Cobble Berms As an Indicator of Flashy Discharge in Ephemeral River Deposits in the Precambrian and Pleistocene*

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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 (Figure 1; Long and Turner, 2012), is suggestive of irregular peak discharge, with velocities on the order of 2.4 m/sec (method of Costa, 1983). Boulder and cobble grade examples in middle Pleistocene cliff exposures near Montecito, California (Figure 2; Minor et al., 2007) show similar evidence of upper-flow-regime conditions, with maximum flow, based on boulder size, on 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.

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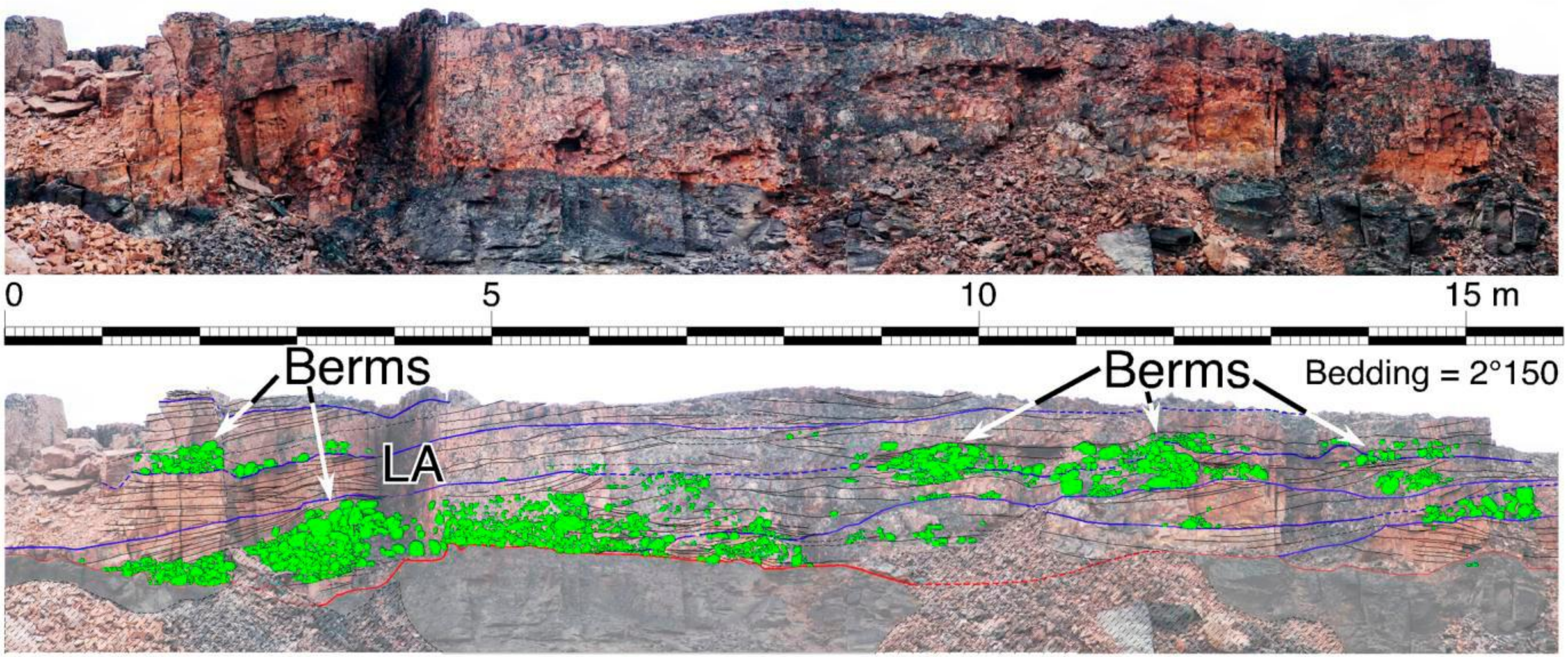

Figure 1. Sub-horizontal east-west exposure of conglomerate and sandstone at the base of the Neoproterozoic Whyte Inlet Formation, showing perched cobbles and boulders (green) resting in clusters on lateral accretion surfaces (LA). Top surface of exposure is a sequence boundary marking rapid marine transgression.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

