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KIPP & ZONEN
SINCE 1830

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January 2014

Contact

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

Tradition of Quality

The New Year has already started. I wish you all a happy and prosperous 2014 and hopefully all your expectations will come true.

As you probably know Kipp & Zonen was founded in 1830 in Delft. From that time on Kipp & Zonen has been delivering products and a lot of these are still around. Some days ago I had a visitor who wanted to show me a Kipp & Zonen product he had found in an old cabin trunk. He asked if we could date it. It appeared to be a pair of opera glasses, most likely manufactured in 1864. I looked through the glasses and was amazed by the bright picture. The glasses were in an excellent condition, after 150 years!

During a recent recalibration of a CM 5 pyranometer that dates back to 1970 we could see that the sensor was still in good condition. This confirms what Kipp & Zonen continues to be; a supplier of quality instruments on which you can rely for a long long time.

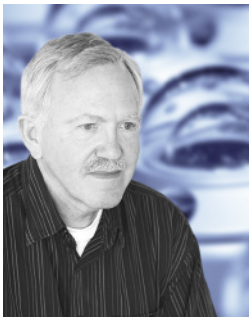
We launched the CMP10 during the Meteorology Technology World Exhibition in Brussels and shortly after that we showed this new maintenance free pyranometer at Solar Power International 2013 in Chicago. No desiccant cartridge to worry about anymore and 5 years of warranty are the warmly welcomed characteristics of this new secondary standard pyranometer, in line with our tradition of quality.

It does not stop here. All the service centers in our sales offices are now equipped with facilities to carry out recalibrations of our pyranometer products under ISO 9847. Turnaround times for service to our major markets are now shortened.

Some weeks ago we received the message that Kipp & Zonen was listed as one of the 5 companies for the annual WNF (Netherlands World Wide Fund for Nature) Cleantech Star Award. With this selection Kipp & Zonen is recognized as a high tech contributor to the renewable energy and bio-based international economy.

I thank you very much for your support and your shared suggestions. 2014 is going to be another incredible year with new challenges and new products.

Best regards,



Ben Dieterink, CEO
Kipp & Zonen B.V.

Passion for Quality

By Remco de Mik, Quality Manager at Kipp & Zonen

Kipp & Zonen stands for high quality. Therefore it is very important, and actually inevitable, for our organisation to be ISO certified.

Since 1995 we have been ISO9001 certified. Now, in 2014, we carry the ISO9001:2008 certificate, which ensures that our well-known products are delivered to the highest standards and that we continuously improve our products and organisational processes.

“My name is Remco de Mik and I am Quality Manager at Kipp & Zonen. I’ve noticed a great quality attitude throughout all the different departments within Kipp & Zonen. Last year we made some great steps to improve the already great quality of our instruments.

One example is that the Quality Department now carries out a complete quality check on every production batch that leaves our company to make sure that every product is according to our specifications and our desired quality level.

We also make quality checks on the incoming goods to ensure the components used to create our products meet our high standards. Our supplying partners are very much aware of our high demands and standards and after passing our selection criteria we will continue to monitor the supplied quality.”

Although we passed our latest ISO audit with flying colours, this does not mean we can relax. We continue to improve, reinvent ourselves and keep our ‘Passion for Quality’ ■

DEKRA

CERTIFICATE

Number: 46264

The management system of:

Kipp & Zonen B.V.

Delftechpark 36
2628 XH Delft
The Netherlands

including the implementation meets the requirements of the standard:

ISO 9001:2008

Scope:
the development, assembly, sales and delivery of recorders for industrial and scientific applications, and of sensors for the measurement of meteorological parameters at Delft. Further this certification also applies to customer support and service.

Certificate expiry date: October 1, 2014
Certified for the first time: September 1, 1995
Certificate effective date: October 1, 2011

DEKRA Certification B.V.

drs. G.J. Zoetbrood
Managing Director

drs. J.M. Bertholet
Certification Manager

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All testing, inspection, auditing and certification activities of the former KEMA Quality are an integral part of the DEKRA Certification Group.

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Solar Monitoring Stations Brochure

Our new brochure ‘Solar Monitoring Stations’ is an inspiring and convincing overview of Kipp & Zonen, sun tracker based, solar monitoring stations installed all over the world, for different applications.

Inspiring, as it shows the variety of situations where solar monitoring systems are being set up, and the objectives of the various projects. Convincing, because customers have chosen Kipp & Zonen equipment for applications that require reliability, performance and high quality measurement data.

