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**Regional and Semi-Global Distribution of Albedo and Absorbed Solar Radiation at the Top of Atmosphere**

This report describes a new "Meteor-M" meteorological satellite program which has been started in Russia. The first meteorological satellite of new generation "Meteor-M" No 1 was put into orbit in September 2009 (Sklyarov et al, 2012). The radiometer IKOR-M – "The Measuring instrument of short-wave reflected radiation" was created in National Research Saratov State University. It was installed on Russian meteorological satellites "Meteor-M" No 1 and No 2. Radiometer IKOR-M designed for satellite monitoring of the outgoing reflected short-wave radiation, which is one of the components of Earth's radiation budget. Such information can be used in different models of long-term weather forecasts, in researches of climate change trends and in calculation of absorbed solar radiation values and albedo of the Earth-atmosphere system.

Satellite "Meteor-M" No 1 and No 2 are heliosynchronous that allows observing from North to South Poles. The basic products of data processing are given in the form of global maps of distribution outgoing short-wave radiation (OSR), albedo and absorbed solar radiation (ASR). Such maps were made for each month during observation period. The IKOR-M product archive is available online at all times. A searchable catalogue of data products is continually updated and users may search and download data products via the Earth radiation balance components research laboratory website (http://www.sgu.ru/structure/geographic/metclim/balans) as soon as they become available.

Two series of measurements from two different IKOR-M are available. The first radiometer had worked from October 2009 to August 2014 and second - from August 2014 to the present. Therefore, there is a period when both radiometers work at the same time. Top-of-atmosphere fluxes deduced from the "Meteor-M" No 1 measurement in August, 2014 show very good agreement with the fluxes determined from "Meteor-M" No 2. The scale relationship of the IKOR-M radiometers on "Meteor - M" No 1 and No 2 satellites found by comparing of the global distribution maps for monthly averaged albedo values.

The effect of aging is investigated for first IKOR-M. This radiometer worked on board of the "Meteor-M" No 1 satellite for five years. Parameters of linear trends are estimated for the Earth's surface area albedo with approximately constant values of this characteristic and the estimate of sensitivity change over time for the radiometer is obtained.

The seasonal and interannual variations of OSR, albedo and ASR were discussed. The variations between SW radiation budget components seem to be within observational uncertainty and natural variability governed by cloudiness, water vapor and aerosol variations.

It should be noted that cloudiness makes a significant contribution to the planetary albedo of the Earth, largely determines its spatial-temporal distribution. In particular, it is important to know what contribution cloudiness makes to albedo and what the relationship between them. Therefore, comparisons between albedo and cloudiness were conducted separately for land and oceans. The comparison of the distributions of cloudiness and albedo had identified the existence of significant correlation to the World Ocean, lower values for the World Ocean and land together and small correlation for land.

It was assessed spatial and temporal variations of albedo and the absorbed solar radiation over different regions. Latitudinal distributions of albedo and ASR were estimated in more detail. Meridional cross sections over oceans and land were used separately for this estimation.

It was shown that the albedo and ASR data received from the radiometer IKOR-M can be used to detect El Nino in the Pacific Ocean and monitoring of the East Asian Summer Monsoon.

The report will be presented more detailed results.

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## References

1.Sklyarov Yu.A., Vorob'ev V.A., Kotuma A.I., Chervyakov M.Yu., Feigin V.M. The measurement of the radiation balance component from “Meteor-M” satellite. The IKOR-M radiometer, *Sovremennye problemy distantsionnogo zondirovaniya Zemli iz kosmosa*, 2012, Vol. 9, No 2, pp. 173-180.

2. Sklyarov Yu.A., Vorob'ev V.A., Kotuma A.I., Chervyakov M.Yu., Feigin V.M. The algorithms for the processing of outgoing shortwave radiation measurements from "Meteor- M" No 1 satellite, *Sovremennye problemy distantsionnogo zondirovaniya Zemli iz kosmosa*, 2012, Vol. 9, No 3, pp. 83-90.