

*Dedicated to the memory of Georgii Titov*

### PREFACE

In July of 1998 we lost our friend and colleague, head of the Laboratory of Atmospheric Radiation, distinguished scientist, Doctor of Physics and Mathematics Georgii Aleksandrovich Titov. March 5 of 1999 would be his 51<sup>st</sup> birthday.



In 1971 Georgii Titov graduated from Tomsk State University, Department of Physics. All his further life was thrown with the Institute of Atmospheric Optics SB RAS.

**Stanislav Tvorogov, Correspondence Member of the Russian Academy of Sciences:**

Georgii Titov's scientific career is a part of the history of the Institute of Atmospheric Optics. It is the place where he worked on his undergraduate's thesis while being a student. Here he became a leader, who essentially influenced the image of the Institute and research programs it was involved in. In our Institute Georgii Titov has formed his world outlook and has sought his own way in science. He always believed that harmonic combination of academic statement of a problem and its strict solution necessarily gives results which must have a practical significance. These principles can be easily followed in all his works.

Titov's speeches for defense of candidate's and then doctor's theses were really splendid; they were marked events in the Institute's life. The exhaustive proof that just the stochastic geometry of a broken cloud is the principle physical factor in the problem of radiative transfer in the atmosphere was a revelation for scientists dealing with atmospheric optics.

Georgii Titov wrote more than hundred scientific papers, and at least brief review of his results is necessary here. Among his results there is one that presents the first calculations of optical characteristics of clouds in the Venus atmosphere; the optical model of cloud fields with stochastic geometry and stochastic inhomogeneity; the closed system of equations for the mean intensity of solar and thermal radiation in the cloudy atmosphere; the detailed treatment of the following problems: stochastic geometry of clouds and mean radiation conditions and brightness of artificial and natural radiation sources; effective parameterization of short-wave radiation flux for radiation codes of the general circulation models of the atmosphere (GCMs). The latter is a part of the large-scale problem considered in *Atmospheric Optics and Climate* monograph written by Georgii Titov in collaboration with Academician V.E. Zuev. This book is a part of *Modern Problems in the Atmospheric Optics* series. Georgii Titov was a great master in the Monte Carlo method, and purely mathematical aspects of this method also attracted his attention. It was Georgii Titov, who proposed further discussion of a very interesting concept that it is just the fluctuations of the optical structure of generally homogeneous (overcast) cloudiness that are among most important physical causes of the "excess" absorption of solar radiation in clouds. This point is of primary importance for the "climate – cloudiness" problem. Loyalty to a once chosen theme and ability to see its significance are very characteristic of Georgii Titov's scientific work.

Certainly, we should necessarily note the problem of transfer of short-wave and thermal radiation under conditions of inhomogeneous (in any respect) clouds. This is a significant or even decisive point of Titov's scientific program. His great talent in research and staggering intuition, allowed Georgii Titov to be the first, who understood the importance and the depth of this problem. Now it is not easy to find a promising direction in science which often looks like mere exhausting technical work. It is much more hard to wait when the results obtained prove needed and called for. The life of Georgii Titov is the wonderful example of a success in science. At some time he turned out to be the main expert in the discussed problem, its fine aspects and tricks. (By the way, I insistently recommended Georgii to work in different research area. However, in reality I have found myself to be involved into his problem.)

Georgii Titov was a charming and merry guy. He enjoyed life, all its sides: work, parties, games (whether it be football or cards), the outdoors, and others. His beautiful nature is evidenced by his sponsorship of scientific laboratories, financial state of which was far from being successful.

His highest qualification was also supported by the gift of oratory. Georgii was able to state his aims and results very accurately and clearly at the same time. His written projects can be considered as a model of such creation.

In our "far from simple" time there was a period, when Georgii Titov was the only one who insisted on the "youth program" to be stated at the Institute. This support was not in words only; he really helped young scientists both in their scientific growth and in their everyday problems as well.

#### **Mikhail Panchenko, Doctor of Physics and Mathematics:**

Even a long article is not enough to describe one's dear friend. It is much more difficult to describe briefly Georgii Titov, who was a gifted and outstanding person. It is very hard for me to speak about him in the past.

