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1 A quantitative geomorphic analysis of the Monterey Canyon System

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We present preliminary results from an ongoing drainage analysis of the Monterey Canyon system, offshore central California, one of the largest known. We apply a holistic approach, examining both erosional and deposition parts of the system, which provide complementary information about the evolution of submarine drainage. We investigate the late Quaternary evolution of this drainage system to understand both internal processes and external forcing. The main external factors appear to be tectonics and sea-level change. Rise in sea level increase shelf area available to capture deltaic and coastal sediment. Drop in sea level tends to rework this sediment and to deliver it to the submarine drainage system. Thus canyon erosion and deep sedimentation tends to vary inversely to sea level. Tectonics may have multiple roles.

The canyon has been progressively offset from its headward part by dextral faulting. Thrust faulting and folding associated with the transpressional plate boundary may be tilting differentially deeper parts of the canyon. Finally large rare earthquakes in either these fault systems is likely to trigger signature mass wasting events on multiple tributaries of the system. These events would be recorded as unusually thick distal turbidites derived from multiple sources and by erosional events in the canyons with associated overbank and fan deposition. Strategies include to parameterize the submarine drainage system and to differentiate equilibrium morphology from deviations representing transient responses to external forcing. Nested surveys include targeted areas with resolution sufficiently high to identify single events, both as deposition and deformation quanta in growth structures. The goal is to understand submarine processes linking erosion, sediment transport by turbidity currents, and deposition of the reworked sediment in distal basins with quasi-horizontal floors.