Examples range from an Extended Baseline Surface Radiation Network (BSRN) station in the plains of Inner Mongolia, to precise measurements of solar irradiance for Concentrated Solar Power (CSP) energy potential in South Africa, and monitoring solar plant performance in Spain.

This compilation of articles that were previously published in our Newsletters covers all types of solar monitoring stations, from a simple installation with horizontal and tilted pyranometers to more complex sun tracker systems measuring direct, diffuse, global and downwards infrared radiation; plus reflected and upwards infrared radiation.

When you read through this brochure, illustrating all kinds of solar monitoring stations, you will surely find a situation similar to yours. The setup described in the article can be a guideline for your own station. A useful companion document to this brochure is our informative guide ‘Solar Radiation Measurements for Solar Energy Applications’ to help you select the most appropriate system configuration.

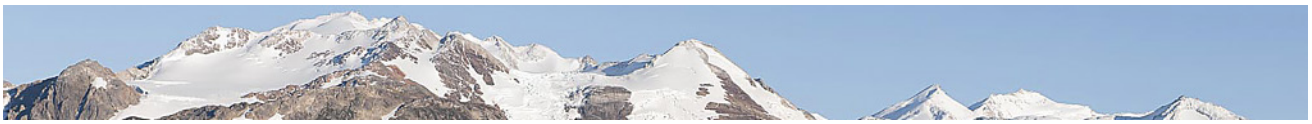
Please find the Solar Monitoring Station brochure at:
www.kippzonen.com/SolarMonitoringStations

and the Solar Energy guide at:
www.kippzonen.com/SolarEnergyGuide ■

Solar Resource Assessment: Making Sense of Data

By Dr. Jaya Singh, BKC Weathersys Pvt. Ltd. of New Delhi, the Kipp & Zonen distributor for India.

Accurate assessment of solar radiation is the foundation upon which profitability of the solar energy industry rests. Precise, on-site, ground measurements with calibrated equipment, is the gold standard for ensuring an accurate assessment of solar irradiance. However, what happens when you've bought the right equipment and are still not getting the kind of results you expected?



Is the equipment at fault? Or have all aspects of the site-geography, environmental conditions, and local weather conditions been considered? This article describes a situation where the measured radiation was out of the expected range and the radiation measurement equipment was presumed faulty. BKC found that by taking into account existing weather and environmental conditions for that particular geographical location, the measurements were in fact accurate.

When setting up a capital intensive solar power plant, an accurate assessment of the available solar radiation should be the first step in evaluating the energy output at a certain site. Initial estimates using historical data for a typical meteorological year (TMY) are a good starting point, but they remain just that, a starting point. For estimates of solar energy yields that can ultimately formulate bankable reports for establishing solar plants, accurate ground measurements on-site are imperative.

Along with solar radiation, meteorological parameters such as wind speed, wind direction, ambient temperature, relative humidity, and other environmental factors such as cloud cover and dust, also impact upon the solar energy available at any given site. Thus, accurate measurement of all of these parameters using high accuracy instruments is invaluable for solar project development and R & D purposes.

Through partnership with Kipp & Zonen and other leading OEMs, BKC Weathersys provides turn-key solutions for solar monitoring stations and also monitors data output for accuracy. Ground measurements can also be correlated with satellite data and advanced solar models to ensure accuracy as you will see in the case study below.

In the following case study a client with a solar monitoring station on a glacier in the Himalayas was having problems. Something was wrong with their set-up. Of late, their readings seemed way-off. Could we please look at the data and decipher what was going on?

Case Study: Reflection of Solar Radiation at Yala Glacier, Himalayas, Nepal.

Introduction

A research institute had installed a solar monitoring station on a glacier in the Upper Himalayas. After a month they reported strange radiation data. The station included a Kipp & Zonen CNR 4 net radiometer; which has two pyranometers that measure incoming and reflected short-wave solar radiation, and two pyrgeometers that measure long-wave radiation from the sky and the ground.

Instrumentation

The CNR 4 net radiometer is a high quality, reliable instrument with proven performance in polar conditions. Apart from the four radiation measurement sensors, two temperature sensors, a Pt-100 and a 10K thermistor, are incorporated to correct the long-wave far infrared readings for the temperature of the CNR 4 instrument housing. In addition there were six other sensors for meteorological and environmental parameters. The data outputs from all seven instruments were fed to a RTDL-11 data logger from Real Time Solutions Pvt. Ltd. There was also a solar panel, with battery charger and controller, to power the system.

