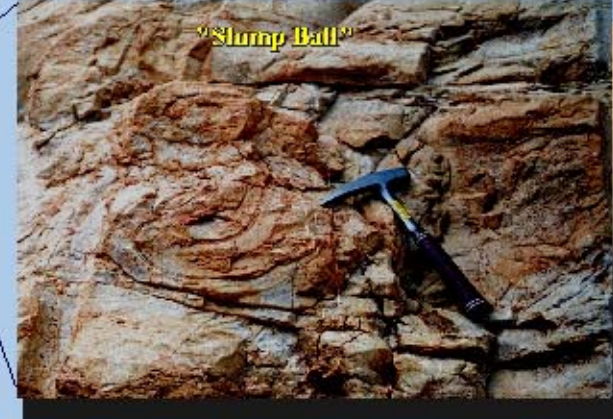


Evidence Bearing on Sediment Competence

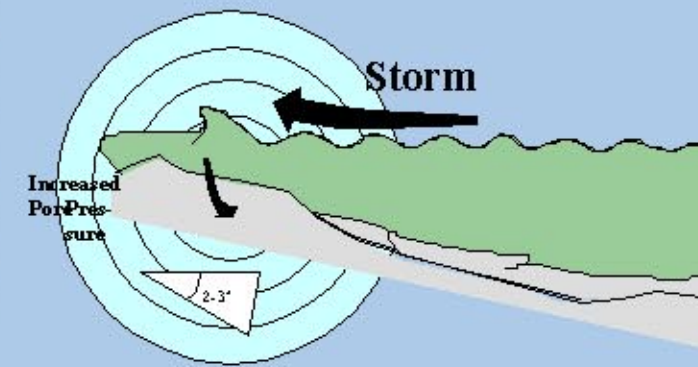


Competency Discussion

Penecontemporaneous sedimentary deformation structures may develop from simple vertical movement or a combination of lateral and vertical movement. Several processes such as seismic events, shock induced by storms, or gravity alone may induce penecontemporaneous load or slump structures in sediments. It is not always easy to distinguish between liquefaction structures involving no downslope movement and slump structures formed by shear stress exerted by fluid flow in the field. Criteria for distinguishing between the two types of deformation structures involve an assessment of sediment competency and the direction of movement. slumps include distorted and overturned stratification, Flow structures, and "pull-apart-structures" are characteristic features produced by rapid loading above thixotropic bed. Stacking of sedimentary blocks, sedimentary bodies made up of multiple beds, block rotation, shear planes, sheared internal stratification, "slump balls" and undisturbed internal laminations are characteristic features of slump structures and indicative of the deformation of competent rather than thixotropic sediment.

Sheet Slump Model

Storm waves pounding the seafloor induce shock waves and increase pore pressure within the seabed, conditions that can trigger submarine mass flow events. Slope angles of two to three degrees are sufficient for the mass wasting to take place. Slope angles of four degrees were recently measured on Jubaila Formation bedding plane surfaces. Regional stratigraphic dip is about one degree, meaning the Jubaila locally had slope angles of at least three degrees.



Conclusions

1. Soft sediment deformation structures are present in the Jubaila Formation and these represent a sheet slump rather than load structures.
2. Sedimentary blocks are made up of mudstone, grainstone, and rudstone beds.
3. The basal glide plane exhibits up to two feet of relief.
4. The depositional slope declivity was sufficient to allow slump formation in the upper Jubaila Formation in the Riyadh area.

Trace of Slump Horizon

