

**Joint COSPAR and WMO Capacity Building Workshop on “Satellite remote sensing, water cycle and climate change”, 20 July – 1 August 2014, Tver State University, Tver, Russia**

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There is a framework agreement between Committee on Space Research (COSPAR) and the World Meteorological Organization (WMO) to organize capacity building events of mutual interests. The present Joint COSPAR and WMO Capacity Building Workshop (CBW) aimed at holding a cooperative training course on satellite remote sensing and climate change in Tver State University (TSU, Tver, Russia) by combining two training events for students and young scientists jointly organized by COSPAR and WMO. Tver city is located at a distance of one hour by fast train from Moscow in the direction of St.-Petersburg.

This event took place from 20 July to 1 August 2014, two weeks before the 40<sup>th</sup> COSPAR Scientific Assembly held in Moscow from 2 to 10 August 2014. The CBW participants were given the opportunity to attend the COSPAR Assembly in Moscow. Note that this conjunction of a CBW and a COSPAR Scientific Assembly has already been experimented successfully in November 2013 with the COSPAR Symposium in Bangkok, preceded by a CBW on atmospheric corrections of remote sensing imagery.

The combined training course was focused on water resources and water cycle on the globe because of two reasons: (1) we observe a serious decline in water resources on the globe due to global warming and climate change; and (2) the changes in water resources and climate are observed by different satellite remote sensing methods. The objective of the present CBW was to provide the participants with basic knowledge on satellite remote sensing, satellites, satellite instruments, data bases and formats, data access, processing software, methods of processing and analysis of satellite data. From the wide spectrum of satellite remote sensing applications we focused on water resources and water cycle on the globe. This included examination of the ocean/sea/lake/river levels, ice and snow cover, vegetation, soil moisture, atmospheric state, and ecosystems in different parts of the world. The CBW showed how satellite remote sensing data may be used for investigation of global and regional climate change and its consequences.

The CBW received a financial support for participation of students and lecturers, and logistical support through generous financial assistance from the Committee on Space Research (COSPAR), World Meteorological Organization (WMO), Tver State University (TSU), EUMETSAT, Russian Foundation for Basic Research (RFBR), P.P. Shirshov Institute of Oceanology (SIO, Moscow) and Immanuel Kant Baltic Federal University (Kaliningrad).

The CBW was directed by Prof. Andrey Kostianoy from P.P. Shirshov Institute of Oceanology, Russian Academy of Sciences, Moscow, Russia. Organizing Committee consisted of (in alphabet order) Prof. Andrey Belotserkovsky (Rector, TSU), Dr. Stephan Bojinski (WMO Space Programme), Dr. Jean-Louis Fellous (Executive Director, COSPAR), Dr. Volker Gärtner (EUMETSAT), Dr. Aaron Janofsky (COSPAR), Prof. Andrey Kostianoy (Director of CBW, P.P. Shirshov Institute of Oceanology), Dr. Alexei Kouraev (OMP-LEGOS), Dr. Sergey Lebedev (Geophysical Center, RAS), Prof. Ernesto Lopez-Baeza (University of Valencia), Dr. Pierre-Philippe Mathieu (ESA, Frascati), Prof. Mariano Mendez (University of Groningen), Prof. Oleg Pokrovsky (Voeikov Main Geophysical Observatory, Roshydromet), Prof. Vitaly Sychev (Russian State Hydrometeorological Institute), Dr. Stefano Vignudelli (Institute of Biophysics,

CNR), Prof. Artyom Yurov (Vice-Rector, Immanuel Kant Baltic Federal University, Kaliningrad).

The tasks carried out by Local Organizing Committee included organization of the CBW in Tver State University, partial financial support of CBW, visa support of participants, transfer of participants from Moscow airports to Tver and back, organization of excursions, etc. During the CBW, LOC was supported by the TSU volunteers. LOC was chaired by Pavel Kravchenko.

Nineteen lecturers from China, France, Germany, Italy, Latvia, Russia, Spain, and Switzerland during two weeks gave 60 lectures and training courses. EUMETSAT instructors together with Russian Virtual Laboratory for Training and Education in Satellite Meteorology (VLab) co-instructors attended the CBW and supported the event with on-site and online presentations and hands-on exercises on EUMETSAT Data Services. Topics of the lectures and training courses included satellite oceanography; satellite altimetry; satellite monitoring systems and applications; multichannel and multiplatform approach for marine environment study and regional climate change; satellite data archives and tools for data analysis; software; European and USA satellite data bases; regional climate change; future satellite missions and international cooperation.