The Problem

The extra-terrestrial 'solar constant' of approximately 1,367 W/m² is the solar radiation expected at the boundary of the atmosphere. Under normal conditions, the global horizontal irradiance (short-wave solar radiation) arriving at the Earth's surface rarely exceeds 1,200 W/m², whilst the long-wave radiation does not usually go beyond 400 W/m². However, during June 2012, the measured global radiation was more than 1,700 W/m².

The customer attributed the cause to faulty instrumentation and set-up. Fifteen days of data were available for analysis by BKC Weathersys.

The Solution

The data from the CNR 4 for 15 days at the Yala Glacier, Himalayas was analysed by our team.

It was clear that the radiation value surged rapidly from a low level, remained at that level, and then declined to normal values, indicating that before the acceleration there must have been some cloud in the sky. Clear sky conditions remained for a short while, before cloud cover arrived again.

The incoming short-wave 'global' radiation and reflected short-wave radiation are shown in figure 1.

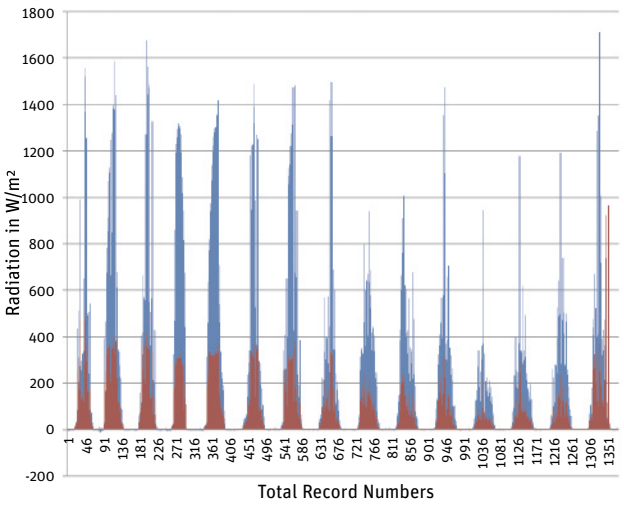


Figure 1. Short-wave radiation; blue - global, red - reflected

The long-wave radiation from the sky and long-wave radiation from the ground are shown in figure 2.

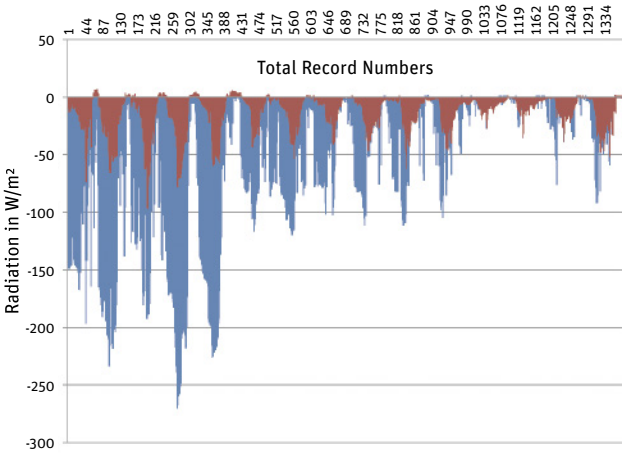


Figure 2. Long-wave radiation; blue - from sky, red - from ground

The reason for the sharp rise in radiation is because the cloud acted as a mirror, reflecting sunlight to the sensor and increasing the reading compared to a clear, diffuse sky. This happens at high altitudes with a clear sky and some bright white cumulus clouds (not covering the sun) and can result in global radiation values exceeding the solar constant, up to more than 1,400 W/m². To reach a measured irradiance of 1,700 W/m² requires another effect.

The monitoring station is installed on the slope of the glacier with snow covered rock above it. This means that the upper sensors of the CNR 4 see not only the sun and sky, but highly reflective surfaces that are producing irradiance much higher than the diffuse sky normally seen by a pyranometer or pyrgeometer. The reflection can be up to 80% of the incoming radiation, depending upon the type and age of the snow and ice.

In summary, we concluded that the radiation data being measured at Yala Glacier was accurate and within range for the location.

Conclusion

This case study shows that local geography, site topology, meteorological parameters, and environmental conditions have a big impact on the measured solar irradiance. All of these factors need to be taken into consideration when validating the final derived data.

