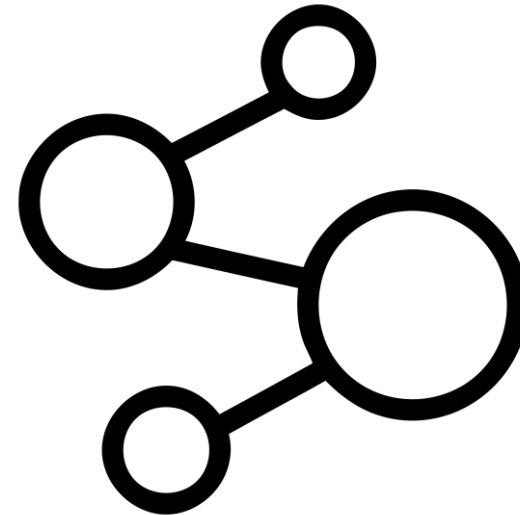


DEPARTMENT OF FOREIGN LANGUAGES  
&  
COUNCIL OF YOUNG INVESTIGATORS

**XXIX INTERDISCIPLINARY CONFERENCE  
ON RECENT ADVANCES IN SCIENCE  
AND TECHNOLOGY**



**RAST-2017**

Department of Foreign Languages TSC SB RAS  
May 19, 2017  
10.00 AM, Room 1

Opening word (Iuliia Zelichenko, Head of DFL)

Welcome address (Mikhail Burkov, Ph.D. in Engineering, junior researcher, Laboratory of Polymer Composite Materials ISPMS SB RAS)

## SESSION 1

10.00 – 11.45 AM

Chairman: **Vitalii Alekseenko** (ISPMS)

### 1. *(invited paper)* **Alexander Konoshonkin**

*V.E. Zuev Institute of Atmospheric Optics*

#### **The physical-optics method using different diffraction equations: comparison of numerical results**

The talk provides a detailed comparison of three options of taking the diffraction effects into account. It has been found out that for the case of diffraction on a slope screen the vectorial diffraction Smythe formula leads to significant violation of the reciprocity principle. At the same time the vectorial diffraction Smythe formula with our modification and the Kirchhoff approximation give practically equal results. These formulae give different results only for scattering angles close to  $90^\circ$ .

Keywords: *diffraction, light scattering, physical optics approximation, ice crystals.*

### 2. **Dmitrii Timofeev**

*V.E. Zuev Institute of Atmospheric Optics*

#### **Modification of the beam-splitting algorithm for light scattering by concave ice crystals of cirrus clouds.**

This work presents the modification of the beam-splitting algorithm. The main idea of the modification is to take into account the influence of cavities in atmospheric ice crystals. The program based on this algorithm was developed; and the calculation results were com-

pared with the well-known ray-tracing algorithm. The comparison shows good agreement.

Keywords: *modification, beam, cirrus clouds, scattering.*

### 3. **Iuliia Li**

*Institute of Strength Physics and Materials Science*

#### **Localization of plastic deformation in metals and alloys**

The evolution of the localization of plastic deformation in metals and alloys was studied. In the present work the digital image correlation method (DIC) and the speckle photography technique were used. The definition of work hardening stages of the plastic flow curves was considered and the parameters of local deformation distribution were evaluated.

Keywords: *plasticity, localization of plastic deformation, metal, alloy.*

### 4. **Ekaterina Batukhtina**

*Institute of Strength Physics and Materials Science*

#### **Crystal plasticity modeling of aluminum single crystal deformation**

Due to a wide usage of aluminum alloys it is important to predict the behavior of an aluminum part. Deformation behavior modeling is a good way to solve this problem. As aluminum has a polycrystalline structure, the investigation of single crystals is necessary. A crystal plasticity theory gives a more complete description of a single crystal deformation behavior.

Keywords: *crystal plasticity, simulation, aluminum, polycrystalline structure.*

### 5. **Valeriia Uimanova**

*Institute of Monitoring of Climatic and Ecological Systems, Laboratory of Geosphere-Biosphere Interactions*

#### **Complex monitoring of weather, climate and hydrological conditions of the Maima river basin (Gorny Altai)**

This work is aimed at creating a modern information and measurement system for forecasting the hydrological behavior of rivers in

Gorny Altai region, which would help mitigate the consequences of extreme meteorological events.

*Keywords: maima, mountainous altai, water level, sensors, remote autonomous complex, monitoring.*

#### **6. Alexandra Pelipenko**

*Institute of Monitoring of Climatic and Ecological Systems, Laboratory of Self-Organization of Geosystems*

#### **Dangerous and unfavorable factors affecting the yield of potato in Tomsk region**

Dangerous and unfavorable phenomena that affect the yield of potato are considered. There are four groups of factors affecting the yields. Tomsk and Pervomaisky regions were analyzed. Weather data for the past 30 years are considered.

*Keywords: yield, potato, climatic factors, high temperatures, low temperatures, excessive humidification dangerous and unfavorable phenomena.*

#### **7. Anna Riazanova**

*Institute of Monitoring of Climatic and Ecological Systems, Siberian Center for Environmental Research and Training*

#### **Development of a new computational module for regional aridity assessment built for 'Climate'**

A new software module for the assessment of aridity was developed and added to the "Climate" system. The well-known Selyaninov's hydrothermal coefficient (HTC) was used with ECMWF ERA Interim reanalysis data for the period from 1979 to 2010. The input data (precipitation, temperature, HTC) were validated using observation data from weather stations. It was found that the ERA Interim data substantially (by 50%) underestimated the measured precipitation in the study region. The precipitation was corrected by the results. New spatially distributed precipitation and HTC data were obtained.

