



Landslide Surveying and Monitoring Systems Deep Monitoring

Advanced technologies for monitoring and prediction of ground instabilities
Pisa, 09-12 December 2024

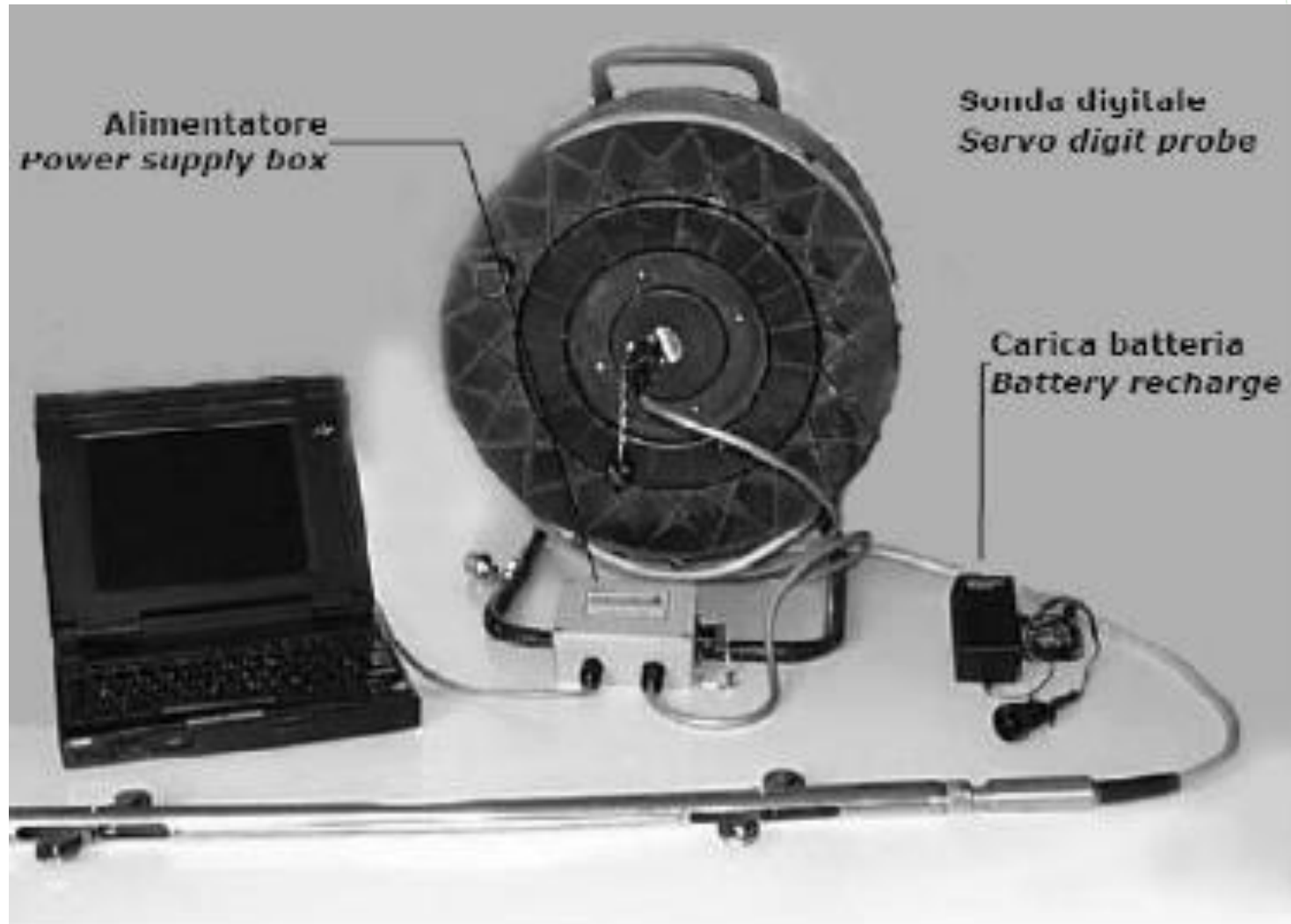
IR0000032 – ITINERIS, Italian Integrated Environmental Research Infrastructures System
(D.D. n. 130/2022 - CUP B53C22002150006) Funded by EU - Next Generation EU PNRR-
Mission 4 “Education and Research” - Component 2: “From research to business” - Investment
3.1: “Fund for the realisation of an integrated system of research and innovation infrastructures”



Deep monitoring

- 🌐 Identify the sliding surface depth and the possible occurrence of multiple shear planes
- 🌐 Define the geometry and thickness of the sliding surface
- 🌐 Quantify the movements in depth
- 🌐 Measure pore pressures
- 🌐 Correlate deep movements with rainfall and pore water pressure