We were close friends starting from our student years and then during our work at the Institute of Atmospheric Optics. I always was astonished by his balanced nature and even slightly envied. His nature was a combination of a player's excitement and fundamental rationality, flight of imagination and practicality. In my opinion, he was one of a few scientists, who rationally evaluate possible results while solving even purely theoretical problems. This approach manifested itself in all his life: when playing cards, when choosing a career, or when planning summer vacations. I remember a very funny, from the first sight, occasion. Once we had to saw some planks to make benches. Georgii put the question, which became then one of the classical jokes among our company. He asked "What should be the accuracy?"

He did not like to do something for no special reason. That is why his bibliography contains practically no papers, which could be considered as "scientific noise" in our terms. I know how long he thought before presenting a paper or report and how hard he worked to state a problem or to interpret a result. I cannot forget how one day he told me that his calculations revealed that enhanced brightness must be observed even for optically dense clouds at their top when viewed at angles close to the rainbow ones. Georgii verified the calculations several times and then asked me to let him join me in a flight of our airborne laboratory. When he saw this effect with his own eyes through an aircraft window, it really delighted him.

One evening, speaking about science and human life, Georgii said that he has found a formula to live in accord with. It was a phrase from a novel by Pikul': "To be rather than to seem to be." And he followed this formula all over his life.

There were different periods in his life, including very severe ones. There was the time when all seemed falling to the ground and there were no funds to continue research. However, Georgii did not leave the science. Moreover, he found that it is promising and quite realistic (!!) to try to participate in the US national scientific program, what seemed unrealizable for most of scientists nearby.

Thus Georgii "discovered America" for many scientists in our Institute. For a long time he was the only foreigner taking part in the ARM National Program of the USA. His project had to pass a very severe expertise. Besides, he together with Vladimir Zuev, director of the Institute of Atmospheric Optics, pioneered in concluding international contracts. As a result, he could work fruitfully here, in Russia. However, having concluded the contract, he did not restrict himself with his own relative well-being. Georgii helped his colleagues and tried to extend the participation of our Institute in the Program and the collaboration with PNNL as a whole. He supported carefully all sprouts of scientific relations between PNNL and the Institute of Atmospheric Optics. He had long discussions with Russian and American scientists constantly explaining them the possibility and prospects of such a collaboration. Besides, he gave much attention to the ethics of this collaboration. Unquestionably the credit for that we have so many close friends in the USA and the collaboration between our Institute and PNNL develops and gets stronger goes to Georgii.

**Tat'yana Zhuravleva, Candidate of Physics and Mathematics:**

The death of Georgii Titov means for me not only the loss of a great scientist, who headed my scientific direction, but also a deeply personal loss.

I began to work with Georgii Titov in 1984, when I joined the Institute of Atmospheric Optics. I immediately understood how lucky I was. Georgii Titov was a very good supervisor. First, I was a beginner in this research area. Second, I am a mathematician rather than physicist, therefore some physical aspects of the problem were hard for my understanding. There was Georgii Titov, who helped me at this first stage of my work. His help covered the whole range starting from mastering of some tricks in the Monte Carlo method to interpreting the obtained results. He was not a detached outlook, whose part is only to give directives. Georgii was interested in this process and took an active part in it. Somewhat later one more Titov's follower – Evgenii Kassianov – has passed the same way.

Georgii never did things by halves. He made high demands on himself as a scientist and expected the same from us. Under his supervision, we rewrote our papers several times before, in his opinion, they became suitable for publishing no matter in the home or foreign press. How many times we had to do over again our work before hearing "Okay" from him! He taught us how to find a goal in a problem, solve it fast and efficiently, and present results clearly. I have to thank Georgii for many things I can do now. I think that it was he who has implanted in me the love to scientific work.

For his followers, Georgii Titov was an "origin" of creativity, power, and good will. His demands on us were high, and that called for high responsibility.

Up to now I can hardly believe that I'll never see Georgii, that he'll never come in our room and say: "Hello colleagues! Why not to drink a cup of coffee?"

The loss of Georgii Titov is irreplaceable for the international scientific community and for the Institute of Atmospheric Optics SB RAS. We will not forget his kindness, honesty, charm, and ability to enjoy life.

*Editorial Board of the Atmospheric and Oceanic Optics appreciate contributions from everybody who took part in preparation of this memorial issue. We also would like to express a particular gratitude to T. Zhuravleva, who worked as an editor of all the papers, and to O. Bazhenov who translated them.*