This study endorses the use of ground observations at the selected site as the most appropriate and accurate method of carrying out such research or resource assessment. Our analysis enabled the research institute to not misdirect resources towards fixing 'faulty instrumentation' when other conditions accounted for the seemingly out of range data, which was, in fact, correct and real ■

Bankable Data: Foundation of a Successful Solar Global Energy Solution

By Sonia Turanski, RainWise Inc.

For many reasons solar generation looks to be a promising energy sector for the future. However, prior to fully embracing solar production, utility companies, independent power producers and developers are confronting several critical concerns regarding the reliability and economy of this technology that will shape the stability of widespread solar deployment.

Before prudent investors will commit, they want to know what energy production results can be expected from a given PV array or plant. Understanding PV module and array performance is fundamental to predicting and maximizing actual electrical production and for scheduling ongoing maintenance.

The standard method for testing module and array performance in the past has been to utilise a single reporting condition set at an artificial uniform ambient temperature of 25 °C. This standard reporting condition does not reflect actual on-site operating conditions where 50 °C (or -10 °C) can be more common. More importantly, an artificial environment does not accurately address variable weather factors involved in actual outdoor performance.

Being able to provide quality 'bankable' statistics from a given site is fast becoming a primary concern. The bankable data that investors seek is based on the ratio between the output power of the equipment and the available sun at the specific location. To determine this ratio (and ultimately the efficiency of a site) performance data must be initially gathered on-site to create a base of output expectation, and then continually assessed to track whether the plant is meeting the anticipated production goals.

Simply monitoring the level of energy production of PV modules or arrays only provides information about the problem, not the solution. Using continuously active on-site meteorological data gathering equipment, monitoring can expose certain problematic conditions that reduce optimum solar gain, including shadowing from structures around plant, misaligned or moved panels, and dirt on the panels. Gauging the surface temperature of a given panel is also helpful to monitor because if the actual panel gets too hot the efficiency will go down.

In response to the need for a compact easy to install weather station specifically designed for solar plants that require the highest standard in dependable data, RainWise Inc. based in Maine, USA, developed the PVmet weather station series.

Consolidating all the necessary sensors into a convenient package, the weather stations in the PVmet series offer sensors aimed at dirt, misalignment and shadowing concerns, global and/or plane-of-array sensors for irradiance solar monitoring, back-of-module sensors to track the panel temperature, and wind speed/direction sensors to track cooling effects. Wind speed can also give indications of incoming storms, information that helps tracking panels to go into 'stow' formation for protection - an important safety measure in hurricane and tornado prone areas.

Sites being funded by investors require a high level of accuracy and accountability in the data acquired by the sensors, the solar sensors in particular. In response to this concern, RainWise upgraded the irradiance sensor to the highly accurate Kipp & Zonen thermopile CMP pyranometer line and is now able to offer a spectrum of these higher accuracy sensors depending on the needs of the industry. The wind sensor has also been upgraded to an ultrasonic sensor with no moving parts, thus reducing maintenance and repair and increasing longevity.

PVmet efficiency monitoring weather stations are successful in providing the optimal environmental data necessary for maximizing actual on-site performance modeling. Providers and investors now have the necessary instruments for acquiring bankable information with which to move forward in the development of dependable mid and large-scale solar power plants.

Find out more about RainWise Inc. and the PVmet Solar Panel Monitors at: **www.rainwise.com**

Solar Instruments applied to Vehicle Testing by Hyundai America Technical Center

Hyundai America Technical Center Inc. (HATCI) is the design, technology and engineering arm for all North American models of the global vehicle manufacturer Hyundai-KIA Motors Group. At HATCI cars are being tested to the extreme with the aim to exceed customer demands and provide the best quality and reliability. The test programmes maximize and accelerate exposure to all North American climate conditions. The accurate measurement of solar irradiance with Kipp & Zonen instruments is part of these impressive vehicle test programmes.

Vehicle soak test at the California Proving Ground with CMP 11

HATCI headquarters are located in Ann Arbor, Michigan. There are additional facilities at the Hyundai Engineering & Design Center in Irvine, California, and at The California Proving Grounds in California City. The Proving Grounds are amongst the most comprehensive and advanced vehicle testing facilities ever built.

At the Vehicle Design, Development and Testing Department Kipp & Zonen CMP 3 pyranometers are mounted on vehicles to measure the solar load in real-world conditions. The measured solar load is then duplicated in wind tunnel test chambers for exhaustive testing of vehicle performance under a variety of road and environmental conditions.