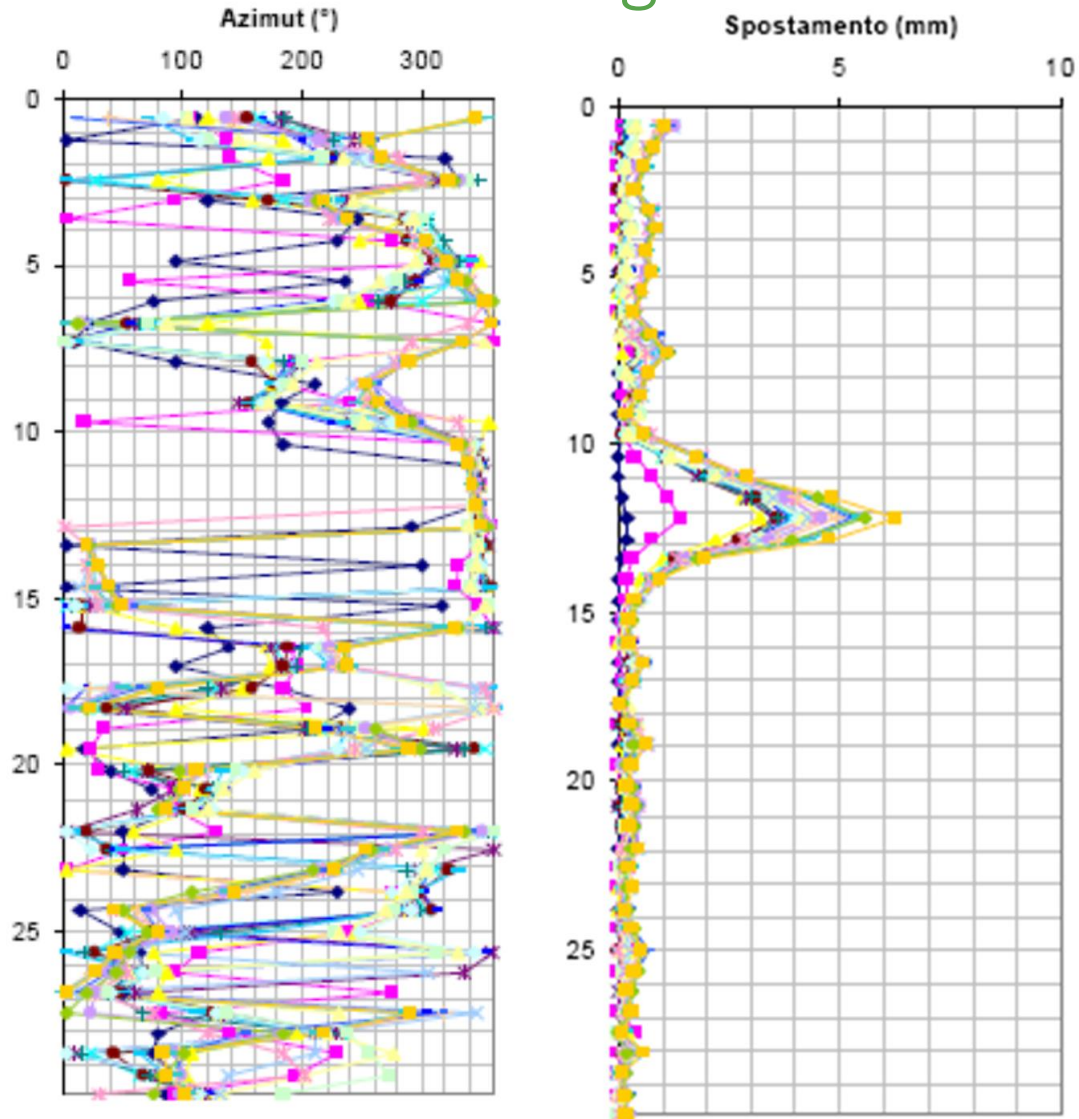
Borehole Inclinomometer



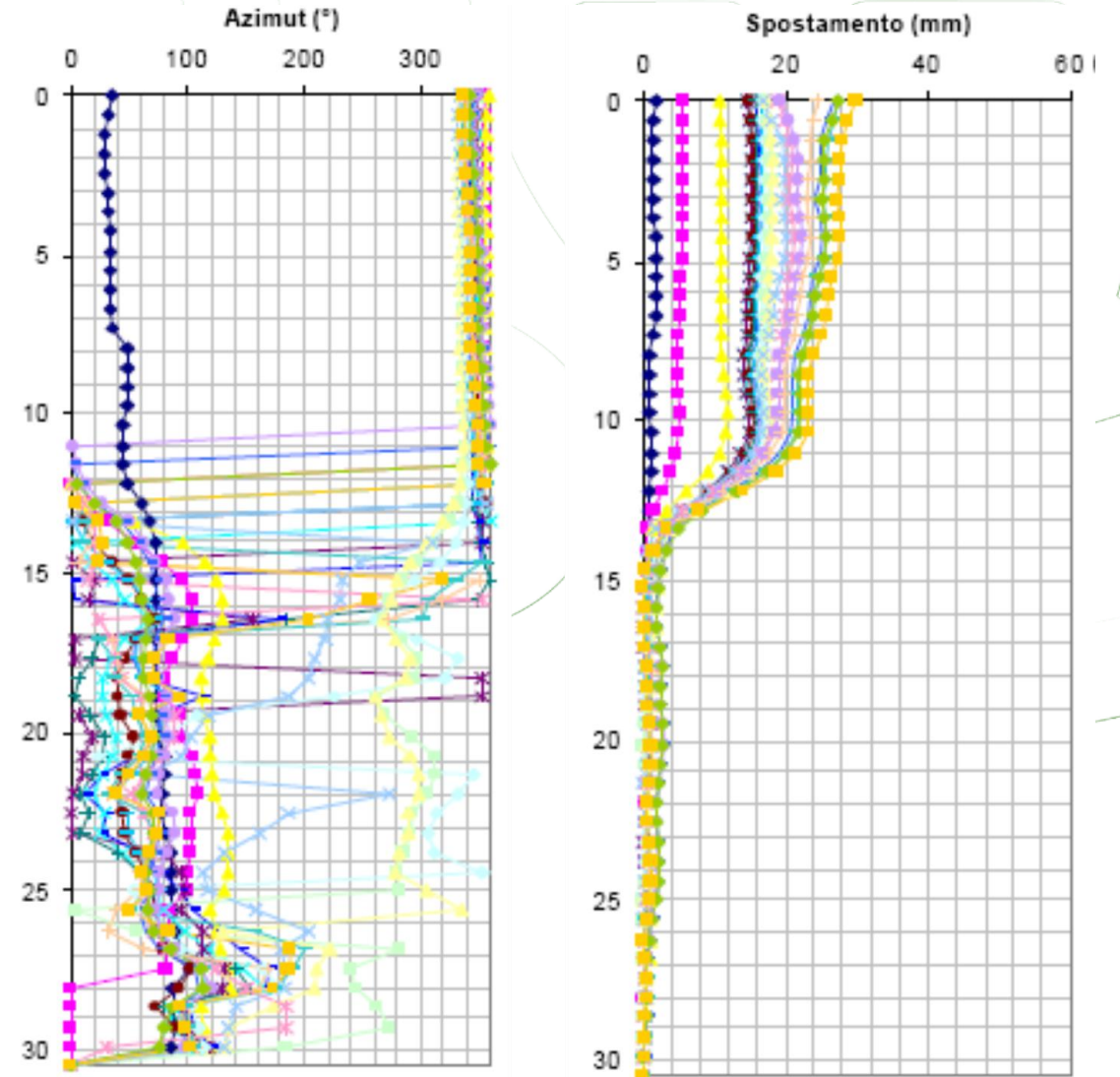
