Protocol of the Science Team Meeting for the Establishment of the Hydrometeorological Observatory in Tiksi
10-17 March 2009
Boulder, Colorado

The meeting on the science program for the Hydrometeorological observatory (HMO) in Tiksi took place in the Earth Systems Research Laboratory (ESRL) NOAA during the period 10-17 May 2009. The main purpose of the meeting was to approve a working document to guide science programs at Tiksi and begin development of Roshydromet-NOAA science collaboration partners. A number of logistic issues regarding the 2009 installation schedule were also addressed.

From the U.S. side the delegation was led by T. Uttal, Team Leader for the NOAA/ESRL Polar Processes Research Group. From the Russian side, the delegation was led by A. Danilov, Deputy Director of the Arctic and Antarctic Research Institute, Roshydromet. The Finnish Meteorological Institute was represented by T. Laurila.

Additional members of the Russian Tiksi Science team were Alexander Makshtas, Alexander Reshetnikov and Alexei Konoplev. Additional members of the U.S. Tiksi Science team were Russell Schnell and Jeffrey Key. Vladimir Romanovsky the fourth member of the U.S. Tiksi science team was unable to attend.

On May 12 and 15 the Russian delegation was able to tour the NOAA tall tower, a NOAA BSRN site and the NOAA gas sampling laboratory. Meetings were attended by the NOAA International Affairs officers to inform them of the Tiksi activities.

During 13-14 May, the Russian delegation was able to attend the NOAA Global Monitoring Annual Conference (GMAC) to review the activities of NOAA observatories located in Barrow (Alaska), Mauna Loa (Hawaii), Trinidad Head (California), American Samoa and South Pole Station to familiarize themselves with NOAA Observatory procedures and science. Also they presented 3 Russian and 2 joint reports about investigations in Tiksi region and the Arctic basin. Agenda is attachment 1.

On 15 May, additional presentations were made on Russian proposals for Tiksi science as well as the NOAA science proposals that were not covered during the GMAC conference. During the meetings agreements were made regarding the primary measurements programs that will be jointly deployed in August of 2009 as follows:

The Climate Reference Network (CRN). CRN program will be transferred to Roshydromet for operations including calibrations for instruments within Russia and submission of data to an agreed upon archive. Training for 2 Roshydromet personnel will be provided by the NOAA climate reference program in Ashville North Carolina during July 13 to July 17, 2009 and NOAA will support travel for this training from SPb or Moscow to the U.S. During a meeting on May 14th this plan was approved by Sharon LeDuc, the Deputy Director of the National Climate Data Center, Dr. Alexander Danilov, the Deputy Director of the Arctic and Antarctic Research Institute and Taneil Uttal, team leader of the NOAA Polar Processes Group. This is the

second installation of a facility of this kind outside of the territorial U.S. Notes from this discussion are included as attachment 2.

The Baseline Surface Radiation Network (BSRN) program. BSRN will be transferred to Roshydromet for operations, including submission of the data to the WMO data archives for the BSRN program. Training for 2 Roshydromet personnel will be provided by the NOAA BSRN program in Boulder Colorado during July 20-22, 2009. Operations and calibrations will be done in accordance to the manuals of the BSRN program that were provided to the Russian delegation. The Russian delegation informed the U.S. delegation of the plan to operate a set of sensors consistent with the existing historical Russian radiation program for comparison. This plan was approved by Ellsworth Dutton, the head of the NOAA atmospheric radiation program and Dr. Alexander Danilov Deputy Director of the Arctic and Antarctic Research Institute and Taneil Uttal Team Leader of the NOAA Polar Processes Group. NOAA will support travel for this training from SPb or Moscow to the U.S. and travel within the U.S. Roshydromet will support travel for this training within Russia.

The NOAA micrometeorological flux program is not an established WMO program and does not have specific protocols. It was agreed that development of the details of the operations of this program would be developed within the first year of operations jointly between surface flux scientists of the NOAA/ESRL and Roshydromet/AARI and the Finnish Meteorological Institute.

It was agreed that a full program for the NOAA samplers including carbon cycle gases, black carbon and ozone would be implemented during August of 2009 when NOAA personnel are in Tiksi. There are complex issues of necessary redundant analysis of gases according to standards that will be resolved within the first year between the gas analysis laboratories headed by Alexander Reshetnikov (MGO) and Tom Conway (NOAA/GMD).

