Widespread collapse of the southwestern Scotian margin triggered by the ~51 Ma Montagnais marine bolide impact, offshore Nova Scotia

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The ~51 Ma Montagnais impact crater on the outer Scotian Shelf is well known, but the potential effects from the impact event on the slope and rise seaward of the crater have, until now, remained poorly understood. Through detailed seismic stratigraphic correlation and ties to available wells, we define a three-fold seismic stratigraphic subdivision for Upper Cretaceous to Eocene strata on the shelf and slope, calibrated to the most recent biostratigraphic results. Using this framework, we identify a number of depositional and erosional products that are temporally consistent with a late Ypresian impact event (within the limits of seismic and biostratigraphic resolution). We link a series of prominent failure scarps on the outer shelf and upper slope to a single widespread mass transport deposit (MTD) on the lower continental slope, rise and abyssal plain. Failed material amassed in a large debris field referred to here as the 'Montagnais MTD'. It covers an area of ~93 000 km^2 and travelled up to 580 km from the impact site where its distal termination onlaps the New England Seamounts, making it one of the largest known debris avalanches on Earth. We interpret these deposits, and the associated pattern of erosion landward of them, as products of widespread margin collapse caused by a combination of ground shaking and ensuing tsunamis triggered by the Montagnais impact event. This study provides insight into the potential effects of outer-shelf marine impact events immediately down slope from impact sites, and their diminished effects with increasing distance along the margin.