Borehole inclinometer



Inclinometer reading

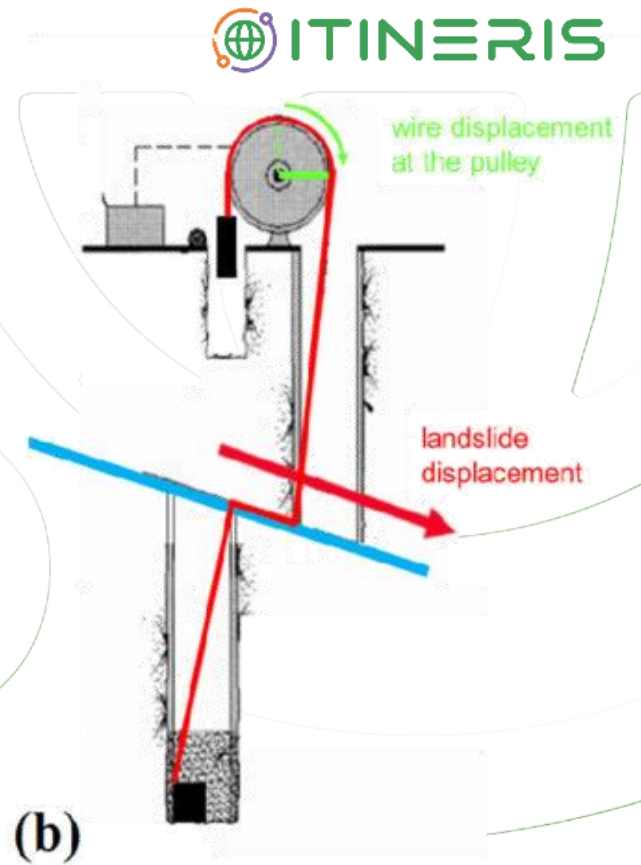
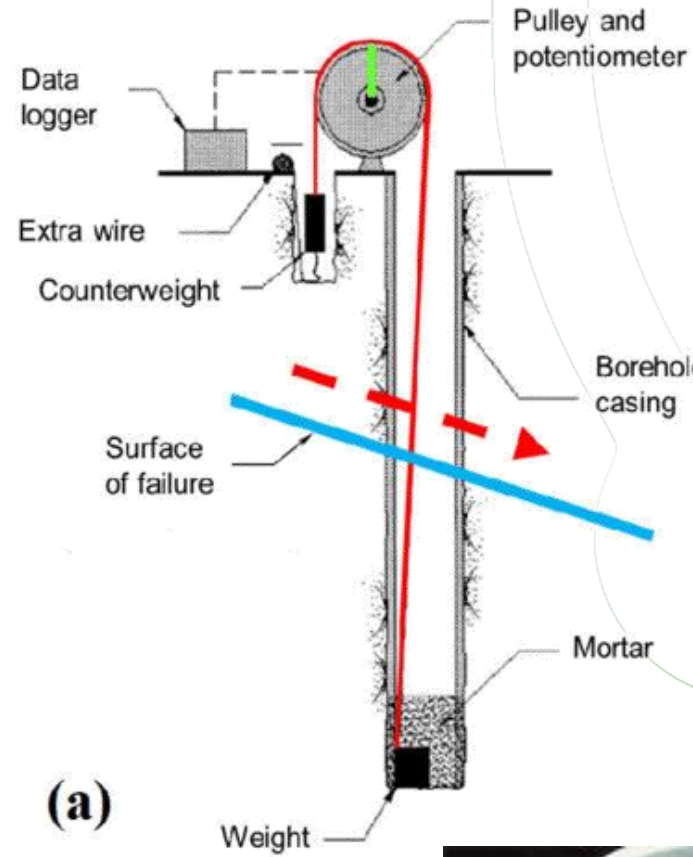


