Onset of submarine debris flow deposition far from original giant landslide

Titre	Onset of submarine debris flow deposition far from original giant landslide
Type de publication	Article de revue
Auteur	Talling, P.-J. [1], Wynn, R.-B. [2], Masson, D.-G. [3], Frenz, M. [4], Cronin, B.-T. [5], Schiebel, Ralf [6], Akhmetzhanov, A.-M. [7], Dallmeier-Tiessen, S. [8], Benetti, S. [9], Weaver, P.-P.-E. [10], Georgiopoulou, A. [11], Zühlsdorff, C. [12], Amy, L.-A. [13]
Editeur	Nature Publishing Group
Type	Article scientifique dans une revue à comité de lecture
Année	2007
Langue	Anglais
Date	2007
Numéro	7169
Pagination	541 - 544
Volume	450
Titre de la revue	Nature
ISSN	0028-0836
Résumé en anglais	Submarine landslides can generate sediment-laden flows whose scale is impressive. Individual flow deposits have been mapped that extend for 1,500 km offshore from northwest Africa1-7. These are the longest run-out sediment density flow deposits yet documented on Earth. This contribution analyses one of these deposits, which contains ten times the mass of sediment transported annually by all of the world's rivers8. Understanding how this type of submarine flow evolves is a significant problem, because they are extremely difficult to monitor directly9. Previous work has shown how progressive disintegration of landslide blocks can generate debris flow, the deposit of which extends downslope from the original landslide10-13. We provide evidence that submarine flows can produce giant debris flow deposits that start several hundred kilometres from the original landslide, encased within deposits of a more dilute flow type called turbidity current. Very little sediment was deposited across the intervening large expanse of sea floor, where the flow was locally very erosive. Sediment deposition was finally triggered by a remarkably small but abrupt decrease in sea-floor gradient from 0.05° to 0.01°. This debris flow was probably generated by flow transformation from the decelerating turbidity current The alternative is that non-channelized debris flow left almost no trace of its passage across one hundred kilometres of flat (0.2° to 0.05°) sea floor. Our work shows that initially well-mixed and highly erosive submarine flows can produce extensive debris flow deposits beyond subtle slope breaks located far out in the deep ocean.
URL de la notice	http://okina.univ-angers.fr/publications/ua3992 [14]
DOI	10.1038/nature06313 [15]
Lien vers le document	http://dx.doi.org/10.1038/nature06313 [15]

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