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Linear pockmark trains linked to bedrock features in the St. Lawrence Estuary (eastern Canada)

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In the St. Lawrence Estuary (Québec, Canada) over 1900 pockmarks have been identified on recently collected multibeam bathymetry. In the study area, pockmarks occur in water depths from 65 to 355 m. They range from less than 100 m to $\sim$700 m in diameter and are up to 25 m deep (average $<$ 10 m). Pockmarks are predominantly located within the Laurentian Channel and on its northwest shoulder. Chemosynthetic (?) carbonate crusts have been sampled in some pockmarks associated with high backscatter values and active gas venting has been documented locally on side-scan sonar images. Pockmarks occur either as linearly distributed or as discrete features. Pockmark trains are up to 15 km long and may include over 75 individual structures. They systematically strike NNE and are located on the relatively flat floor of the St. Lawrence channel, far from major rivers mouths which account for most of recent biogenic inputs. In detail, trains comprise pockmark clusters in some areas and some pockmarks have elliptical shapes with primary axes oriented parallel to the train they belong to.The integrated analysis of the datasets suggests that the distribution of linear pockmark trains in the St. Lawrence Estuary is mainly controlled by the geology of the underlying Paleozoic bedrock as suggested by the parallelism of pockmark trains with bedrock features, including bedrock ridges buried by Quaternary sediments. This suggests that some unknown specific unit(s) or structural features within the Paleozoic succession act as a pathway for the migration of thermogenic gas. Others examples of non-random distribution of pockmarks have been linked to submarine landslides and paleo-channels. However, these pockmark clusters are characterized by a dominant curvilinear trend and a more irregular concentration of individual pockmarks

compared to the linear pockmark trains associated with bedrock features.