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## Observation-based reconciliation of the Earth's Energy Imbalance budget constraint

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The Earth's Energy Imbalance (EEI) represents the balance of heat fluxes between the Earth and outer space in response to radiative forcings and associated climate feedbacks, and as such is a key metric to understand and define global climate change. Recent publications have shown that the EEI has doubled in the last two decades, which would have major impacts on the different components of the Earth's system. However, these results also show inconsistencies in the quantification of this increase depending on the observing system considered. In this study, we investigate two independent ways to estimate EEI from ocean observations and from energy budget at the top of the atmosphere inferred from satellite. We show that these two observing systems lead to consistent estimates of EEI variability and amplitude over the period 2005-2019. Global Ocean Heat Content (GOHC) is derived from a suite of ocean in situ temperature products, and is also compared to satellite estimate and to ocean reanalysis estimate. We provide recommendations on how to achieve a consistent and optimized observation-based comparison between estimates for the EEI budget constraint approach from independent global climate observing system components and at different time-scale ranging from interannual to decadal.