The Vehicle Evaluation Thermal Systems Group uses CMP 3 pyranometers to evaluate HVAC (heating, ventilation and air conditioning) and engine cooling systems in field tests in both desert and winter conditions. This way they ensure that vehicle systems respond as expected under the various sun load conditions that the North American climate offers. Pyranometers are used to measure the solar load at the roof of the vehicle and, for some tests, to measure the solar load inside the vehicle.

Another department at HATCI uses CMP 11 pyranometers, CHP 1 pyrheliometers and UVS-A-T radiometers for interior and exterior component weathering testing and full vehicle soak evaluation. The interior test employs sun tracking fixtures, sealed under glass, that simulate the cabin condition of the vehicle while the exterior test utilizes special UV reflective mirrors attached to a dual axis tracking fixture that concentrates UV radiation onto the test samples.

The vehicle soak test utilizes production vehicles that are instrumented with thermal sensors on both the interior and exterior of the vehicle that feed back to a data logger. Soak testing is performed in a variety of climate conditions. For example, a pyranometer is mounted directly behind the front window of a car to measure the interior solar load during a full vehicle solar test at the California Proving Grounds facility.

Both Principal Engineer John Myers and Senior Engineer David Webb from HATCI agree “Kipp & Zonen is well known and we have been working with these instruments for many years, not just at HATCI. It was no question to choose Kipp & Zonen for our testing. It is the industry standard.”

The Hyundai America Technical Center Inc. website is at: **www.hatci.com**

Kipp & Zonen in the Sky: New Russian Airborne Research Laboratory

Yak-42 based airborne laboratory 'Atmosphere' on its maiden flight (photo by Sergey Lysenko)

Measuring parameters of the atmosphere over a large territory with high quality has always been a challenge for scientists around the world. Networks of ground-based stations and satellite instruments are routinely used for collecting data about different atmospheric parameters. But the limitations of these methods do not always provide the required quality of data. Ground-based stations require high spatial density and wide distribution over the territory. For such an enormous territory as Russia it is nearly impossible to have stations all over the country, especially as large parts of the country are not easily accessible. Satellite measurements on the other hand, are not always available in the right place and at the right moment and provide a limited set of data. Roshydromet decided to use another approach - a flying laboratory.

The Russian Federal Service for Hydrometeorology and Environmental Monitoring (Roshydromet), together with the Central Aerological Observatory in Moscow, and the Main Geophysical Observatory in Saint Petersburg, developed a special instrumented airborne platform (an aircraft laboratory) which will become an effective instrument for environmental research. The new airborne laboratory is named 'Atmosphere' and will perform simultaneous measurements of various parameters of the atmosphere and the Earth's surface with high spatial and temporal resolution in a given region - even in the most remote and difficult to access areas.

The laboratory will also allow the integration of ground-based and remote sensing data in one informational picture. As an extension to its functions the aircraft will also be used for cloud modification and control by means of cloud seeding. The YAK-42D aircraft was specially modified by Myasishchev Design Bureau of Zhukovsky, Moscow Region to satisfy the research needs of Roshydromet and to carry all the necessary equipment.

The aircraft carries a set of equipment that measures gaseous and aerosol composition of the atmosphere. The data enables the identification at an early stage of various climate factors that may lead to changes on regional and global scales. Both natural fluctuations and anthropogenic influences in aerosol composition, concentration of ozone, greenhouse gases, nitrogen oxides and other gases can be detected by the system consisting of lidar, gas analysers, spectrometers and chemiluminescent instruments.

The flying laboratory will be monitoring radioactive contamination of the air and the underlying surface by measuring gamma radiation dose rate and isotopic composition. The measurements made by such an airborne laboratory will allow not only the determination of the amount of pollution but also the identification of possible sources of pollution and directions in which that pollution may spread.

A special radar tracking system is used for research into clouds and precipitation and creating maps of different

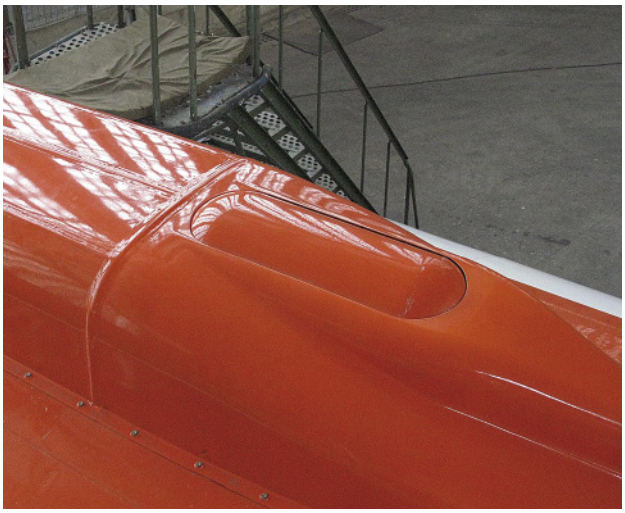
weather phenomena. Also the aircraft has onboard systems for measuring cloud microphysical parameters and cloud modification equipment.

