

A TRIP TO MOSCOW

By Ferris Webster

IN mid-May 1988, I had the opportunity to go to Moscow as part of a delegation to the first meeting of the U.S./U.S.S.R. Joint Working Group on Earth Sciences. The meeting was held under the *Agreement Between the United States of America and the Union of Soviet Socialist Republics concerning Cooperation in the Exploration and Use of Outer Space for Peaceful Purposes*, signed in April 1987. The agreement is implemented by the U.S. National Aeronautics and Space Administration (NASA) and the U.S.S.R. Academy of Sciences.

The current urgency of issues related to global change in the Earth's environment stimulated NASA to establish an earth sciences working group to consider the acquisition and exchange of space-based data related to global change. In the words of the advance document:

Global change in the Earth's environment is of universal and urgent concern. Previous and current studies have shown that the combinations of human activity and natural events has resulted in changes in the atmosphere's ozone layer, the build-up of "greenhouse" gas in the atmosphere, the expansion of deserts, acidification of precipitation, and other dramatic changes in the Earth's climate, atmospheric composition and biosphere. The causes and potential effects of the changes are not adequately understood.

The U.S. delegation was led by Sam Keller and Shelby Tilford of NASA. Of the 12 members of the U.S. delegation, half a dozen were experts in the scientific disciplines expected to be discussed at the meeting. The Soviet delegation was led by Academician K. Ya. Kondratiev, of the Institute of Lake Studies of the U.S.S.R.

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Academy of Sciences. Konstantin Fedorov, Deputy Director of the Shirshov Institute of Oceanology in Moscow was the chief oceanographic spokesman.

I went on the trip with some misgivings. I had received a single advance document from NASA that talked in generalities about the agreement but did not mention the ocean. I had visions of eight wasted days. Was a U.S. oceanographer really needed? Would I meet any Soviet oceanographers at the meeting? I hoped I would. This was to be my first trip to talk about joint work with the USSR since my involvement with Poly-MODE in the mid-seventies. After all I had been reading about glasnost and perestroika, I was curious to see if any changes were evident among Soviet oceanographers.

As it turned out, I need not have feared that the ocean would not be discussed. Several Soviet oceanographers were at the meeting (see Appendix). On the first day, the Soviet side came in with a three-page ocean proposal, entitled *Hydrophysical monitoring of marine ecosystem conditions based on remote sensing*. The document had three sections (all translations are unofficial):

Assessing Conditions of the Marine Ecosystem and Bioproductivity of the World Ocean. This section included:

- Intercalibration of methods for assessing water quality and bioproductivity, with emphasis on areas of intensive land runoff or ecological stress.
- Integrated satellite-ship-airplane experiments, at a variety of spatial and temporal scales in selected areas, such as the Gulf Stream, the north and tropical Atlantic, the Kuroshio, and eastern and western tropical Atlantic nearshore waters.
- Creating basic procedures for data processing, including data collection for long-term monitoring, and testing ecosystem models with remotely sensed data.

Using aerospace data to model and monitor

for the thermohydrodynamics of the ocean. This section envisaged collecting enough reliable data to specify thermal and dynamic parameters to model the field of ocean variability. Such models must include three-dimensional dynamics based on remote sensing from satellite. Elements proposed were:

- Studies of the dynamics of intensive ocean currents, eddies and fronts and the thermal state of the ocean, based on a joint analysis of data from satellites and ships.
- Studies of the synoptic global wind field.
- Ocean ice studies.
- Development of laser technologies to study upper-ocean thermodynamics.
- Global altimeter measurements.
- Developing methods for using drifting buoys for ocean dynamic studies.
- Demonstrating the accuracy of reconstructing ocean fields based on remote-sensing data and quantitative ocean circulation models in 3 or 4 energetically active zones of the ocean.
- Creation of a global model of ocean dynamics based on a long-term data base of satellite and sub-satellite measurements.

Improving and developing models to create and transform space data for models. Elements proposed were:

- Creating integrated models for the fluxes at the air-sea interface.
- Joint experiments on methods to improve the accuracy and evolution of models.
- Intercalibration of methods for handling inverse problems in remote sensing.
- Intercalibration of remote sensing instruments, by comparing data from different types of satellites or drifting platforms.
- Collecting sub-satellite measurements to compare with data from satellites.

