

Newsletter 35

Field Measurements in Inner Tien Shan
New Microwave Scintillometer, RPG-MWSC-160
Mobile Flux Observation System



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If you have a news item for the newsletter or want to share your experiences with Kipp & Zonen applications and contribute to our next issues, please e-mail the editor: kelly.dalu@kippzonen.com

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Kipp & Zonen B.V. - 2016

Hello 2016!

On behalf of all our employees and shareholders we wish you a healthy and prosperous 2016.

We look forward to a great year with exciting new projects and innovative developments. Let's start with some great news: We now offer a 5 year warranty.

On the majority of our instruments you can now extend the standard 2 year warranty to 5 years. All you have to do is register within 6 months after your purchase. As the market leader we deliver the best instruments worldwide with a long and reliable operating life. Passion for Precision was, is and remains our slogan.

Our strong R&D team developed the extended smart range of instruments last year and the first new smart pyranometers are on their way to measure solar radiation around the world. Innovation in both science and the solar energy industry will be the key engine for this year, so keep an eye out for our newsletters.

Another pointer for 2016 is service. Local calibration, for example, will improve the turnaround time considerably. Regular calibration of all measurement equipment is the key to maintaining the original performance and accuracy. We recommend calibration of the sensitivity of our radiometers every two years.

With local service points the Kipp & Zonen quality of service is available in key areas. In this year's first quarter our German distributor Gengenbach Messtechnik e.K. will be equipped and authorised to calibrate Kipp & Zonen instruments, followed by Equinox Instruments Ltd. in the United Kingdom, in the second quarter. More locations will be announced throughout 2016.

Next to innovation and service, we have another ambition. We will continue to invest in our great people to be able to answer your business needs. Our Kipp & Zonen team of almost 60 people works hard every day to make the next steps in atmospheric science and solar radiation measurement and to exceed your expectations. One team one goal.

We are facing an exciting year ahead of us in a world where renewable energy is still growing and so is the awareness of climate change. Let's all make our contribution to a wonderful year.

Best regards,
The Kipp & Zonen Management Team

Now Available! www.kippzonen.com in Chinese

We are proud to announce that our Chinese website is up and running! With the growing interest and numbers of Chinese visitors to our International, English, website it was time to develop a dedicated website.

Go to cn.kippzonen.com or click on the Chinese flag at top right of each page. All the product pages and corporate information have been translated, as well as key application examples.

Robin Zhang, Sales and Marketing Manager of Kipp & Zonen China about the Chinese website: "By introducing this brand new website, we are able to offer our existing and new customers in China an easy channel for obtaining information, as well as a convenient way of communication. We will keep developing the website by adding more content, and make it the leading portal for users in China interested in solar radiation and atmospheric properties" ■



Field Measurements of Glacier Albedo in Inner Tien Shan

By Dmitry Petrakov, Moscow State University, Faculty of Geography.

Why are data on glacier albedo important?

Surface albedo determines the shortwave radiation balance, which is the largest energy balance component, especially on continental glaciers. Spatial and temporal assessments of albedo of ice and snow are required for modelling of glacier mass balance. Although albedo values could be derived from satellite data, terrestrial photography or parametrization schemes, ground-based measurements are needed for calibration and validation of these approaches.

Nevertheless, in many mountain regions ground-based data on glacier surface albedo are scarce or even absent. This is true for the highly glaciated Tien Shan mountains, which are surrounded by arid lowlands. Glacier meltwater is a vital component of river runoff and data on albedo is among many parameters that can help to adapt the local economy to climate change.

Is the SP Lite2 albedometer the best choice for field campaigns in high mountains?

In August, 2015 we performed real ground-based measurements of albedo on seven glaciers in the headwaters of the Naryn River, located in the Eastern part of Kyrgyzstan in the Inner Tien Shan. We measured albedo at many points of each glacier, considering different types of surface; clean or dirty ice, superimposed ice, firn and snow.



Alyona Shpuntova with the SP Lite2 albedometer



Ryskul Usabaliev during fieldwork

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The number of measuring points varied from 40 to more than 100, depending on the glacier area and the survey scale. During this field campaign we covered more than 100 km over several days at altitudes above 4000 m and with significant height differences.

Thus, the choice of albedometer was very important for success of the project; it should be compact, easy to use, precise and with a short response time. Furthermore, it was necessary to read and save the measured values of incoming and reflected short-wave radiation.

Upon the advice of specialists from Kipp & Zonen we chose a pair of SP Lite2 pyranometers and a mounting rod, to make a light weight albedometer, in combination with two METEON data loggers. After the field campaign we can say that this combination is probably the best solution for real measurements of albedo in high mountains.

Albedo of continental glaciers could be lower than supposed earlier.

Our preliminary results were surprising. Typically, the albedo of glacier surfaces can range from more than 0.9 (90% reflection) for fresh snow down to around 0.2 for dirty ice. According to our data most of the ice in the Inner Tien Shan has albedo within the range 0.12 to 0.25, but at some points, where ice was very dirty, the albedo varied from 0.1 to 0.15. How could it be explained?