Incremental displacements



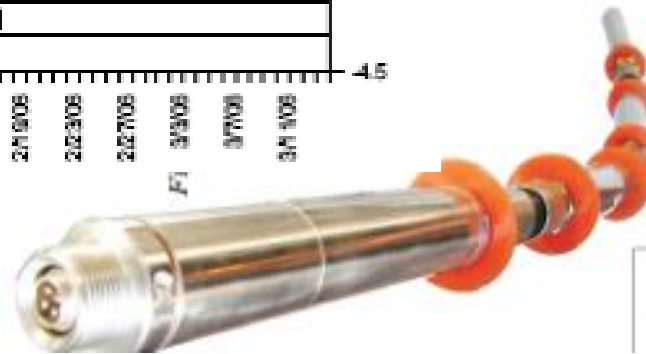
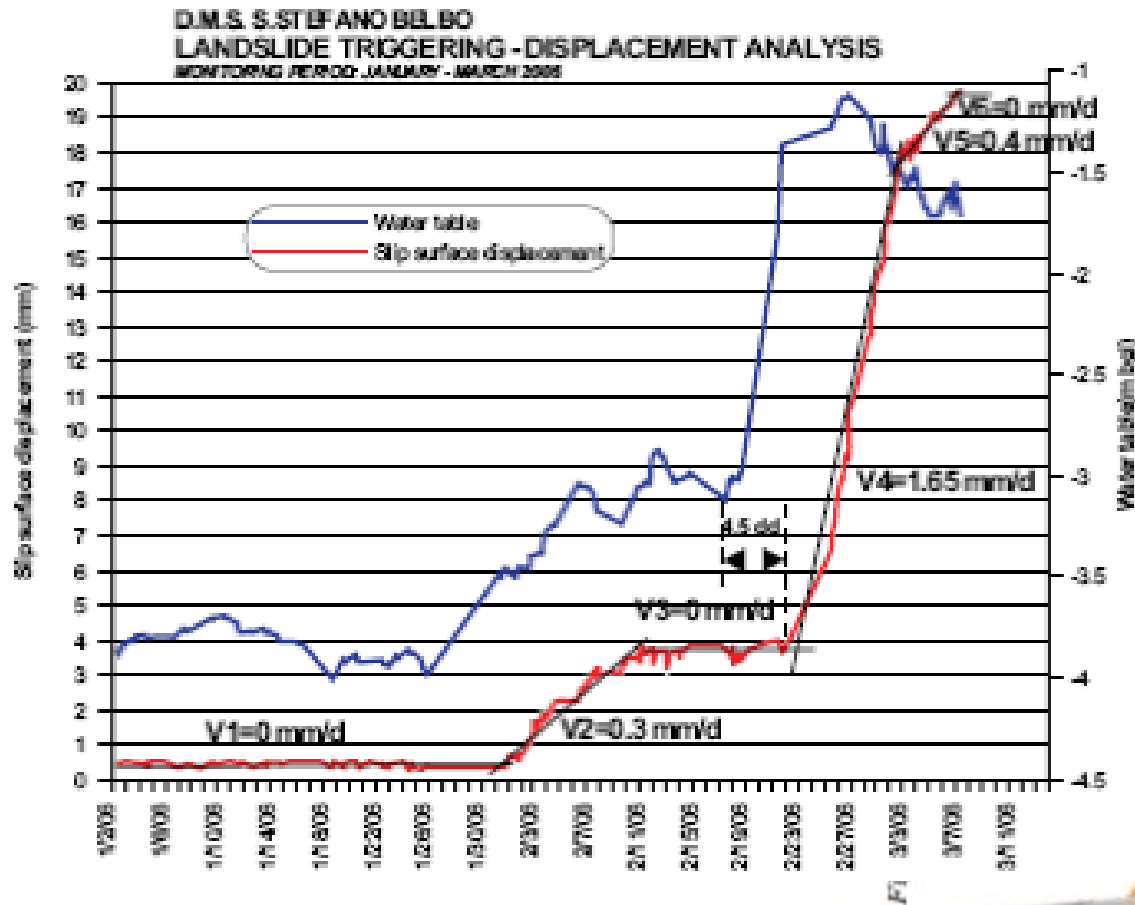
Cumulative displacements

