A second rapid sea-level fluctuation during Termination II at Barbados

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Rapid, centennial or shorter timescale, climate variations are often superimposed over thousands of year duration orbital insolation driven climate cycles. Fast paced Heinrich events of the last glacial period are associated with ice-berg discharges and sea-level oscillations that periodically have triggered changes in the North Atlantic Ocean's thermohaline circulation. The resultant severe climate shifts have been recorded in numerous climate proxies. Such climate variability is not confined to glacial periods but extend through degalciations and possibly into interglacial periods [1]. A definite pattern of climate change is discernible for the last six glacial terminations (T1, TII etc.) each of which appears to have gone through two major and distinct climate events. For T1 these are the Younger Dryas cold period and Henrich event H-1 during the so-called Mystery Interval [2]. Similar features are present at T3 and T4. At T2, there is a very large >60 m sea-level oscillation called the Aladdin's Cave (AC) transition first documented at Huon Peninsula that peaks around 135.3 ka, approximately 10 m below last interglacial sea levels [3,4,5,6]. A number of marine proxy climate records of the time as well as descriptions of European lacustrine deposits of the Saalian period indicate the presence of at least two climate oscillations which would be consistent with similar climate events during TI and TIII [2,6,7]. Along the Gordon Cummins Highway, adjacent to the West Indies University at Barbados, the road cut follows the rising sea-level during TII and there are deposits of fossil coral reefs that grew at the time in response to the rise in sea-level. Here, we have discovered a second peak in sea level at 133.5 ka, distinct from the timing of the original AC transition. The sea-level high-stand is close to the peak of the last interglacial relative sea levels at this location. However, its magnitude cannot be precisely quantified from the available data but may be as much as 90 m.

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High frequency network sensors for integrating biogeochemical processes in the Seine River and quantifying the impact of Paris Megalopolis

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The CARBOSEINE program, inititated in 2011, focuses on the urban part of the Seine river (Paris, France). It develops an integrated approach based on *in situ* sensors network in order to determine the main parameters controlling the biogeochemical carbon dynamics in the river. To do so, three on-line high frequency (every 15 min) multi-probe stations are devoted to the monitoring of the main hydrogeochemical parameters (weather, CTD, pH, phosphate, O_2, turb., chla) for the River downstream Paris (54 km long).

Carbon dynamics based on diel oxygen concentration variations allow the quantification of river metabolism processes over time. During algae blooms, river ecosystem shifts from heterotrophic to autotrophic on daily periods according to Net Ecosystem Production calculations. Combining Gross Primary Production and chlorophyll biomass leads to quantify the productivity of the autotrophic component, which can heavily differ from one bloom to another. Phosphate *in situ* measurements (4h freq.) demonstrates nutrient depletion without reaching the limitation level. They document the diffusive sources coming from watershed alteration, that allow algae growth upstream Paris. Moreover, these P measurements highlight the human impact variability. Comparison between probes located upstream and downstream the largest European Waste Water Treatment Plant allows to calculate the mass budget resulting from Paris megalopolis activity.

As a generic result, this high frequency observation approach constitutes a powerful tool for understanding and managing aquatic biogeochemistry in anthropic ecosystem. A challenge consists in developping an accurate data treatment strategy to segregate natural variations from human impact, with respect to different observation time scales. Finally, the generated dataset, allows to develop new modelling techniques to better define the processes representation in river numerical models.

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