The Finnish Meteorological Institute and the Roshydromet/Main Geophysical Observatory will jointly develop a program for the sampling of aerosols to study concentrations of green house gases in the atmosphere and exchanges of the gases and aerosols between the surface and the atmosphere.

The capabilities of the NOAA Arctic satellite program were reviewed by Dr. Jeff Key of the NOAA/National Environmental Satellite and Data Information Service and the potential contributions to the Tiksi science program were discussed.

A plan was developed for developing a proposal for the joint sampling of atmospheric mercury between the Roshydromet Center for Environmental Chemistry (Dr. Alexander Konoplev) and the NOAA Air Resources Laboratory (Dr. Steve Brooks).

Information was provided to the NOAA delegation of the installations that Roshydromet expects to make in August of 2009. The question of logistical support for the Tiksi Observatory were discussed on May 16, 2009. A brief protocol of this meeting is included in attachment 3.

It was agreed that the revised program of scientific activities reflecting the discussions of the meeting would be provided to science team members in Russian and English by June 30th, 2009.

The science team will have until July 15th, 2009 to make final comments. It was agreed that this document would necessarily develop with the Tiksi program and that revisions would be made once every year by the science team.

It was agreed that Roshydromet would consider the possibility of having Tiksi designated as a Global Atmosphere Watch station in the future.

A number of practical issues for installing equipment in August 2009 were discussed. These issues are summarized in the attached notes from this discussion in Attachment 3.

Taking advantage of the visit by the Russian delegation in Boulder, representatives of the NOAA Unmanned Aircraft Systems (UAS) made a presentation and discussed the possibility of involving Russia in a UAS program between the Arctic Nations. It was suggested that NOAA send Dr. Alexander Danilov a proposal for a meeting at AARI in November of 2009 to discuss the use of UAS for Arctic research and possible AARI involvement.

Head of the NOAA Delegation	Head of the Roshydromet Delegation
Taneil Uttal	
Taneil Uttal	Alexander Danilov

Attachment 1: List of Presentations on the Hydrometeorological Observatory in Tiksi given at the Annual Global Monitoring Conference, Boulder, Colorado, U.S.

1. Measurement of Greenhouse Gases in the Russian Arctic – A.I. Reshetnikov, N.N. Paramonova, V.I. Privalov, A.V. Zinchenko, V.V. Ivachov (Main Geophysical Observatory).

Измерения парниковых газов в Российской Арктике – А.И. Решетников, Н.Н. Парамонова, В.И. Привалов, А.В. Зинченко, В.В. Ивакхов (ГГО).

2. Statistical Analysis and Estimation of the External Effects on the Total Ozone Field Over Russia in 1973-2007 – E.A. Titova, I.L. Karol, A.M. Shalamyansky, L.P. Klyagina, A.A. Solomatnikova (Main Geophysical Observatory)

Статистический анализ и оценка внешних факторов на распределение общего озона над Россией в 1973 – 2007 – Е.А. Титова, И.Л. Кароль, А.М. Шаламянский, Л.П. Клягина, А.А. Соломатникова (ГГО).

3. Comparison of Barrow, AK and Tiksi, Russia Climate Variability Using Historical Meteorological Records – L. Matrosova, (NOAA/PSD/CIRES) T. Uttal, (NOAA/ESRL/PSD)

A. Makshtas, N. Ivanov (AARI)

Сравнение изменчивости климата в Барроу, Аляска и Тикси, Россия по историческим метеорологическим данным – Л. Матросова (НОАА/ЦИРЕС), Т. Уттал (ЛИСЗ, НОАА), А.П. Макштас, Н. Ю. Иванов (ААНИИ).

4. Long-Term Climate Variability in the Area Surrounding Tiksi, Russia – A. Makshtas, N. Ivanov, R. Bekriaev, S. Shutilin(AARI), Т. Уттал (ЛИСЗ, НОАА)

Долгопериодная изменчивость климата в регионе Тикси – А. Макштас, Н. Иванов, Р. Бекряев, С. Шутилин (ААНИИ), Т. Уттал (ЛИСЗ, НОАА).

