



The storage of carbon in Holocene deposits in the Netherlands

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A large part of the shallow subsurface in the Netherlands consists of Holocene fluvial and coastal deposits, which are rich in organic matter. On longer time scales, such as the Holocene, these deposits form a more or less permanent carbon sink. It is however so far not well known what the magnitude of this terrestrial carbon sink is, due to the high variability of the amount of carbon in sediments and soils. Quantification of this sink is important to better understand the magnitude of the lateral and vertical fluxes within the terrestrial part of the global carbon cycle, and to determine the storage capacity of fluvial and coastal deposits. Within the Dutch Holocene subsurface, three forms of organic carbon storage are distinguished: (i) peat deposits, (ii) particulate organic matter intercalated in fluvial deposits, and (iii) organic carbon absorbed to clay minerals. The Netherlands are a very suitable location to quantify carbon storage, as thick Holocene deposits are present and extensive earlier works provide a framework of sediment budgets, 3D subsurface models, and palaeo-geographic studies. This study exploits these results to calculate total carbon storage in the coastal and deltaic deposits of the Netherlands and the rates in which this accumulated. In total, five different methods were used to quantify the volume and lithology of the subsurface. The results are: (i) a comparison of the different methods to quantify the volumes of the deposits in the subsurface, and (ii) a quantification of the total amount of carbon stored as each of the three forms. Per unit area, the amount of carbon stored in the coastal deposits is much larger than the amount stored in fluvial deposits further upstream in the Rhine and Meuse catchments, mainly because of ample accommodation space due to sea level rise. This causes coastal deposits to be thicker and peat to grow. Even though carbon accumulation rates in these environments are generally low, over large areas and long time spans they can yield a sink that is globally large and permanent. Once the carbon storage component is known and recognised, this can be taken into account in future spatial planning to minimise effects such as CO₂ respiration and subsidence in coastal areas.