A team of lecturers consisted of (in alphabet order): Zanita Avotniece (Latvian Environmental Geology and Meteorology Agency, Riga, Latvia), Dr. Jerome Benveniste (ESA, Frascati, Italy), Dr. Stephan Bojinski (Satellite Utilization and Products Division, WMO Space Programme, World Meteorological Organization, Geneva, Switzerland), Dr. Jean-Louis Fellous (COSPAR, Paris, France), Dr. Jochen Kerkmann (EUMETSAT, Darmstadt, Germany), Prof. Andrey Kostianoy (P.P. Shirshov Institute of Oceanology, Russian Academy of Sciences, Moscow, Russia), Dr. Alexei Kouraev (OMP-LEGOS, Toulouse, France), Dr. Sergey Lebedev (Geophysical Center, Russian Academy of Sciences, Moscow, Russia), Dr. Ernesto Lopez-Baeza (University of Valencia, Valencia, Spain), Dr. Suleiman Mostamandy (EUMETSAT/Vlab, Russian State Hydrometeorological University, St.-Petersburg, Russia), Vesa Nietosvaara (EUMETSAT/Vlab, Darmstadt, Germany), Dr. Kristina Petraityte (EUMETSAT, Darmstadt, Germany), Dr. Eduard Podgaiskiy (EUMETSAT/Vlab, Russian State Hydrometeorological University, St.-Petersburg, Russia), Prof. Oleg Pokrovsky (Voeikov Main Geophysical Observatory, St.-Petersburg, Russia), Dr. Sergey Stanichny (Marine Hydrophysical Institute, Sevastopol, Russia), Prof. Vitaly Sychev (Russian State Hydrometeorological Institute, St.-Petersburg, Russia), Prof. DanLing Tang (PORSEC President, PACON President, South China Sea Institute of Oceanology, Guangzhou, China), Prof. Yuliya Troitskaya (Institute of Applied Physics, Russian Academy of Sciences, Nizhny Novgorod, Russia), Dr. Stefano Vignudelli (Consiglio Nazionale delle Ricerche – IBF, Pisa, Italy).

Altogether 32 international and Russian young scientists and students attended this workshop. 14 foreign students came from Armenia, Azerbaijan, Bangladesh, China, Egypt, Ethiopia, India, Iran, Nepal, Pakistan, and Uzbekistan. Participants were accepted by the Selection and Organizing Committees mainly on the basis of their qualifications and the likely benefit to their research from the participation. To apply for the workshop, participants completed the Application for Participation Form with a CV and a list of publications; two letters of recommendation from senior scientists familiar with the applicant; and a one-page research statement about how the attendance to this workshop would benefit the future research of the applicant. Selection Committee tried to get participants from as much as possible different countries, and different cities, universities and organizations in Russia.

Lectures and training courses were given in the conference hall of the Rectorate building of TSU, located in the center of Tver city. The building is located several dozens meters from the living rooms of the participants. The conference hall was very comfortable for about 40 persons and equipped by notebooks specially bought by TSU for the CBW. Internet connection via WiFi was enough fast to work with 32 notebooks simultaneously. PC projector quality and the wall screen size were very good for presentations. The program of the CBW was very intense. Lectures started on 9-00 and ended on 18-30. LOC organized breakfasts, coffee-breaks, lunch

and dinners in the dining room of TSU. Even a halal food table was specially organized for participants from the Muslim countries. The first working day of CBW was ended by a special dinner. The last day, during closing ceremony all participants received personal certificates of attendance from hands of Dr. Jean-Louis Fellous, Executive Director of COSPAR. The final banquet was organized on the open air in the Botanic Garden of TSU and was recognized by lecturers and participants as something exceptional.

A week-end between two working weeks of CBW was used for two bus excursions to Torzhok – a small historical village in the Tver Region, and to Seliger Lake and Nilova Pustyn which is an active monastery established in 1594 on Stolbny Island. Excursions were guided in English by an interpreter from TSU. A Tver city walking excursion was also organized for the CBW participants.

The CBW was very successful thanks to the efforts of all organizers, sponsors, lecturers and participants who already send their feedbacks to Andrey Kostianoy with comments and ideas how to improve the CBW in future. All of them were very thankful to the organizers for the possibility to attend these very interesting lectures and trainings in oceanography, meteorology, climatology and hydrology. In several comments participants specially appreciated trainings in different fields of science, including those given by EUMETSAT lecturers, and asked for more time to be given to training practical courses in the future. Some of them could compare the CBW in Tver with other courses they attended before and wrote that this one was the best from the scientific and organizational points of view. COSPAR asked Andrey Kostianoy and TSU to keep active the web site of the workshop (<http://event.tversu.ru/venue>) for several years as an example for future CBWs. All the CBW materials, lectures as well as photo gallery of the event can be found and downloaded from this web site.



Participants and lecturers of the Joint COSPAR and WMO CBW in Tver State University, Tver, Russia. In the first row (from left to right): Sergey Lebedev, Jean-Louis Fellous, Jerome Benveniste, DanLing Tang, and Andrey Kostianoy.



Participants of the CBW in the conference hall in Tver State University.



Participants of the CBW at the boat during excursion on Seliger Lake.



Participants of the CBW in Nilova Pustyn (active monastery established in 1594) on Stolbny Island in Seliger Lake.