5. Chemical precipitation on the Russian Arctic Territory – A Polischuk, N. Pershina, P. Svistov (MGO)

Химия осадков на территории Российской Арктики – А. Полущук, Н. Першина, П. Свистов (ГГО).

Attachment 2
Meeting regarding CRN station in Tiksi – May 14, 2009, at NOAA/DSRC

Those attending: Sharon LeDuc, A. Makshtas, A. Danilov, A. Reshetnikov, L. Matrosova, T. Uttal, L. Darby

During meeting Russian participants were informed about representatives of CRN program. Michael Palecki is the CRN program manager. Howard Diamond is the liaison to the NOAA Climate Program Office in Washington D.C. and is responsible for logistics.

The NOAA/Atmospheric Turbulence and Diffusion Division (ATDD Oak Ridge do the installation of the CRN sites.

Calibrations are to take place once per year. It would be most useful if calibration equipment was kept on-site. It could be that calibration equipment could be purchased in Russia. Calibration equipment costs in the U.S. are ~$15000 – 20,000.

U.S. side pointed out that all ground work and power for the CRN installation should be in place before August 15, 2009.

Sharon LeDuc suggested the Russians build the wind shield for the precipitation gages rather than shipping the materials to Russia. Alexander M. suggested that Roshydromet (Tiksi office) or the Polar Foundation build the shield in Tiksi.

t was proposed that the training for the people who will maintain the CRN site will take place July 15-21, 2009. The training will take place in Asheville, NC and Oak Ridge, TN. It's a 2-hour drive between the two places. Attendees will be Rob Albee (NOAA/GMD), Vasily Kustov (AARI), engineer to be determined (from Yakutsk or Tiksi)

CRN data will be transferred to AARI by the satellite link.

CRN data quality control is mostly automated. NOAA/PSD and Roshydroment need clarification on how much manual quality control will be desirable.

The American side proposed that after the first installation of CRN in Tiksi, the possibility of a second CRN installation in Yakutsk will be discussed.

We discussed the possibility of Mike Helfert (retired from Oak Ridge) working on contract to assist the Tiksi deployment, funded by the NOAA/SEARCH program. He has been to Tiksi and completed the original site survey.

Russian side informed American side that Tiksi meteorological data is available on the internet.

Attachment 3 Action Items

Yakutsk Office of Roshydromet
Name of engineer/technician for training in the U.S. on CRN and BSRN
Provide support for team installing CRN at Tiksi Observatory

Moscow Office of Roshydromet
Investigate date of approval of Instrument Operations Permissions Document
Investigate possibility and impacts of modifications to Operations Permissions Document
Return ozonometer to the U.S.
Visa support for U.S. team to Russia

NOAA
Provide additional information for Operations Permissions Document – value, serial numbers, modifications
Preparation for customs documents for import to Russia
Determine if NOAA can pay for charter aircraft services through AARI or Polar Foundation
Provide summarized requirements list to Polar Foundation
Visas support for Russian team to the U.S.

AARI Office of Roshdromet
Check on price for hiring aircraft charters from Moscow to Tiksi for people and/or equipment
Check on providing storage of equipment in SPb

LIST FOR FMI
Renew Instrument Operations Permissions Documents for FMI equipment and arrange transport of FMI equipment into Russia with MGO

CH2M Hill and POLAR FOUNDATION
Confirm and verify construction and installation schedule for August 2009
Acknowledge Modified Requirements List for CAF Received

Institute of Chemistry (Typhoon)
Provide a plan of activities for summer 2009 at Tiksi Hydrometeorological Observatory

Training
<u>Personnel</u>
July 13 to July 17 Ashville CRN Training
July 20 to July 22 Boulder for BSRN Training including data transfer
Vasily Kustov – AARI PhD Student Radiation Transfer in Atmosphere Sea Ice Ocean
Yakutsk or Tiksi Employee – Focus will be on strong electronics engineering background
Rob Albee – NOAA Engineering Technician
Roshydromet will fund travel from Yakutsk to SPb for training
NOAA will fund travel from SPb to Ashville NC and Boulder Colorado for training
Daily maintenance training will be done on site

Issues
2009 Permissions to Operate Equipment Renewal
Determine is customs will be paid or waived
Property ownership
Flasks
Temporary permissions and calibration require development of new Permissions to Operate Equipment documents for 2010
Finnish IT documents (through MGO to AARI)
Finnish Permissions for Operations of Equipment (through MGO to AARI)
Scheduling of Operations Team Meeting
MGO does not currently have funding to transport flasks within Russia