A set of probes is used to measure electrical characteristics of the atmosphere, such as the potential of the ionosphere and its changes, and electrical charges in the troposphere associated with aerosol layers and clouds. Electrically charged cloud layers often represent a hazard for aeroplanes and the range of instruments onboard the flying laboratory will allow the study of these clouds with great detail.

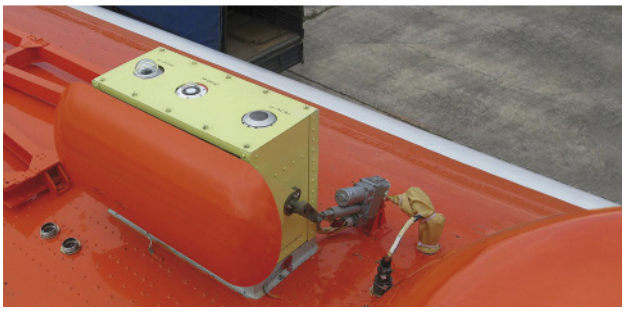
Instruments installed in special booms under the wings of the aircraft measure thermodynamic parameters of the atmosphere such as temperature, pressure, wind speed, humidity and atmospheric turbulences, which are necessary for analysing data from other measurement systems.

Radiative balance and remote sensing of clouds and the underlying surface is measured with a system that includes Kipp & Zonen radiometers. Instruments for measurements of solar, sky and terrestrial radiation were supplied via our Russian distributor RPO ATTEX. Two CMP 22 pyranometers and two CGR 4 pyrgeometers were installed on the top and the bottom of the aircraft to measure downward and upward short-wave and long wave radiation. A UVS-B-T was installed on top of the aircraft to measure the downward UVB radiation.

The instruments were mounted in a rack integrated into a specially designed fairing structure with a retractable cover to protect the instruments when no measurements are taken.



The fairing structure on top of the plane where CMP22, CRG4 and UVS-B-T radiometers are installed. (Photo: Roshydromet)



View with fairing removed: rack with radiometers and the retractable cover. (Photo: Roshydromet)

Measuring the net short-wave fluxes at the aircraft and at the surface allows determination of the absorption of solar radiation by the atmospheric layers below and above the aircraft. By measuring the long-wave thermal radiation at the same time the scientists can evaluate the influences of natural and anthropogenic aerosols and greenhouse gases on the radiative balance.

The data from high precision Kipp & Zonen radiometers are combined with high resolution spectral and brightness temperature measurements made by the scientific equipment developed in Russia by NPO Lepton of Zelenograd, Moscow Region, and the Main Geophysical Observatory.