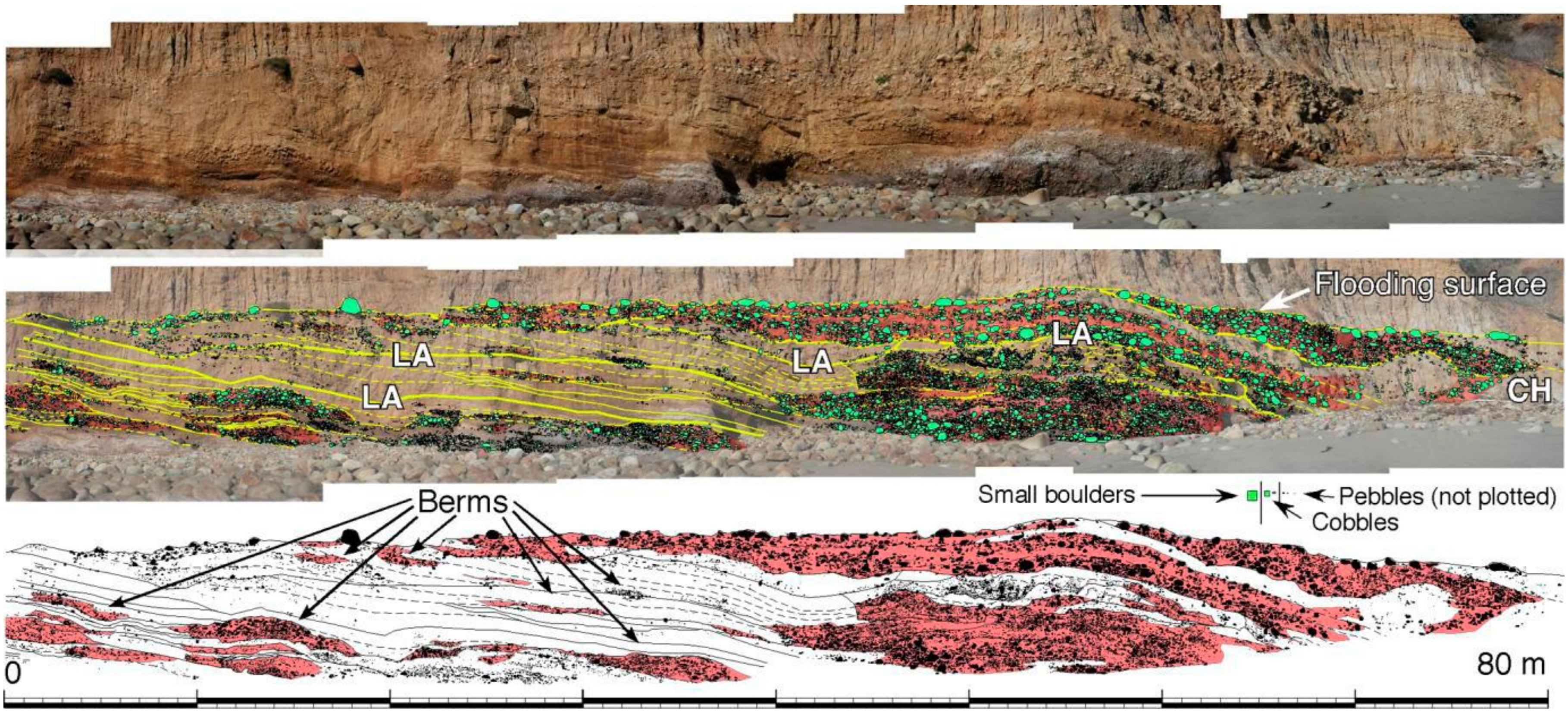

Figure 2. Eighty meter-wide sub-horizontal coastal exposure of middle (?) Pleistocene conglomerate (red) and conglomeratic sandstone at Montecito, California. Top = outcrop. Middle = Exposure with cobbles and pebbles added (green). Yellow lines are lateral accretion surfaces (LA). CH = Channel thalweg. 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 upper Pleistocene marine terrace deposits (unit Qmt of Minor et al. (2007). The base of exposure is the modern beach.