Stratigraphic singularity: An earthquake located off Jersey triggered the mudflow preserving the only loess outcrop actually known under the seas

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Dublin, Ireland
(25 – 31 July 2019)

SEQS Session "The Quaternary of Europe: stratigraphical perspectives and tools for correlation"

Stratigraphic singularity: An earthquake located off Jersey triggered the mudflow preserving the only loess outcrop actually known under the seas

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General map of the studied area (yellow square)

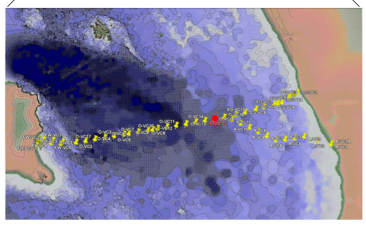


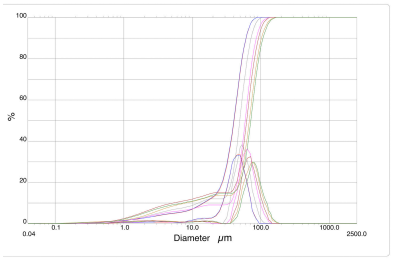
Fig. 1. Distribution of the different core samples collected between Jersey and the Cotentin (after Chambers and Nichols, 2014).

Abstract

A five meters long core sample, retrieved in 2007 from the Havre de Lessay (France) (Latitude: 49°20993, Longitude: -1°788815) and located between Jersey and the Cotentin Peninsula (France) has been studied using different techniques (image processing, granulometry, petrography, malacology, palynology and tentative dating).

Between the lower part and the top, the core is a yellowish loess, a black mud and a grey shelly formation. The basal formation, which displays a typical loess granulometry, is the only loess found anywhere in situ on the seabed worldwide. Elsewhere, this fragile sediment has been always washed out by the successive Quaternary transgressions.

The overlying mud formation, which displays all the characteristics of a mudflow, sealed up the loess deposit. Because this core has been sampled on the rim of a submarine valley located in front of a major onshore geological disruption (the Saint-Germain-sur-Ay transcurrent shearing), clearly associated with an active seismic zone, it is likely that the protection of the loess deposit from erosion was initiated by an earthquake that triggered the overlying submarine mudflow.



Position of the curve in the section

Sample N°	Depths in m		
7136 - 1180L	V 2.65_2.701	7139 - 1180L	V 3.53_3.58
7137 - 1180L	V 2.65_2.702	7140 - 1180L	V 4.08_4.13
7138 - 1180L	V 3.13_3.18	7141 - 1180L	V 4.53_4.58
		7142 - 1180L	V 4.92_4.97

Fig. 4. Superimposition of the different granulometric curves measured in the loess section of core O-VC15.

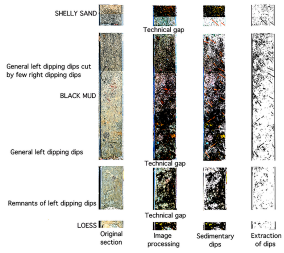


Fig. 5. Successive stages of the image processing evidencing the different dips characterising core O-VC15.

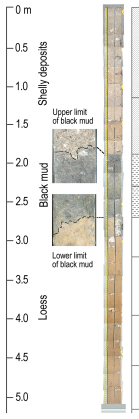


Fig. 6. Vertical distribution of the main groups of gravels found in core O-VC15.

Yellow circles: sampling for granulometry.
1: decreasing number of fragments of Eocene shelly sandstones in loess towards the top;
2: no fragments of Eocene shelly sandstone in the black mud save in the lowermost part;
3: absence of these fragments in the Quaternary shelly sand;
4: very rare metamorphic (greenschist facies) rocks and no granitic fragments;
5: many Palaeozoic sandstones and green slates with rare fragments of rocks of the greenschist facies; 6: only basement rocks, mainly slates;
7: no "faluns"; 8: very rare pieces of "faluns";
9: few pieces of "faluns";
10: presence of well-rounded quartz mainly in the black mud;
11: no remnants of cement on gravels;
12: remnants of cement of Pleistocene conglomerate;
13: light-grey fragments of beach-rocks.

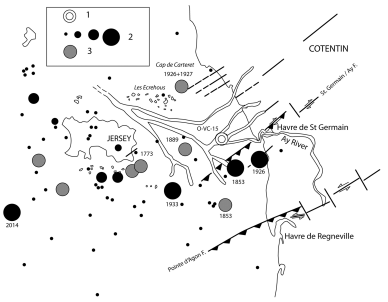


Fig. 7. Distribution of the earthquake epicentres between Jersey and the Cotentin.

1: Core O-VC15;
2: Epicentres after the British Geological Survey database, the diameters of the black dots are proportional to the intensity of the earthquakes; the largest diameters correspond with magnitudes 5.1 or 5.2;
3: Location of the Historical Epicentres after Graindor 1973 (the true intensities are often unknown or doubtful).
The St Germain S/Ay and Pointe d'Agon thrusts are shown.