A high altitude semi-arid landscape with scarce vegetation, in combination with cryogenic weathering and strong winds, leads to intensive Aeolian transport of dust. Dust is transported not just from the glacier surroundings but also from deserts near to the Tien Shan. Dusty mists continued over several decades were registered in the Naryn headwaters in the 19th century.

Extremely warm weather before and during our measurements also led to a lowering of albedo. Although there is a temptation to explain low values of albedo as a result of mining in the area, we noted that similar values of albedo of dirty ice were registered by V. Konovalov and I. Lebedeva on glaciers in the Western Tien Shan in 1982. Therefore, we can assume that the albedo of glacial ice in Tien Shan is lower than considered earlier, especially during warm summers.

The team:

Dmitry Petrakov, Nikolay Kovalenko and Alyona Shpuntova, Moscow State University

Ryskul Usabaliev, Central Asian Institute for Applied Geosciences

Go to www.eng.geogr.msu.ru to find out more about the Faculty of Geography ■



Dust cones at Petrov Glacier surface

New Microwave Scintillometer, RPG-MWSC-160

By Dr. Keith Wilson, Scientist, Kipp & Zonen - Optical scintillometers, such as the LAS MkII from Kipp & Zonen, allow measurements of the transfer of heat between the Earth's surface and the air above, called the sensible heat flux (H). But, this is just one component of the Earth's energy balance. Incoming solar radiation heating the Earth's surface, must be balanced by outgoing heat in the form of long-wave radiation, sensible heat and latent heat flux (LvE) to the atmosphere (plus a little heat into the ground). Otherwise, we would continuously heat up.

The net radiation balance can be measured by the NR Lite2 or CNR4 net radiometers from Kipp & Zonen. The latent heat flux and evapotranspiration (ET) can be calculated from scintillometer measurements and a suite of other real-time meteorological data using our LAS MkII ET System. But, what about measuring the latent heat flux or evapotranspiration directly?

This would be ideal for studies in hydrology, irrigation, water scarcity and management in arid regions, agriculture, forest health, forest fire warning, weather forecasting, the radiation budget, and the Earth's climate.

This can now be done using the RPG-MWSC-160 microwave scintillometer, a new instrument from Radiometer Physics GmbH (RPG) of Meckenheim, Germany. The transmitter projects a beam of 160 GHz radiation and the receiver has an aperture of 300 mm diameter. Both operate from 12 VDC (an AC supply is optional).

In combination with an optical Large Aperture Scintillometer, and an all-in-one weather station, this allows simultaneous path averaged measurements of latent and sensible heat flux within the atmospheric surface layer, on scales comparable to satellite measurements or atmospheric models.

The RPG-MWSC-160 prototype was developed by RPG and Wageningen University of the Netherlands within the OMS (Optical and Microwave Scintillation) project, with support from the Dutch STW technology foundation and uses hardware developments from space projects. The RPG-MWSC-160 was successfully tested in two extended field campaigns in Sonora (Mexico) and Lindenberg (Germany).

The RPG-MWSC-160 comes with a comprehensive operating software package and inbuilt computer. The LAS MkII receiver plugs directly into the RPG-MWSC-160 receiver, which collects analogue data from, and supplies power to the LAS. The transmitters are co-located at the end of the measurement path.

The software synchronously digitizes the microwave and optical raw signals. Complete data processing from raw signals to heat fluxes is performed in real time. All data products are automatically stored and can be continuously visualized when a suitable display is connected.

The advantages of the new system are:

- *Rapid, direct measurements of the sensible heat and latent heat fluxes, plus the structure parameter C_n^2 of the turbulent surface layer, all averaged over a source region, so no time averaging is needed and it is representative of a large area.*
- *No influence of the mounting structure on the measurements.*
- *Remote sensing technique allowing measurements over open water, swamps, or sensitive natural habitats without disturbance.*
- *Easy installation and self-contained system, only requiring power.*
- *Very little maintenance and no moving parts for enhanced reliability.*

Please contact us through info@kippzonen.com for more information ■



RPG Radiometer Physics GmbH is a Rohde & Schwarz (R&S) company with currently 50 employees. An advantage of the backup from R&S is the ability to mass produce products which are developed by RPG. RPG specializes in the development of radiometers for space and ground-based remote sensing in the millimeter, sub-mm and Terahertz regions. www.radiometer-physics.de

Data is only as Good as the Precision of the Measurement

By Kelly Dalu - Kipp & Zonen was honoured to welcome Dr. Mauro Valdes Barron, Dr. Ana Lilian Martin Del Pozzo and Alma Lucia Villareal Castillo from Universidad Nacional Autónoma de México (UNAM) to the head office in Delft in April last year.

The recent projects and improvement of Mexico's network of weather stations and the collaboration between us in recent years was a good reason to meet in Delft. The meeting was an inspirational session where we, experts in the measurement of solar radiation, had the opportunity to learn from a well-respected expert in field meteorology. Dr. Mauro and his team from the Solar Radiation Section (SRS) of the Instituto de Geofísica of UNAM are involved in setting up and improving the radiation reference network for Mexico.

