

## Cobble berms as an indicator of flashy discharge in ephemeral river deposits in the Precambrian and Pleistocene

Darrel G. F. Long, Department of Earth Sciences, Laurentian University, Sudbury, ON, P3E2C6  
 dlong@laurentian.ca

### Summary

Clusters of boulders and cobbles on the upper part of lateral accretion surfaces in mixed sandy-gravelly fluvial deposits are a potential indicator of highly variable to catastrophic discharge characteristics in ephemeral and highly seasonal fluvial systems (Carling, 1987, 1989). An example of cobble berms, developed on the upper part of lateral accretion surfaces in the Neoproterozoic Whyte Inlet Formation, Bylot Supergroup, north of Fury and Hecla Straits, Canada (Fig. 1; Long and Turner 2011), is suggestive of irregular peak discharge, with velocities in the order of 2.4 m/sec (method of Costa, 1983). Boulder and cobble grade examples in Middle Pleistocene cliff exposures near Montecito California (Fig. 2; Minor et al., 2007) show similar evidence of upper-flow regime conditions, with maximum flow, based on boulder size, in the order of 3.5 m/sec. The major difference in the two examples is that the Pleistocene examples have higher mud content, presumably due to a combination of provenance and enhanced weathering by organic acids.

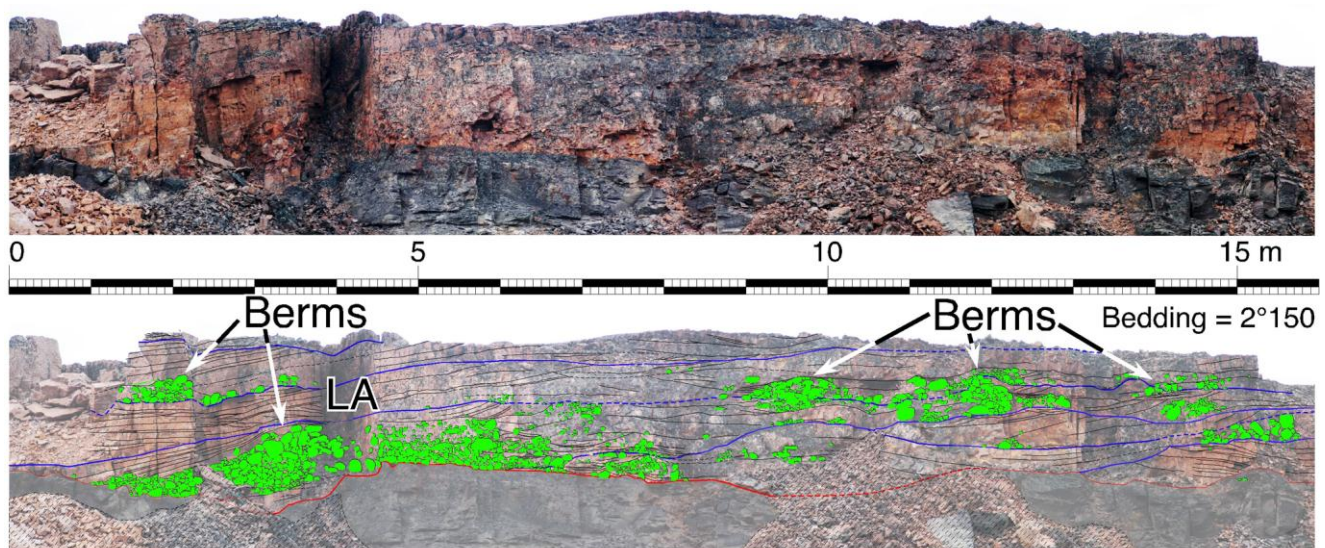


Figure 1 Sub-horizontal east-west exposure of conglomerate and sandstone at the base of the Neoproterozoic Whyte Inlet Formation, showing perched cobbles and boulders (green) resting in clusters on lateral accretion surfaces (LA). Top surface of exposure is a sequence boundary marking rapid marine transgression. *Top* = as exposed. *Bottom* = with 0<sup>th</sup> to 2<sup>nd</sup> order surfaces in black, 3<sup>rd</sup> order surfaces in blue, and basal unconformity marked in red.