I was surprised by the extensiveness of the work proposed by the Soviets. It certainly went beyond the space-based work

our delegation could agree to. I was impressed by the implied enthusiasm for joint work such as a list suggested, but wondered if the scope of the work went beyond the capabilities of the two sides. Our NASA delegation suggested that much of the work proposed was more appropriate for consideration under an oceanographic bilateral agreement known as the *World Ocean Agreement* (signed by Nixon and Brezhnev many years ago). We countered with a much simpler proposal, to begin with a quid-pro-quo exchange of satellite-based ocean data. This was generally accepted.

The text of the *Ocean Remote Sensing* part of the Agreement (signed, but still subject to confirmation) is as follows:

The US and USSR agreed to cooperate in remote sensing of the ocean for studies of productivity and global change in the Earth's environment. Both sides agreed, as a first step, to examine mechanisms for the exchange of data from existing archives of ocean-related space data and related surface information. Both sides agreed that this exchange would be done on an equivalent basis. Both sides agreed to establish an implementation team on productivity-related problems of ocean remote sensing. The team, reporting to this working group would review details of the data exchange such as quantities, formats, quality, and media for exchange of data and would consider future supporting programs. The USSR has agreed to arrange a workshop on remote sensing to study global biosphere dynamics at the Lake Baikal in 1989.

The *Summary of Results* of the meeting names Fedorov (USSR) and Webster (US) as members of the implementation team. They are to "define the scope of projects and data to be exchanged in areas of mutual

interest." I recognized some of the items proposed in the Soviet paper as work underway or proposed nearly a decade ago, under the joint *World Ocean Agreement*. Joint scientific activities, including those in oceanography, dried up following the Soviet invasion of Afghanistan and the resulting outrage in the U.S. scientific community over a number of human rights issues. A further dampening factor had been the frustration experienced by U.S. oceanographers in trying to work with Soviet colleagues. In the new climate of détente and perestroika, is this the time for picking up the pieces and starting again?

It's clear that some U.S.S.R. oceanographers are ready for joint projects. Are some U.S. oceanographers also ready? Joint work in the past has been fraught with difficulties: communications, travel, quality control, language, culture, differences in the systems for research, and the international political climate. Is the situation changing so that it's worth trying again? I was impressed by the openness of the Soviet oceanographers I met this time. In the spirit of glasnost, they frankly discussed problems we had had in PolyMODE, when they often avoided discussing problems or denied their existence. I thought the new openness was a good start.

However, working with U.S.S.R. oceanographers will likely remain difficult, at least in the short term. Communications are not easy, and there may be forces on both sides that would just as soon keep them that way.

The ways of planning experiments, of working at sea, of handling data, of analyzing results, and of writing and publishing papers, are often so different that considerable patience and understanding is required by both sides.

On the other hand, the global scale of problems in the ocean may be great enough to make the potential rewards of joint

U.S./U.S.S.R. work worth the effort. Should we try? ■

Appendix:

1. U.S. Delegation Members:

Moustafa T. Chahine, Jet Propulsion Lab
Ingrid Disilvestre, NASA
Irene Firsov, U.S. State Dept
Samuel W. Keller, NASA
Berrien Moore, III, Univ of New Hampshire
Marion R. Norris, NASA
S. Ichtiague Rasool, NASA
P. Diane Rausch, NASA
Shelby G. Tilford, NASA
Kenneth Watson, U.S. Geological Society
Robert T. Watson, NASA
Ferris Webster, Univ of Delaware

2. Oceanographers on the U.S.S.R. delegation:

Konstantin N. Fedorov, Deputy Director, Shirshov Institute of Oceanography, U.S.S.R. Academy of Sciences, Moscow.
Gennady K. Korotaev, Marine Hydrophysical Institute, Sevastopol.
Sergei V. Victorov, Laboratory for Satellite Oceanography of the State Oceanographic Institute (Hydromet), Leningrad.
Jaak Lokk, Institute of Thermophysics and Electrophysics, Tallinn.
Anatoly Shevirnogov, Institute of Biophysics, Krasnoyarsk (studies of Lake Baikal).

NOTE

After this note was written, it was with shock and sorrow that I heard of Konstantin Fedorov's sudden death (see Omega, this issue). Konstantin was an energetic and productive physical oceanographer with great scientific insight. Oceanographers in the US and the USSR will greatly miss him.
- F.W.