SUPPLEMENTARY SECTION

As indicated in its caption, Figure S1 shows the three domains considered in this study. These domains were created in order to specify values of parameters ($\phi_0$, $c_0$, $\lambda_s$) required to calculate the volume of pore water and the temperature of sediments on a global scale. These parameter symbols refer to the porosity of sediments at the sediment-water interface porosity ($\phi_0$), the sediment compaction length scale ($c_0$) and the thermal conductivity of the solid phases in sediments ($\lambda_s$). See Table 1 for their values and the main text for the equations that they are used in.

Figure S2 summarizes the methods section in the main text in a single image in order to communicate the series of actions that were taken to carry out the calculations that form the results of our manuscript.

The panels shown in Figure S3 essentially combine the two key results in this manuscript: the global distribution of temperature in marine sediments and the volume of pore water in marine sediments. The combined result depicts the volume of pore water in the same temperature intervals shown in Figure 1 and Table 2. Unlike the sediment thickness shown in Figure 1 and corresponding volumes listed in Table 2, the volumes of pore water are not greatest at the higher temperatures. This is because although there is a greater thickness of sediments at the higher temperatures, the porosity and thus the volume of pore fluids decreases exponentially with depth according to the porosity model that we have adopted (Eq. 1).

SUPPLEMENTARY FIGURE CAPTIONS

**Figure S1.** Illustration of the shelf, margin and abyss domains considered in this study. The location of the continental margin boundaries was adopted from Vion and Menot (2009): shelf
environments (dark gray) roughly correspond to water depths < 200 m, with the exception of the Antarctic region where shelf area corresponds to water depths < 500m; areas deeper than ~3500 m are taken to be abyssal plain (white). The remaining light gray regions correspond to the continental margin.

**Figure S2.** Overview of the workflow used to describe the model, characterize the domains and carry out the calculations required to generate the maps shown in Figures 1 & S3 and the data displayed in Table 2.

**Figure S3.** Volume of pore water in global marine sediments in discrete temperature intervals. In each panel, the volume of marine sediment pore water within the indicated temperature range is given for a particular grid cell. Note that the scale, and therefore the color palette, for each panel is different, especially that for the coldest (< 0 °C) pore fluids and those ranging from 0 - 60 °C.
Global seafloor partitioned in $0.25^\circ \times 0.25^\circ$ grid to apply global datasets ($T_{SWI}$, $q$, $z$)

Three domains (shelf, margin, abyss) considered to specify some parameter values ($\phi_0$, $c_0$, $\lambda_s$)

Shelf: < 200 m (< 500 m near Antarctica)  Margin: 200 – 3500 m (500 – 3500 m near Antarctica)  Abyss: > 3500 m

Each domain has characteristic sediment-water interface porosity ($\phi_i$), compaction length scale ($c_0$) and solid-phase thermal conductivity ($\lambda_s$) given in Table 1.

Porosity as function of depth ($\phi_i(z)$) - Eq. (1), $\phi_0$, $c_0$ and global sediment thickness databases, $z$.

Bulk thermal conductivity as function of depth ($\lambda_{bulk}(z)$) - Eq. (3), $\phi_0$, solid phase thermal conductivity ($\lambda_s$) for each domain, thermal conductivity of fluid ($\lambda_f$)

Temperature as function of depth ($T(z)$) - Eq. (2), $\lambda_{SWI}$, temperature at the sediment-water interface ($T_{SWI}$), $z$, and heat flow ($q$)
Pore fluid volume [km$^3$] for temperature range 0-20°C
Pore fluid volume [km^3] for temperature range 100-120°C
Pore fluid volume [km$^3$] for temperature range above 120°C