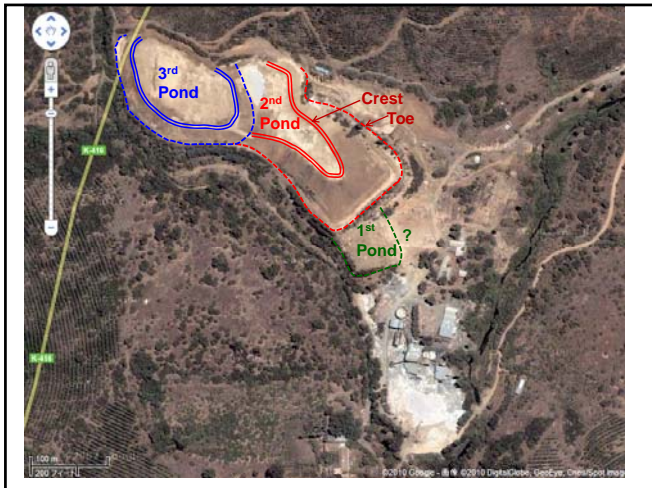
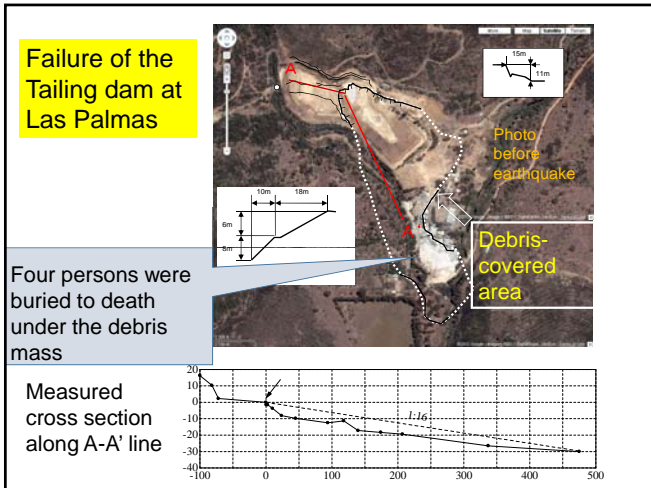
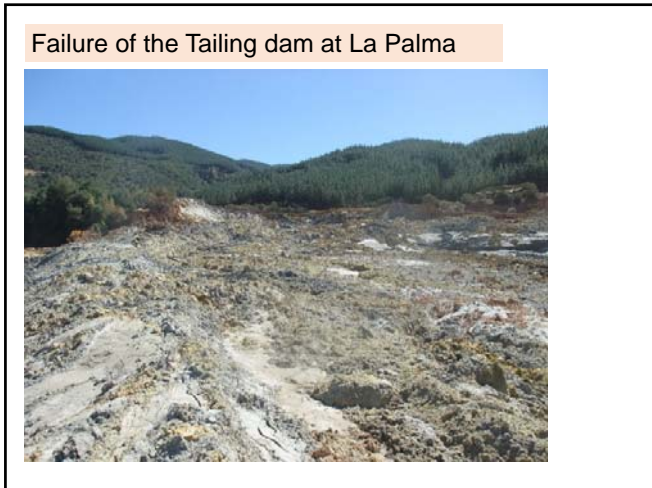


Gracias!

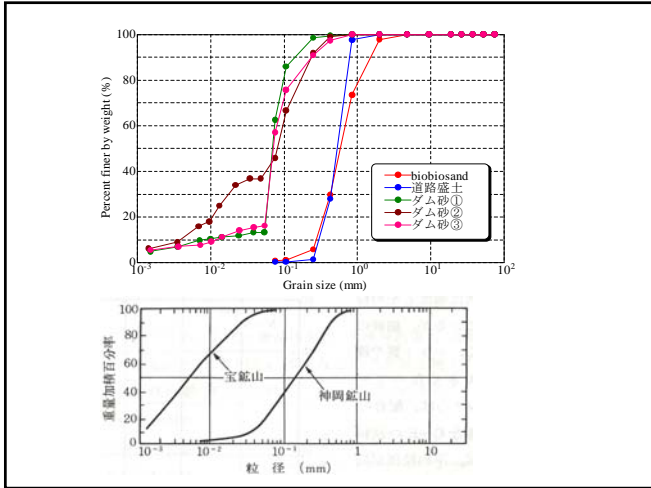












Same problem in Japan
 Failure of Mochikoshi Tailing dam in the 1978 Izuohshima-kinkai Earthquake in Japan

Problem to be solved in Chile and Japan
 How to maintain abandoned tailing dams?

- (1) Stability of slopes during earthquake
 - Decrease water table in tailing dams
- (2) Environmental

Drainage facilities at abandoned Mochikoshi tailing dam

海岸部の斜面崩壊・隆起

San Antonio
海岸段丘斜面の崩壊

Arauco
海岸の斜面の崩壊

隆起

Surveyed from helicopter