Borehole extensometers

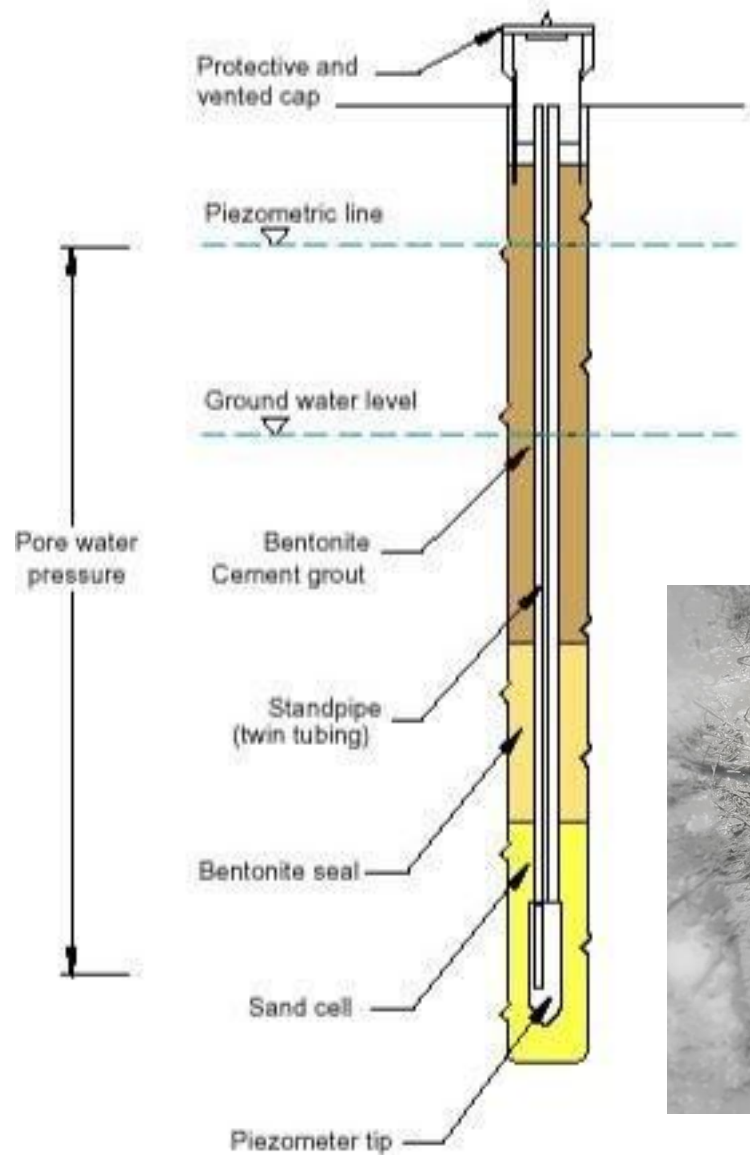


Gili et al. (2021)

