Editorial

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Differences in Energy Production: Carbon vs. U-235 - Some Viewpoints

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One gram of sugar ($C_6H_{12}O_6$) – sugar as an example of carbon compounds - converted to CO_2 (and H_2O) releases about 4 kcal (4,000 calories) of energy [1]. Since 1750, atmospheric CO_2 has increased by about 40% [2]. Because the average global carbon turnover time in the soil–vegetation–climate system is about 23 years [3], much of this additional CO_2 has repeatedly cycled back into carbon compounds, like $C_6H_{12}O_6$, through endothermic (energy-consuming) reactions, photosynthesis, and then back to CO_2 through exothermic (energy-releasing) reactions [1]. Cereals are the most water-efficient source of calories for human consumption: producing 1 kilocalorie (0.25 g) requires about 0.51 liters of water [4], or about 125 g of water per kilocalorie of sugar. The chemical structure of sugar requires 6 × H_2O per $C_6H_{12}O_6$, equivalent to 108/180 × 0.25 = 0.15 g of water per kilocalorie, or about 1‰ of the total water used. The rest of the water may be lost through processes such as leaching, but half, 60 g, is assumed to evaporate, which needs 0.54 kcal/g at 100 ˚C [5], about the same at 25˚C [6]. Evaporate 60 g of H_2O therefore consumes about 32 kcal. The resulting cooling is local: when the transported water vapor later condenses in cooler areas, the same energy is released again, in accordance with the law of conservation of energy. In this way, evaporation transfers heat away from cities and can reduce the energy use for cooling machines.

A 1975 National Academy of Science report stated that global temperatures had declined steadily since the 1940s [7]. The same decrease is also evident at Utö [8], where temperature variation is largely free from urban bias [9]. Solar-physics cyclicity is discussed in more detail in [10]. Differences among ERA5, NCPE (National Centers for Environmental Prediction, USA), and CRU (Climatic Research Unit, the IPCC data source) for 1940–1970 may be explained by NCPE's reliance on original observations, as in [8], rather than projections based on 1970–2020 data [11]. Without excess CO_2, the cooling during 1940–1970 might have been slightly stronger. The oscillation of temperature in 1940-2025 is not exceptional [10]. Unlike carbon, the heating effect of U-235 accumulates continuously.

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