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According to the IPCC, "The radiation budget of the Earth is a central element of the climate system.…Anthropogenic influence on climate occurs primarily through perturbations of the components of the Earth radiation budget." Unfortunately, there are no statistical analyses on the linkage between CO_2 concentrations and energy budget listed in the various IPCC reports. This paper represents an attempt to address this gap in the research using hourly data from the Barrow Atmospheric Observatory in Alaska.

The analysis begins by noting that the net incoming irradiance quantity at the Barrow Atmospheric Observatory was largely positive from 1996 to 2016. This indicates that less energy over this period left the earth's surface at Barrow than arrived at the earth's surface. A time-series model to explain the net irradiance levels was formulated using a lagged CO2 value and simulated meteorological variables as predetermined/exogenous inputs. Linearity is not assumed. The model also includes an ARCH/ARMA specification to capture the data's heteroskedastic and autoregressive nature. The model was estimated using hourly data for the period May 1993 through 31 Dec 2015. There are 146,170 observations in the sample. The results are consistent with the hypothesis that increases in CO_2 concentration levels have adverse consequences for net energy levels leaving the earth's surface. The model's explanatory power is equivalent to an R-Squared of 0.9448. This explanatory power level is encouraging, but it is noted that the true adequacy of a model can only be determined by considering how well it performs on data that were not used in its estimation. The model was evaluated using out-of-sample hourly data over the period 1 Jan 2016 through 31 Dec 2017. Consistent with causality, the out-of-sample predictions are more accurate if the estimated effects of CO_2 are included in the prediction equation.