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Earth's Energy Imbalance and Implications

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Improving observations of ocean heat content show that Earth is absorbing more energy from the Sun than it is radiating to space as heat, even during the recent solar minimum. We update our analysis of Earth's observed energy imbalance through 2011 and compare this with climate simulations. Observed global surface temperature change and ocean heat gain together constrain the net climate forcing, implying existence of a large negative forcing by human-made aerosols. Continued failure to quantify the specific origins of this large forcing is untenable, as knowledge of changing aerosol effects is needed to understand future climate change. We discuss implications of the trend of observed sea level rise in recent years, and its consistency with reported ice melt rates and ocean thermal expansion.