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Synchronous flows within the Seine Abyssal Plain, offshore NW Africa: A case for earthquake triggered turbidity currents

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Turbidites found in deep-water basins are derived from sediment accumulated on adjacent continental margins. In seismically active areas earthquakes can trigger submarine flows, which are potentially recorded within the basin stratigraphy. Thus a basin can potentially be used as a record of palaeoseismicity. Here we present a suite of shallow sediment cores, which penetrate turbidite stratigraphy down to ∼225 ka across the Seine Abyssal Plain, offshore NW Africa. A robust chronostratigraphic framework is extended across the basin using coccolith biostratigraphy, stable oxygen isotope analysis, and carbon dating. From this individual turbidite beds are mapped out across the basin. From these correlations flow pathways into the Seine Abyssal Plain are identified, including the Agadir and El Jadida Canyons; two separate canyon systems that feed the basin from the West and East respectively. Three of the turbidite beds (ages ∼15, ∼60, and ∼110 ka) have multiple fining trends, which originate from the mouths of the Agadir and El Jadida Canyons. The most likely explanation for these trends is that multiple flows passed through the canyons synchronously and entered the Seine Abyssal Plain forming individual beds composed of multiple flow events. The synchronous flows most likely originated from multiple simultaneous slope failures in the heads of each canyon. In turn, the most likely trigger for these simultaneous slope failures is an earthquake. Hence, we interpret these three turbidite beds as earthquake-triggered events. However, in historic times onshore Agadir has been subject to moderate seismic activity, yet no significant turbidites are recorded in the Seine Abyssal Plain. This study highlights the difficulties of using turbidites as a record of palaeoseismicity beyond historical records.