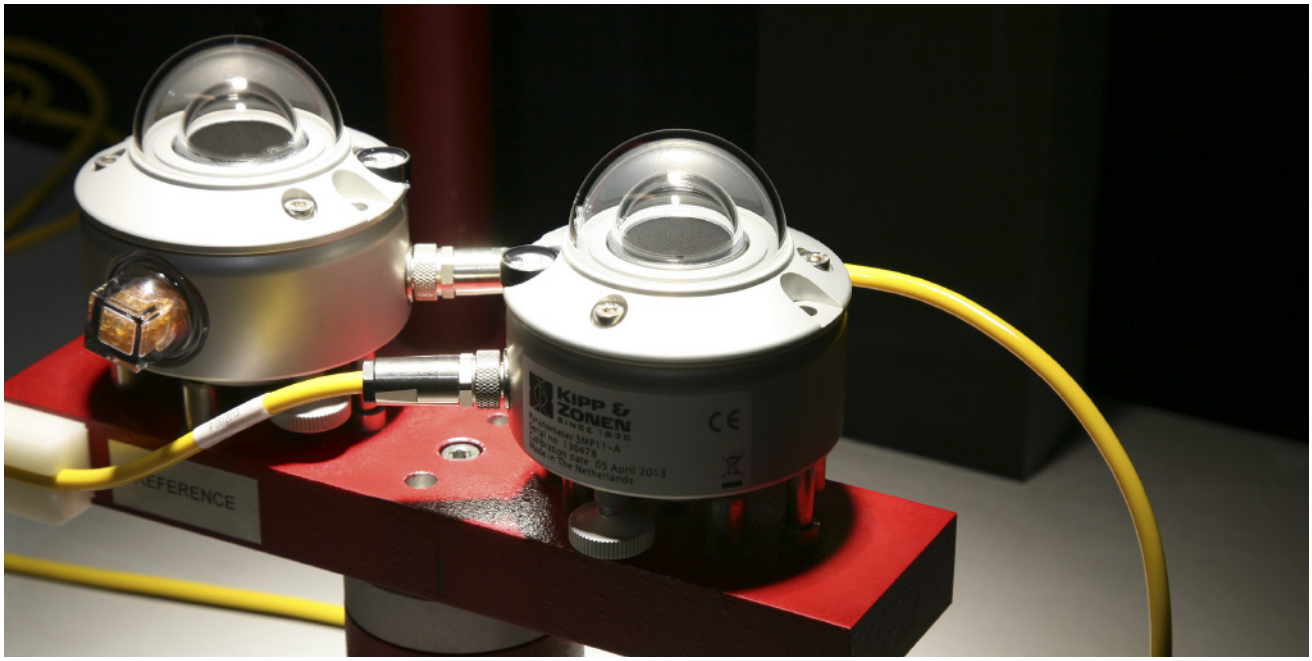
In the summer of 2013 the new flying laboratory of Roshydromet undertook a series of test flights to test the aircraft and the instruments in various conditions; maximum and minimum height, speed and acceleration, tilts, etc. From November the laboratory started its routine monitoring flights.

You can find more information about the 'Atmosphere' airborne laboratory and other projects on the websites of Roshydromet at **www.meteorf.ru** and the Central Aerological Observatory **www.cao-rhms.ru**.

Our distributor for Russia, RPO ATTEX, can be found at **www.attex.net**

Expanding our Global Calibration and Services

We're happy to announce that we've completed the expansion of our service facilities in 2013! It is now possible to have your Kipp & Zonen radiometers calibrated at all our offices. Not just in Delft, but also in Paris, New York and Singapore! Every office now has the resources, expertise and facilities to calibrate pyranometers in compliance with ISO9847.



Following customer requests and increased demand for calibration, Kipp & Zonen made the decision last year to expand our services with improved facilities in the USA and new calibration centres in Singapore and France. The main advantages are the reduction of turnaround time and shipping costs for regional customers

The start of this project was to improve and further automate the design of the calibration facilities used at the factory in Delft with all-new electronics and software. One of the benefits is that the three new calibration tables at our offices recognise the reference sensors automatically by radio-frequency identification (RFID) and select the relevant information from our database. This is very helpful in preventing errors and makes the calibration process quicker and simpler.

After the development of the new calibration table two of our R&D colleagues from Delft, software engineer Erik Nagel and physicist Ilja Staupe, completed factory acceptance tests of the tables before they were shipped. They both travelled to all three offices to install the new calibration facility and train the engineers thoroughly to ensure that the quality level of Kipp & Zonen is guaranteed. They finished each visit with a successfully completed site acceptance test. All three offices also have the infrared calibration equipment for pyrgeometers.

From our French, Asia Pacific and US offices we can now offer sensitivity calibration of:

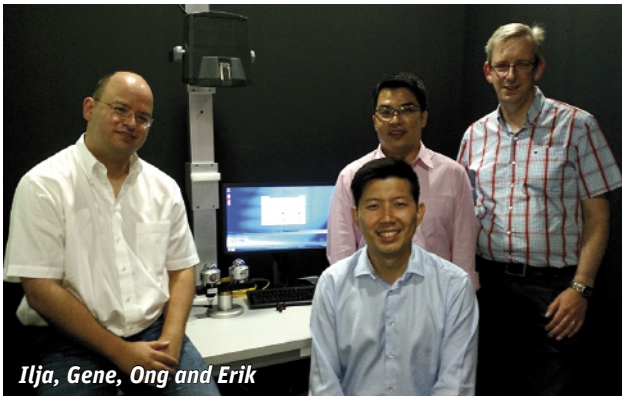
- CM and CMP pyranometers, with the exception of the CM 22 and CMP 22
- SMP pyranometers
- CM 4 pyranometer
- CG and CGR 3 pyrgeometers
- CNR 4 net radiometer
- CMA albedometers

All the pyranometer and albedometer calibrations are to Annex A.3 of the international standard ISO 9847 'Calibration of Field Pyranometers by Comparison to a Reference Pyranometer'. Annex A.3 refers to 'Calibration Devices Using Artificial Sources'. The equipment and method is specifically referred to in ISO 9847 as the 'Kipp & Zonen Device and Procedure'.