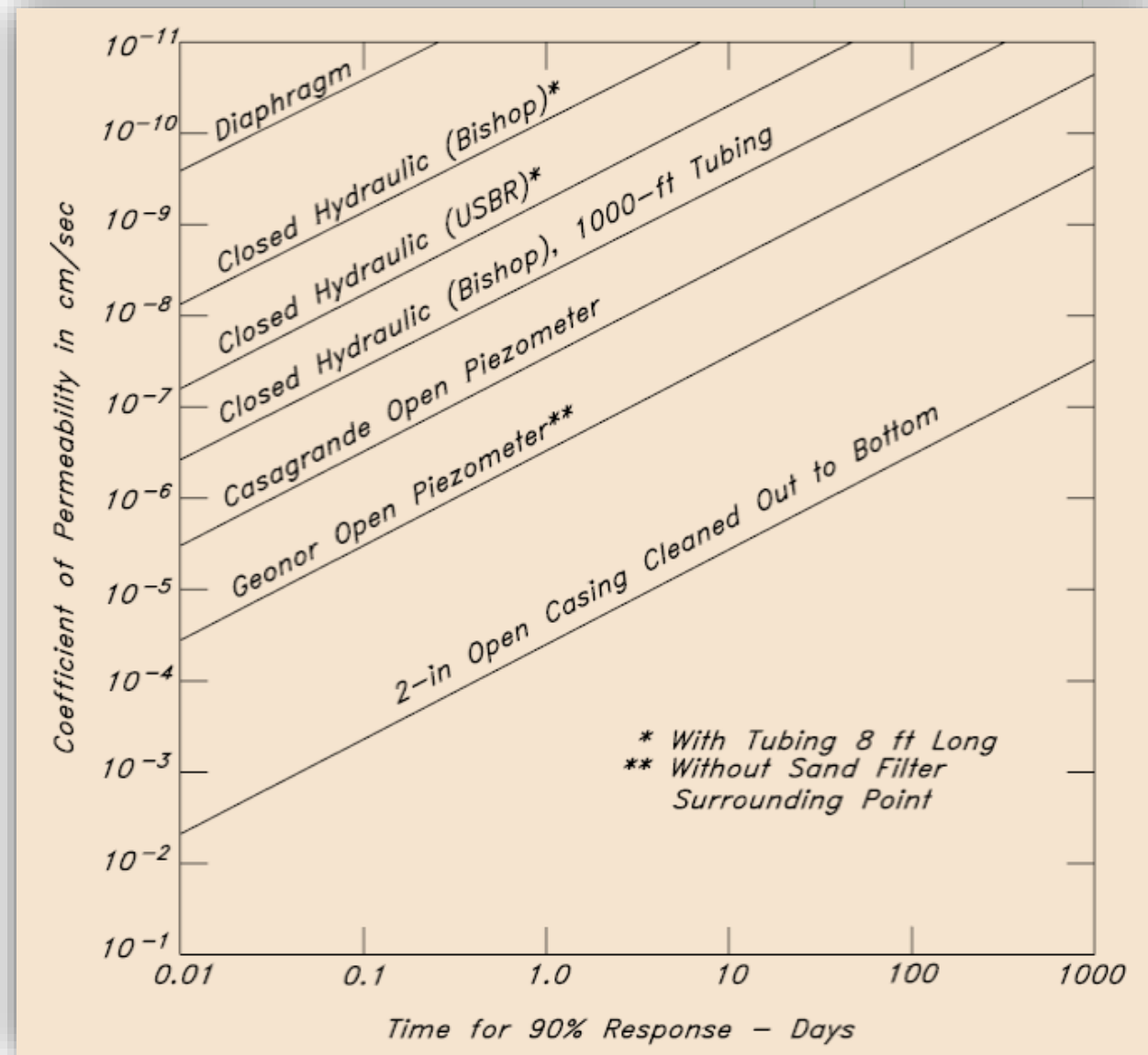
Differential Monitoring System



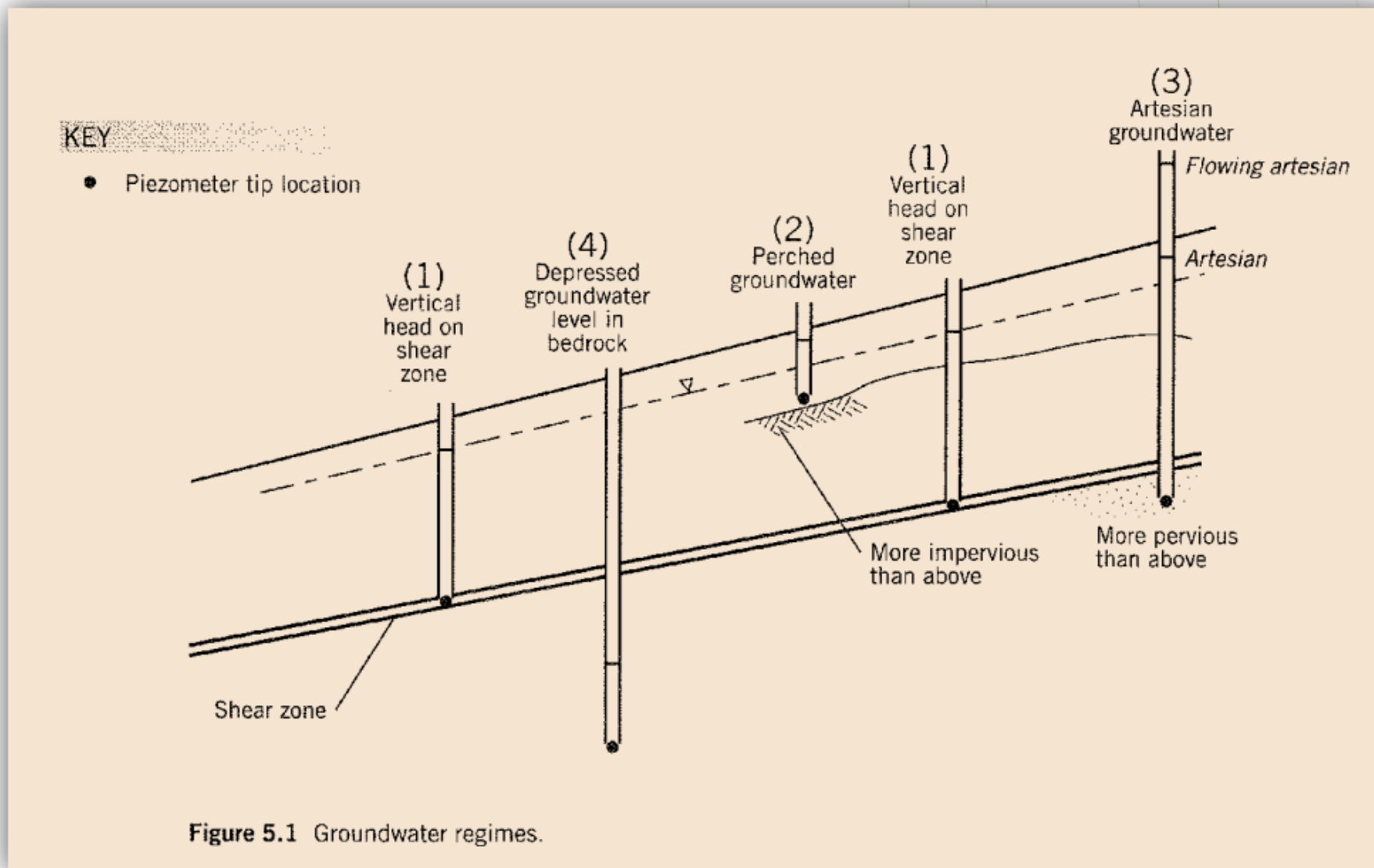
Piezometers



Piezometer response time





Piezometer location

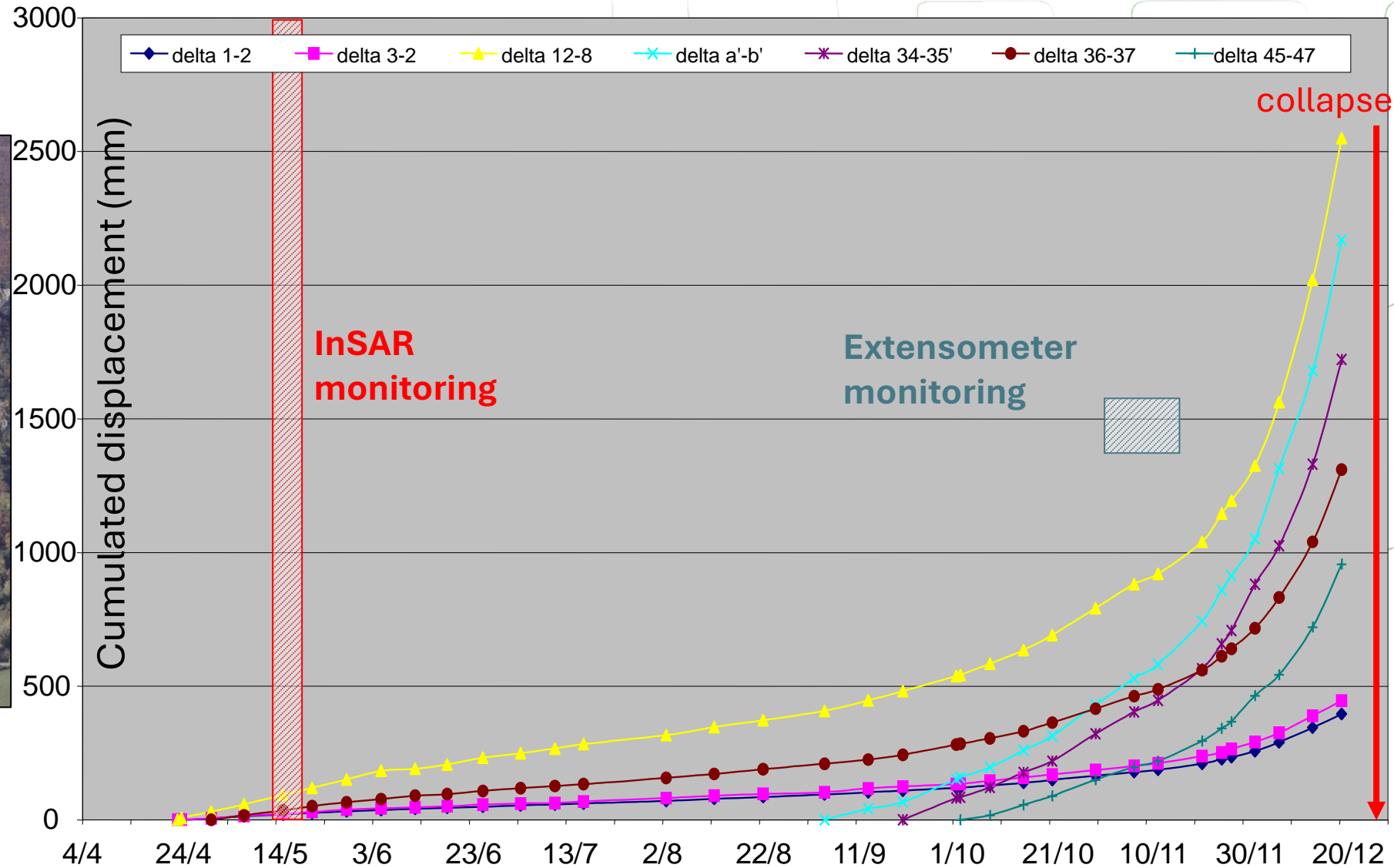


