

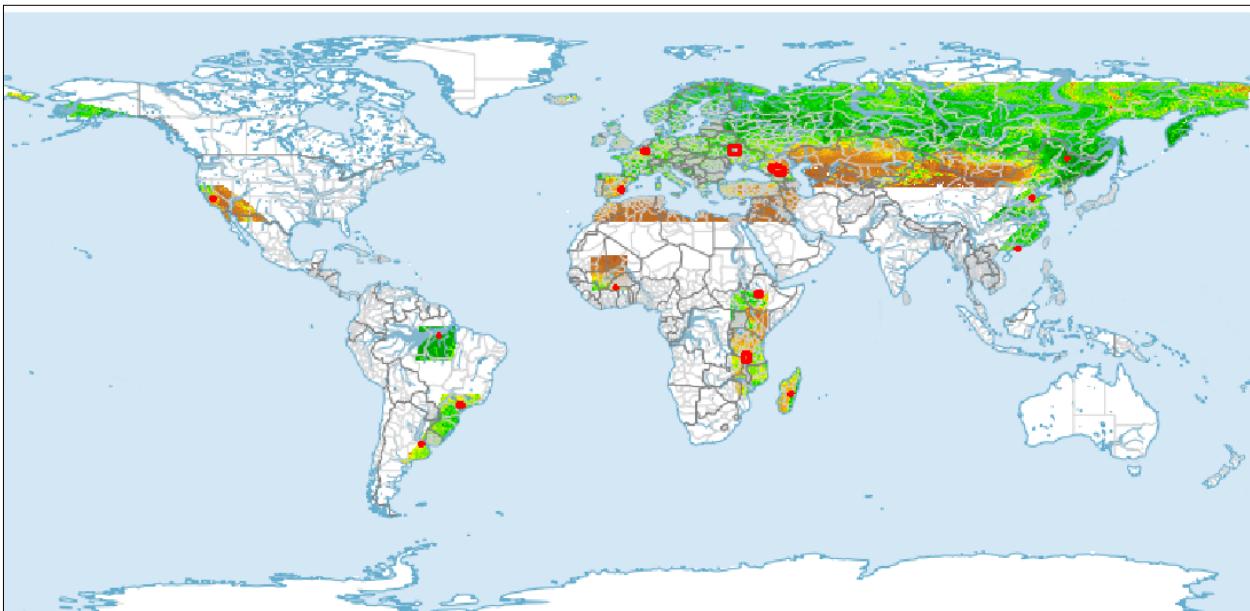
## Main research and development work completed in 2014 and ready for implementation

### 1. VEGA-GEOGLAM Information System for Global Agriculture Monitoring using Earth Observation Satellites

Space Research Institute of Russian Academy of Sciences

Dr.Sc. Loupian E. A., Dr.Sc. Bartalev S. A.

Information system VEGA-GEOGLAM (<http://vega.geoglam.ru/>) was developed by IKI to support initiated by the G20 countries GEOGLAM programme on creation of global system for satellite monitoring of agriculture. The VEGA-GEOGLAM system allows near-real-time analysis of the Earth observation satellite data regularly acquiring over globally distributed test sites in different countries of Eurasia, Africa, North and South America to monitor status of different agricultural crops and harvest forecast. The system permits to develop agricultural satellite monitoring capacity in different regions of the World.



The test-sites (marked in red) network for agricultural monitoring using Earth observation satellite data based on the VEGA-GEOGLAM information system

The VEGA-GEOGLAM development was supported by the Russian Academy of Sciences and the SIGMA project funded by the European Commission.

### 2. MicroBOKZ - the New Generation Star Tracker

The new generation miniature star tracker MicroBOKZ was developed at IKI RAN in 2014. This device was installed on the small spacecraft "Aurora" and launched into space on June 06, 2014. MicroBOKZ star tracker exceeds both the Russian and foreign analogues in dimensions, weight and accuracy characteristics. The tracker has a mass of 600 g, power consumption of 1 W and provides for measuring the optical axis orientation parameters with a random error of less than 1 arcsec. The star trackers MicroBOKZ and BOKZ-M60/1000 are shown in fig. 1. These devices have a similar accuracy but differ in weight and power consumption by an order of magnitude.



Fig. 1. Photos of star trackers (right – BOKZ-M60/1000, left – MicroBOKZ on CMOS)

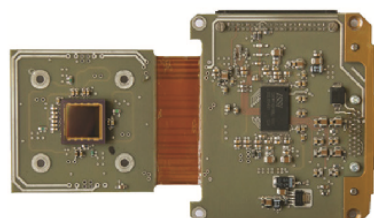


Fig. 2. Flex-rigid board of the MicroBOKZ star tracker

#### Developers:

Avanesov G.A., Bessonov R.V., Dyatlov S.A., Zaretskaya E.V., Karavayeva E.S., Krasikov V.A., Mysnik E.A., Prokhorova S.A., Filippova O.V., Forsch A.A.

#### Scientific and technical materials:

1. G.A. Avanesov, R.V. Bessonov, A.A. Forsch, R.G. Zalyalova, A.V. Filatov «Operating experience and prospects of the BOKZ star trackers development». The 4<sup>th</sup> All-Russian Scientific and Technical Conference "Contemporary Problems of Spacecraft Orientation and Navigation", Tarusa, 8–11 September 2014 Abstracts. IKI, 2014, P. 3.
2. G.A. Avanesov, R.V. Bessonov, S.A. Dyatlov, E.A. Mysnik «Ground testing of the MicroBOKZ star trackers». The 4<sup>th</sup> All-Russian Scientific and Technical Conference "Contemporary Problems of Spacecraft Orientation and Navigation", Tarusa, 8–11 September 2014 Abstracts. IKI, 2014, P. 8-9.
3. G.A. Avanesov, R.V. Bessonov, A.A. Forsch, M.I. Kudelin «Analysis of current state and prospects of the BOKZ family star trackers development». «Priborostroenie», submitted for publication.
4. Scientific&Technical report "Study on the orientation device in the field of stars as regards testing of the radiation detectors, microprocessor devices and built-in angular velocity sensors; device operation simulation; modeling and mocking-up bench equipment for testing instruments", 2013