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A sedimentological and architectural analysis of volcaniclastic deposits associated with the 1918 eruption of Katla volcano: Southern Iceland

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The 1918 eruption of Katla subglacial volcano, Southern Iceland, generated a pumiceous flood that was concentrated to hyperconcentrated in nature. The flood material was routed south-eastwards beneath the Mýrdalsjökull ice cap and broke through the snout of Kötlujökull outlet glacier at approximately 1500h on October 12^{th}, 1918. Eyewitness accounts of the flood event suggest that the main flood lasted for 5-6 hours, inundating a 200km^2 area of the associated glacial outwash plain, Mýrdalssandur.

Present day stream sections reveal the sedimentology and architecture of the outburst flood deposits. Architectural panels aligned parallel to palaeoflow direction reveal the presence of lenticular bed-sets defined by a gently inclined, concave-up erosional base and truncated upper surface. Internally, these bed-sets exhibit diffuse stratification that is sub-parallel to the basal erosional surface in lower portions, decreasing in concavity with height in the bed-set. Stratification in lenticular bed-sets is observed to dip gently downstream at the up-current margin but more steeply upstream in down-current portions. In rare cases more prominent sedimentary features accompany these lenticular bed-sets and are defined by greater erosive relief, which, like the lenticular bed-sets, coincides with an erosive concave base infilled with very diffuse and impersistent stratification.

A comparison with similar sedimentary structures formed from a range of flume-work experiments and field descriptions of subaqueous and subaerial flow deposits, suggests that the jökulhlaup (glacial outburst floods) producing these specific sedimen-

tary structures were supercritical with respect to Froude number. Lenticular bed-sets are interpreted to be the product of antidune formation, migration and subsequent destruction under upper flow regime conditions. The diffusely stratified and structureless character of these lenticular bed-sets is interpreted to be a by-product of rapid suspension sedimentation on the stoss-side of major antidunes crests.

Deposits of this kind, albeit with slight differences in detail, are well documented in the literature from work on turbidites, fluvial deposits, pyroclastic surge/flow deposits and from experimental flume-work on supercritical flows. However there is little, if any, previous work regarding similar deposits that matches the scale of bedforms described here produced by flows with an aqueous transporting media. Also, previous studies on deposits associated with catastrophic systems have ignored the architectural implications of catastrophic sedimentation, with focus mainly on vertical sedimentary logging.