SRS is one of the regional radiation centres of the World Meteorological Organization (WMO). Alongside its educational purpose, the section is very busy with performing outdoor calibrations of radiometers according to international standards. These are not just for the Servicio Meteorológico Nacional (as described in the article 'CMP11 in Automatic Weather Stations in Mexico' from Newsletter 30), but also for all 15 universities of Mexico and other institutes from Mexico and the surrounding countries such as Colombia, Panama, Honduras and Costa Rica.

Alma Lucia Villareal Castillo had just received her bachelor degree after writing her thesis 'Pyranometer calibration using solar simulator' and doing her research in the SRS. She compared the outdoor calibrations with indoors, using a CMP22 pyranometer as the reference to calibrate 40 CMP11 pyranometers in both situations.

Until now the information on solar radiation in Mexico has been unreliable. With new equipment and high quality instruments SRS has started to improve the network of weather stations. A study by Dr. Mauro to regionalise the country by climate resulted in 17 different locations for Automatic Weather Stations (AWS). To ensure reliable and accurate solar data all the pyranometers are regularly serviced and calibrated according to WMO and ISO standards.

This will soon result in a solar map of Mexico and publicly available reference solar radiation data for each climatic region within the country. The selection of instruments for the AWS was not easy because they had to perform in the whole range of climates. SRS selected the CMP11 pyranometer mounted in the CVF4 ventilation unit. "Both for their accuracy and reliability, because data is only as good as the precision of the measurement" says Dr. Ana Lilian. "We can relate to Kipp & Zonen's passion for precision, it's so important in the measurement of solar radiation."

Dr. Mauro says: "With the existing network, the new equipment that is now being installed, and collaborations with other universities and with NREL in the USA we are confident that Mexico will have a good and reliable solar database for the future" ■

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A New Design of Mobile Flux Observation System

By Mr. Zhou Haitao, service engineer at Beijing Techno Solutions Ltd. - The mobile flux observation system designed by our company was officially put into operation in the test field of the Inner Mongolia Agricultural University (IMAU) on 30th April 2015. The unique platform design makes the system rapidly movable, which facilitates deployment and emergency observations and enables short-term observation for various land use types. However, it also performs long-term stable fixed-position observations by using support jacks at each corner that can also be used to level the system.



The system integrates a wheeled platform, measurement equipment, autonomous power supply unit, recording and data analysis equipment into one complete machine. It can collect, analyse and store output parameters, such as energy fluxes, corresponding data quality information, the details of the source region and environmental factors required by ecological system models.

An eddy covariance system provided by Campbell Scientific Inc. is mounted on the wheeled platform and the total height is 4.7 m. There are observations of the four components of the surface radiation energy balance by a Kipp & Zonen CNR4. Other parameters measured include; precipitation, evaporation, atmospheric pressure, 3-axis wind speed and direction, temperature, humidity, soil temperature, soil moisture and carbon dioxide gas concentration. In addition, the system can record radioactive components that may be present.

All the measurement data is recorded by a Campbell Scientific data logger and the entire system is powered by two small PV panels and batteries. Sensible heat flux and latent heat flux can be calculated and the evapo-transpiration derived. The complete system is significant for research into weather and climate forecasting, water cycle process analysis, agriculture and water resource management, and so on.

In combination with several fixed small-scale automatic meteorological stations that include Kipp & Zonen NR Lite2 net radiometers, the mobile observation vehicle designed by Beijing Techno Solutions Limited can perform observations at different points in different months for different underlying surfaces.

We sincerely thank the College of Water Conservancy and Civil Engineering of Inner Mongolia Agricultural University, Hohhot for their cooperation with this project ■



Our congratulations also go out to the great performance of Solar Team Twente! This Dutch team held the lead position for half of the thrilling race. After some 3000 km they were only 3:35 minutes behind the Nuon Solar Team, finishing in second place. Great work! ■

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In October 2015 the Bridgestone World Solar Challenge took place in Australia. The Dutch Nuon Solar Team from the Delft University of Technology won the race for solar powered cars from Darwin to Adelaide. Kipp & Zonen sponsored the team with two new SMP10 smart pyranometers. Read how they integrated the SMP10's into their Mission Control App for the Nuna 8 car in our next newsletter.

Fairs & Events

AMS Annual Meeting • New Orleans • USA	10 - 14 January 2016
World Future Energy Summit • Abu Dhabi	18 - 21 January 2016
Solar Middle East • Dubai	01 - 03 March 2016
InterMET Asia • Singapore	16 - 17 March 2016
IRS 2016 (International Radiation Symposium) Auckland • New Zealand	16 - 22 April 2016
SNEC PV Power Expo • Shanghai • China	23 - 25 May 2016

Passion for Precision

Kipp & Zonen is the leading company in measuring solar radiation and atmospheric properties. Our passion for precision has led to the development of a large range of high quality instruments, from all weather radiometers to complete measurement systems.

We promise our customers guaranteed performance and quality in; Meteorology, Climatology, Hydrology, Industry, Renewable Energy, Agriculture and Public Health.

We hope you will join our passion for precision.

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