*Keywords: hydrothermal coefficient, observation data, reanalysis data, comparison and correction, spatial distribution.*

#### **8. Iliia Lisachenko**

*Institute of Monitoring of Climatic and Ecological Systems, Siberian Center for Environmental Research and Training*

#### **Real-time Environmental Monitoring System using Wireless Sensors Network (WSN) based on the Internet of Things (IoT) concept**

In this work we considered the problem of the development of a complex operating environmental monitoring system based on the Internet of Things (IoT) concept. In the course of this study we break the problem down to several major parts. An analysis of available solutions for each of these parts was carried out, based on which the most suitable system configuration was suggested.

*Keywords: internet of things, environmental monitoring, sensors, cloud platform, nowcasting, wide area network (LPWAN), GPRS, raspberry pi, kaa IoT platform.*

END OF SESSION 1

COFFEE BREAK (15 min)

## SESSION 2

12.00 – 13.30 PM

Chairman: **Nikolai Lavrentev** (junior researcher, IAO SB RAS)

### 9. Danila Sedinkin

*Institute of Monitoring of Climatic and Ecological Systems, Environmental Instrumentation Laboratory*

#### **Enhancement of Raman scattering signals from gaseous medium near the surface of a holographic silver diffraction grating**

The present study is dedicated to the main disadvantage of Raman spectroscopy which lies in a very low output level of Raman signal intensity from the gaseous medium. This problem is solved by using the effect of surface-enhanced Raman scattering, which is expressed in the excitation of surface plasmon polaritons (SPP) on the surface of the silver diffraction grating.

Keywords: *raman scattering spectroscopy, surface plasmon-polaritons.*

### 10. Iurii Donskoi

*Institute of Monitoring of Climatic and Ecological Systems*

#### **Software and firmware for Doppler acoustic locator**

Doppler acoustic locator is a complex system consisting of hardware and software. The main functions of the firmware and the software are generation and digital processing of signals, visualization of the received data. By using digital signal processing algorithms that allow you to change the measurement parameters (e.g. signal frequency), you can get a flexible system, that can be used with any analog hardware.

Keywords: *software, firmware, doppler locator, digital signal processing algorithms*

### 11. Denis Molchanov

*Institute of High Current Electronics, High Energy Density Department*

### **Feasibility of using the line transformer for the purposes of rock drilling**

Lab tests prove the possibility to use the line transformer (LT) for the purposes of electro-pulse drilling which is just as effective in terms of specific energy consumption as Marx generator which is traditionally used in this area. Proposed and implemented is the design with an additional capacitor. It's effectiveness is theoretically confirmed.

Keywords: *electropulse drilling, drilling of solid rock, super deep well, geothermal power engineering, high-voltage pulse generator, linear pulse transformer, pulse generator.*

### 12. Eduard Nekrasov

*Institute of High Current Electronics, Microwave Electronics Laboratory*

#### **Dual polarized receiving steering antenna array for measurement of ultrawideband pulse polarization structure**

To measure simultaneously two orthogonal components of the electromagnetic field of nano- and subnano-second duration, an antenna array has been developed. The antenna elements of the array are the crossed dipoles. The dipoles have superimposed phase centers allowing measuring the polarization structure of the field in different directions.

Keywords: *ultrawideband pulses, polarization structure, antenna array.*

### 13. Iuliia Iovik

*Institute of Petroleum Chemistry, The Laboratory of Hydrocarbons and High-Molecular Petroleum Compounds*

#### **Oxidative desulfurization of Novokuibyshevsk oil refinery vacuum gas oil**

Oxidation of Novokuibyshevsk oil refinery vacuum gas oil was carried out with using "hydrogen peroxide-formic acid" mixture. Optimal conditions for oxidation of vacuum gas oil sulfur compounds were established. Material composition dependence of vacuum gas oil oxidative desulfurization products on  $S_o:H_2O_2$  molar ratio and processing time was shown.

Keywords: *vacuum gasoil, oxidative desulfurization, hydrogen peroxide, sulfur compounds.*

#### 14. Tatiana Filippova

*Institute of Petroleum Chemistry*

##### **The effects of demulsifiers in the modeling of oil-water emulsions destruction process**

The influence of the process parameters on the quality of oil and recommended effective technological modes for oilfield treatment are analyzed. It is shown that the parameters that significantly affect the efficiency of oil recovery are temperature and water-oil emulsion flow rate.

Keywords: *water-oil emulsions, coalescence, demulsification, surface tension, dehydration and desalting.*

#### 15. Vladislav Norin

*Institute of Petroleum Chemistry, The Laboratory of Hydrocarbons and High-Molecular Petroleum Compounds*

##### **RCO: resonant conversion of organic compounds**

The new technology which is aimed at processing any organic material with maximum output (up to 90% wt.) of light hydrocarbons was developed. The problems of the oil refining industry, which can be solved by using this technology, are considered. The experiments on the test unit were conducted and conclusions from their results were drawn. Some examples of the potential applications of this technology, which are not related to the oil refining industry, are also given.

Keywords: *conversion of organic compounds, oil refining industry, oil conversion ratio, technology, APG, light distillate fractions.*

END OF SESSION 2  
OPEN FLOOR FOR FINAL COMMENTARY

Closing word (Chairman)