Piezometric column

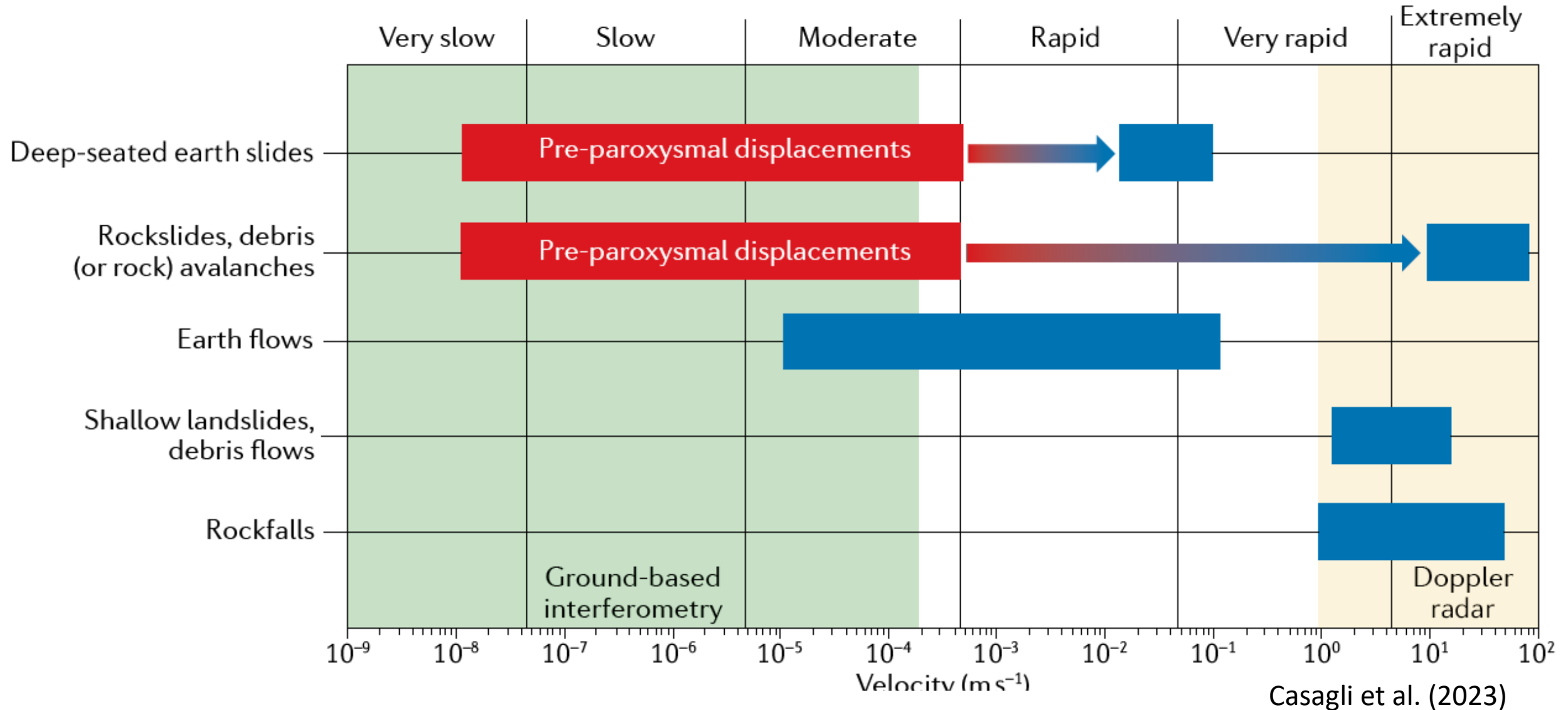


-  They consist of a series of piezometric cells to be installed at different heights within the same perforation
-  Each single cell is isolated in a predetermined layer of the soil using bentonite plugs

There is no ideal monitoring system



There is no ideal monitoring system



References

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THANKS!

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