



Earth's Radiation Imbalance from a Constellation of 66 Iridium Satellites

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The Earth Radiation Imbalance (ERI) at the top of the atmosphere is the primary driving force for climate change. If ERI is not zero, then Earth's temperature, both oceanic and atmospheric, will change gradually over time, tending toward a new steady state. The best estimates of current ERI from climate models range from 0.4 to 0.9 W/m² (the imbalance being caused mainly by increasing CO₂), but current satellite systems do not have the accuracy to measure ERI to even one significant digit.

In this paper, we will describe a proposed constellation of 66 Earth radiation budget instruments, to be hosted on Iridium satellites. This system represents a quantum leap over current systems in several ways, in particular in providing ERI to at least one significant digit, thus enabling a crucial test of climate models. Because of its 24/7 coverage, the system will also provide ERI at three-hourly time scales without requiring extrapolations from narrowband geostationary instruments. This would allow studies of ERI's response to fast-evolving phenomena like dust storms and hurricanes. This offers a new, synoptic view of Earth radiation budget that will transform it from a monthly average into a dynamical variable alongside standard meteorological variables like temperature and pressure.