Long-Term Global Ground Heat Flux and Continental Heat Storage from Geothermal Data

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Energy exchanges among climate subsystems are of critical importance for determining the climate sensitivity of the Earth's system to greenhouse gases, to quantify the magnitude and evolution of the Earth's energy imbalance, and to project the evolution of future climate. Thus, ascertaining the magnitude and change of the Earth's energy partition within climate subsystems has become urgent in recent years. Here, we provide new global estimates of changes in ground surface temperature, ground surface heat flux and continental heat storage derived from geothermal data using an expanded database and new techniques. Results reveal markedly higher changes in ground heat flux and heat storage within the continental subsurface than previously reported, with land temperature changes of 1K and continental heat gains of around 12 ZJ during the last part of the 20th century relative to preindustrial times. Half of the heat gain by the continental subsurface since 1960 has occurred in the last twenty years.