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Cataclasis and silt smear on normal faults in weakly lithified turbidites

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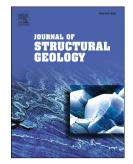
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## ACCEPTED MANUSCRIPT

1	Cataclasis and silt smear on normal faults in weakly lithified turbidites
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11	
12	Abstract
13	Fault-seal analysis in sand-shale multilayers emphasises the role of shale smear
14	without explicitly accounting for cataclasis. These processes produce low-
15	permeability fault rock and are examined here for small displacement (0.001 to 70 m)
16	normal faults displacing weakly lithified turbidites comprising ~55-80% lithic grains.
17	Late Miocene Mount Messenger Formation (MMF) turbidites from the North Island
18	of New Zealand provide fault rock data over a range of scales from individual grains
19	(~0.1-350 $\mu$ m) to the height of coastal cliffs (~10-20 m). Fault rock and unfaulted
20	source beds has been analysed using thin sections, SEM images, particle-size
21	distribution (PSD) measurements and outcrops of faults mainly in cross section.
22	Cataclasis associated with particle size and macroscopic porosity reduction of
23	protolith sandstones commences at low fault shear strains (<1) and continues as fault
24	displacement accrues. The relationship between particle-size reduction and
25	displacement is non-linear with initial rapid cataclasis facilitated by disaggregation of
26	weak lithic and altered feldspar grains along pre-existing grain defects (e.g., grain

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