Each office has a set of reference instruments calibrated at the World Radiation Centre (WRC) in Davos, Switzerland.

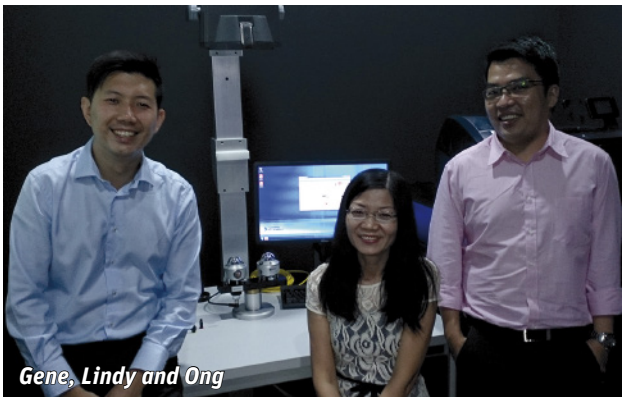
All the office calibrations are made through the database server in Delft, so that the records are centralised and traceable. These data links also allow remote access to all the calibration facilities, so that Erik and Ilja are able to support our office colleagues and monitor the calibration quality.

"We look forward to randomly checking and testing the database and will not warn our engineers when a secret instrument from a fictitious customer is sent for calibration, to test their competence" says Ilja, who is also a member of our Calibration Committee.


Ilja, Gene, Ong and Erik

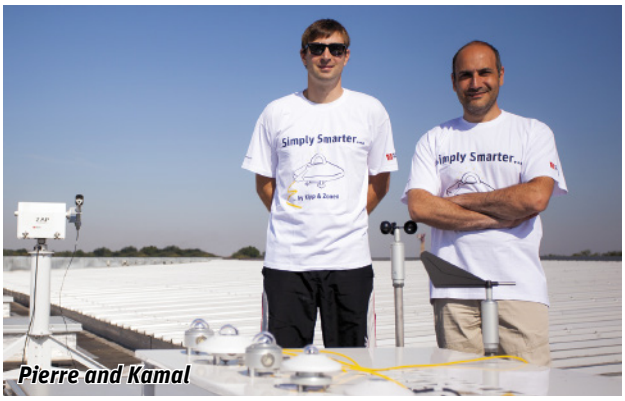
Ong Chee Hiong, Service Engineer at Kipp & Zonen APAC

"My first calibration went smoothly and the customer was pleasantly surprised with the short lead time of 1 week! Previously it used to be 4 to 6 weeks because it had to be sent back to Delft. With the implementation of the new calibration lab in Singapore, and calibration support from the factory, APAC customers can now send their instruments directly to us and still be sure of the same accuracy of the sensors without worrying about the turnaround time."


Gene, Lindy and Ong

Pierre Simonneaud, Customer Support Technician at Kipp & Zonen France

"After training from our R&D colleagues on how to use the calibration facility, I was able to successfully perform my first calibration. It was a real pleasure using the calibration facility, and discovering all its advantages; automated, RFID, connected to server, etc. Thanks to this new facility, customers can be sure to have their instruments inspected and calibrated within a short time and with French Quality! We expect to calibrate instruments in less than 2 weeks, while the average lead time used to be around 4 weeks."



Pierre and Kamal

Victor Casella, Sales & Marketing Manager Scientific Markets at Kipp & Zonen U.S.A.

"We have been doing calibrations under the Kipp & Zonen guidelines since 2008. Now, together with the other Kipp & Zonen offices, the US Office has made the investment to have a fully duplicated traceable calibration table for future use. Over the past years we have prided ourselves on quick turnaround times, in most cases less than a week. We can also schedule services so we can turn the instruments around in 24 hours if emergencies come up." ■

Victor

Fairs & Events

World Future Energy Summit (WFES) Abu Dhabi • United Arab Emirates	20 - 22 January
AMS Annual Meeting Atlanta • Georgia • USA	2 - 6 February
Intersolar China • Beijing • China	26 - 28 March
EGU General Assembly • Vienna • Austria	27 April - 2 May

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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