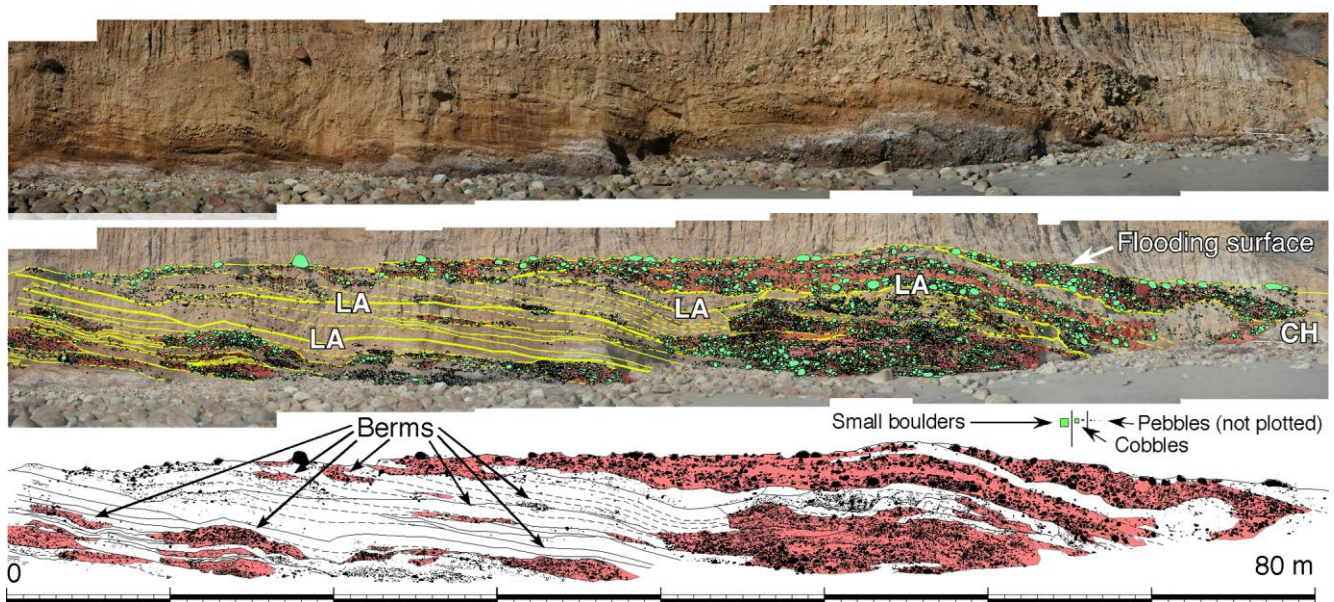


Figure 2 Eighty meter wide sub-horizontal coastal exposure of middle (?) Pleistocene conglomerate (red) and conglomeratic sandstone at Montecito, California. *Top* = outcrop. *Middle* = Exposure with cobbles and pebbles added (green). Yellow lines are lateral accretion surfaces (LA). CH = Channel thalweg. *Bottom* = Observations with outcrop removed. Red patches are conglomerates, white areas are pebbly sandstones. Upper limit of conglomeratic outcrop is a marine flooding surface beneath late Pleistocene marine terrace deposits (unit Qmt of Minor et al. (2007). The base of exposure is the modern beach.

## References

- Carling P.A., 1987. Hydrodynamic interpretation of a boulder berm and associated debris-torrent deposits: *Geomorphology*, **1**, 53-67.
- Carling, P.A., 1989. Hydrodynamic models of boulder berm deposition: *Geomorphology*, **2**, 319-340.
- Costa, J.E., 1983. Paleohydraulics reconstruction of flash-flood peaks from bolder deposits in the Colorado Front Range: *Geological Society of America, Bulletin*, **94**, 986-1004.
- Long, D.G.F., and Turner, E.C., 2011. Tectonic, sedimentary and metallogenic re-evaluation of basal strata in the Mesoproterozoic Bylot basins, Nunavut, Canada: Are unconformity-type uranium concentrations a realistic expectation? *Precambrian Research*, doi:10.1016/j.precamres.2011.11.005
- Minor, S.A., Kellogg, K.S., Stanley, R.G., and Brandt, T.R., 2007. *Geologic Map of the Goleta Quadrangle, Santa Barbara County, California*: USGS Open File Report 2007-1403.