Geophysical Research Abstracts
Vol. 17, EGU2015-15259-1, 2015
EGU General Assembly 2015

The Sun-earth Imbalance radiometer for a direct measurement of the net heating of the earth

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It is accepted that the climate on earth is changing due to a radiative energy imbalance at the top of the atmosphere, up to now this radiation imbalance has not been measured directly. The measurement is challenging both in terms of space-time sampling of the radiative energy that is leaving the earth and in terms of accuracy. The incoming solar radiation and the outgoing terrestrial radiation are of nearly equal magnitude – of the order of 340 W/m^2 – resulting in a much smaller difference or imbalance of the order of 1 W/m^2. The only way to measure the imbalance with sufficient accuracy is to measure both the incoming solar and the outgoing terrestrial radiation with the same instrument.
Based on our 30 year experience of measuring the Total Solar Irradiance with the Differential Absolute RADiometer (DIARAD) type of instrument and on our 10 year experience of measuring the Earth Radiation Budget with the Geostationary Earth Radiation Budget (GERB) instrument on Meteosat Second Generation, we propose an innovative constellation of Sun-earth IMBAlance (SIMBA) radiometer cubesats with the ultimate goal to measure the Sun-earth radiation imbalance. A first Simba In Orbit Demonstration satellite is scheduled for flight with QB50 in 2015. It is currently being developed as ESA's first cubesat through an ESA GSTP project.
In this paper we will give an overview of the Simba science objectives and of the current satellite and payload development status.