

## **Earth's Radiation Imbalance Observed from Space**

**Norman G. Loeb** [[Norman.G.Loeb@nasa.gov](mailto:Norman.G.Loeb@nasa.gov)], NASA Langley Research Center, Hampton, VA, USA

In an equilibrium climate, there is a balance between how much of the sun's incident radiation is absorbed by Earth and how much thermal infrared radiation the Earth emits to space. Perturbations to Earth's top-of-atmosphere (TOA) radiation budget resulting from changes in atmospheric composition (e.g., greenhouse gases, aerosols), changes in solar irradiance, and changes in surface albedo due to land use cause an imbalance in Earth's TOA radiation budget. Currently, the Earth's energy imbalance (EEI) is approximately  $0.6 \text{ Wm}^{-2}$  due mainly to human activities, which is driving global warming. This presentation will provide a brief overview of EEI and its critical role in climate science. The presentation will also discuss how satellite instruments such as SORCE and CERES (Clouds and the Earth's Radiant Energy System) are being used along with in-situ measurements of ocean heat content anomaly tendency from the Argo network to quantify and track changes in EEI.