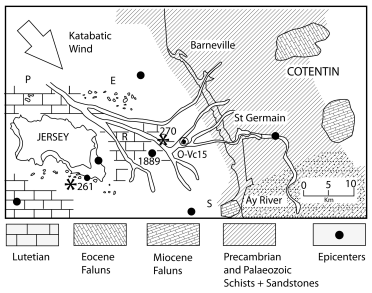


Fig. 2. Simplified map of the main types of rocks at the origin of the gravels found in core O-VC15. Stars: Pleistocene conglomerate; the epicentres corresponding to historical seismicity are taken from the Cossmania database (Graindor, 1973). The direction of the katabatic winds blowing during the Upper Pleistocene is taken from Lefort et al. (submitted). S: Sénéquet shoal. Dotted area: metamorphic zone.

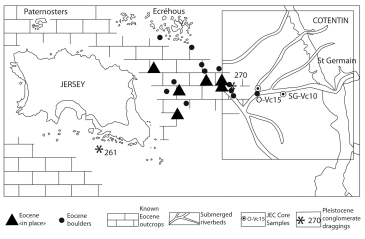


Fig. 3. Location of the samples of Eocene "in place" dredged by Dangeard (1923) and of the localities very rich in Eocene fragments (Hommeril, 1967). The outcrops of Pleistocene conglomerate and the submerged rivers are also shown.

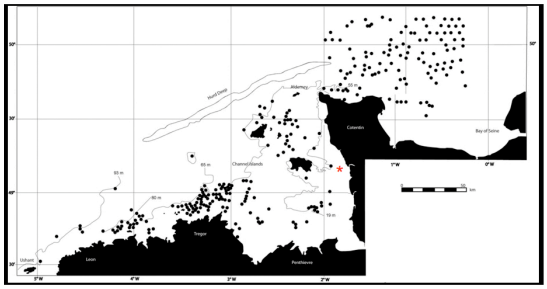


Fig. 10. Distribution of the Pleistocene conglomerate showing the original extension of loess (black dots) and location of the O-VC15 core (red star) in the Western and Central English Channel (after Lefort et al., 2013).

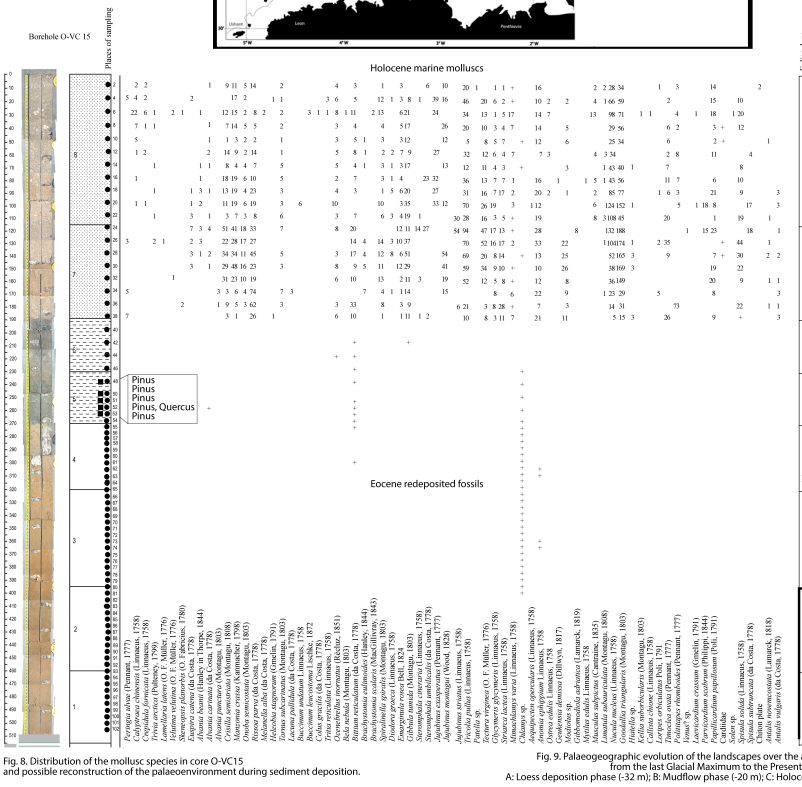


Fig. 8. Distribution of the mollusc species in core O-VC15 and possible reconstruction of the palaeoenvironment during sediment deposition.

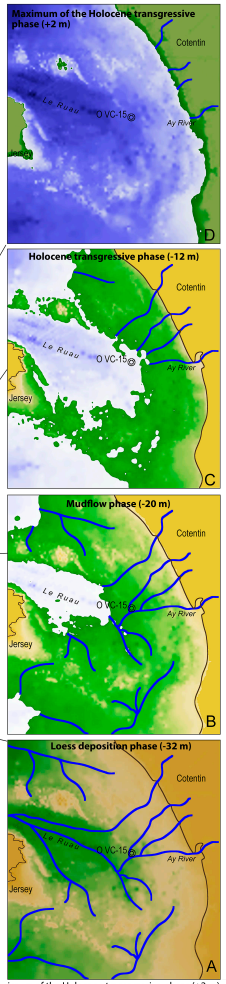


Fig. 9. Palaeogeographic evolution of the landscapes over the area between Jersey and the Cotentin from the last Glacial Maximum to the Present. The approximative sea-level is given.
A: Loess deposition phase (-32 m); B: Mudflow phase (-20 m); C: Holocene transgressive phase (-12 m); D: Maximum of the Holocene transgressive phase (+2 m).