Impact of sand content and cross-shore transport on the morphodynamics of macrotidal gravel beaches (Haute-Normandie, English Channel)

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Summary. The beaches of Haute-Normandie, of which Quiberville and Pourville are the subject of this study, are characterised by (1) an accumulation of coarse sediment with a steep slope (10 %) and, at the foot of this incline, a sandy foreshore with a low slope (1 %) that is more dissipative, (2) a macrotidal environment and (3) a seawall, which stops them from moving inland. According to existing literature these beaches experience a surface gravel drift, while their internal structure includes an interstitial sand fraction. The internal structure of these mixed beaches is often quite heterogeneous and may contain up to 20 % of siliceous splinters resulting from gravel attrition. At the end of periods of high energy, some splinters are found close to the low foreshore, suggesting that sand exchanges take place across the beach from the gravel accumulation towards the lowest part of the beach. Hydrodynamic measurements and the monitoring of fluorescent tracers confirmed displacement of sand from the low beach towards the gravel beach during moderate swells, and in the opposite direction during storm events. These sand transfers seem to be part of the system of adaptation of the gravel beaches to changing hydrodynamic conditions, determining the infiltration potential of the mixed sediment beach and the reflective or dissipative nature of the whole beach. The results also suggest that understanding the morpho-sedimentary behaviour of these gravel or composite beaches (SHULMEISTER, & KIRK, 1993) requires, to the same extent as for sand beaches, an appreciation of the sediment exchanges from the lower beach or even from the infra-tidal zone.