Customs (NOAA and Yakutsk Responsibility)
Contact Yakutsk customs broker
Roshydromet has to provide update on Current Permissions Documents for Operating Equipment

SHIPPING
PLAN 1 – Ship directly from U.S. to Yakutsk and Roshydromet takes responsibility for shipping to Tiksi
PLAN 2 – Ship U.S. to St Petersburg and Roshdyromet takes responsibility for shipping to Tiksi
Determine plan by June 30th

Roshydromet /Moscow must return broken ozonometer to U.S. by August 2009
Ship new ozonometer
Parcel post to Yakutsk for small items
Freight Shipping
Cost estimate to Moscow/SPb from Agility
Information from Yakutsk on Shipping Broker
Information from CRN on read to ship date
Information from CRN on Shipping Broker
Investigate Special Charter flight for people and or cargo to Tiksi

Site and Program Preparation by Polar Foundation
Verification will be made through CH2M Hill that infrastructure requests have been received
Request transfer of butane and ethanol (investigate purchase in Yakutsk)
Transfer of Gas Cylinders for MGO need to be shipped

PLAN: NOAA and Roshydromet Specify Schedule to Polar Foundation
Construction Schedule
July 20 – August 9 POLAR FOUNDATION CREW
Complete the following:
General Power
Security for CAF
Construct Tower
Install board walk to tower only
Set up transportation

Inspect Existing CAF and Weather Station Buildings and repair as requested by Roshydromet
Resolve CAF and weather station waste water and shower design as required by Roshydromet
Groundwork and Electrical for CRN
Groundwork and Electrical for Tower

August 9 to August 26
Install CRN (Albee, Kustov, Yakutsk Engineer)
Install BSRN (Albee Kustov)
Install AOD sensor (Albee for Kustov NASA)
Install Micrometeorological Flux Tower (Hare, FMI, Albee)
Install FMI Aerosol Cabin (Laurila, Reshetnikov)
Install new Meteorological Station (Roshydromet)
Install new Radiosonde System (Roshydromet)
Install thermo chains (AARI)
Install Traditional Russian Radiation System for Comparison (Makshtas, Kustov)
Initiate Gas Sampling Program (Matrosova - Reshetnikov)
Initiate Ozone Sampling Program (Matrosova - Shalamyansky)
Initiate Black Carbon Sampling Program (Matrosova - Makshtas)
Initiate Black Carbon Snow Sampling (U of W)
Install Filter Aerosols (Makshtas for Shevchenko-IO RAS)
Install Communications/Network (Kuzmichov, Programmer. Estes)
Install final security for towers and racks (Polar Foundation under NOAA/AARI/FMI direction)
Radiometer TWC (Karavaev, MGO)
Chemistry of Precipitation (Pershina, MGO)

ON LINE Education Teleconference set up (Kuzmichov, AARI programmer)
Final distribution of furniture in CAF (Polar Foundation under NOAA/AARI direction)
Have electrician on site to do adjustments to electrical layouts (Polar Foundation under NOAA/AARI direction)
Have boardwalks installed as necessary to albedo rack locations and FMI Cabin (Polar Foundation under FMI direction)

Tiksi August Trip Staff
1. Alexander Makstas (AARI Lead Scientist)
2. Taneil Uttal (NOAA Lead Scientist)
3. Alexander Reshetnikov (MGO Lead Scientist)
4. Rob Albee (NOAA Engineering Technician)
5. Ludmila Matrosova (NOAA Tiksi Program Management and Translation)
6. Alexander Kuzmichov (AARI IT)
7. Programer (AARI IT)
8. Vasily Kustov (engineer AARI– Surface Atmosphere exchanges)
9. Yakutsk or Tiksi Staff TBD (Engineer or Engineering Technician)
10. Eric Estes (NOAA IT)
11. Tuomas Laurila (FMI GHG)
12. Eija Asmi (FMI Aerosols)
13. FMI – TBD

14. Victor Ivakhov (MGO)
15. Dimitri Karavaev (MGO)
16. Engineer (CRN)
17. Natalya Pershina (Deputy Director of the Center of Atmospheric Pollution, MGO)