

The

A newsletter for the customers of  
Campbell Scientific, Inc.

# CAMPBELLUPDATE

January, 2002

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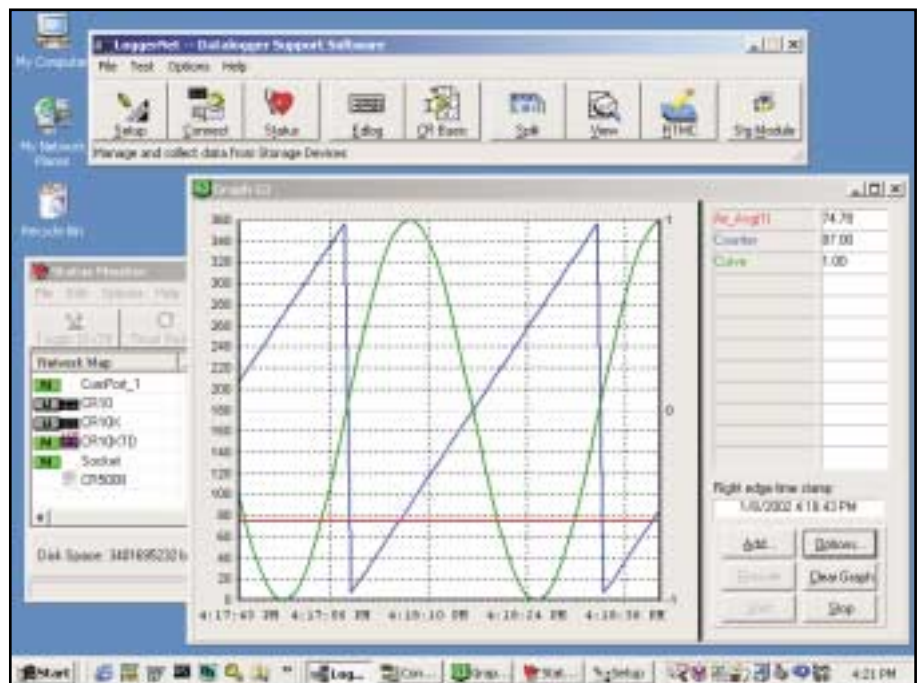
Volume 13, Issue 1

## LoggerNet 2.0 to replace PC208W

*New version will serve as primary datalogger support software*

Early in 2002, we will release LoggerNet 2.0 as our primary datalogger support software. LoggerNet is 32-bit software that provides many new features, including support for our Table-based dataloggers. We will continue to offer the 16-bit PC208W at its current revision level through the end of 2002. After 2002, we will no longer sell PC208W, but we will provide technical support.

LoggerNet 2.0 retains the significant functions of PC208W software, such as support for array-based dataloggers, telecommunications options, and scheduled data retrieval. LoggerNet includes 32-bit versions of Edlog (datalogger program editor), Split (processing data files and creating reports), View (graphing and viewing data files) and SMS (storage module support software). The files created by earlier versions of these programs are forward compatible; LoggerNet includes a software utility to convert PC208W network setups to LoggerNet network setups. Additionally, new applications in LoggerNet, such as CRBasic Editor



*LoggerNet 2.0 retains much of the look and feel of our PC208W software, but offers significant new functionality.*

(CR5000 and CR9000 program editor) and RTMC, provide new functionality.

LoggerNet runs from a simple "PC208W-like" toolbar that controls both a server and its clients. You don't have to manage the log-ins, log-outs, and client-server communications.

Most PC208W users will find LoggerNet both familiar and easy to use. You can customize the toolbar to provide easy access to the LoggerNet applications of your choice.

**See LOGGERNET on Page 3**

## Expanded price lists now include systems and WR products

Our 2002 price lists are now available. The US and International Price Lists now include the Bowen ratio system, the Time Domain Reflectometry system (TDR), the ET106 Evapotranspiration Station, and many Water Resources products (primarily sensors and datalogger operating sys-

tems). Price lists for the Trace Gas Analyzer, specialized Water Resources products, the MetData1 Weather Station, and products available on GSA contract will continue to be published as separate documents.

We expect additions to our product line

throughout the year.

To review changes to our price lists, visit [www.campbellsci.com/new.html](http://www.campbellsci.com/new.html) periodically.

Please note our wire transfer instructions have changed; contact our Order Entry Department for details.

## Message from the President

# It's time to enjoy the Olympic Winter Games

By Paul Campbell

This issue of *The Campbell Update* should be in your hands within a few weeks of the 2002 Olympic Winter Games, hosted by Salt Lake City. An article on Pages 7 and 8 gives an overview of weather monitoring at the Utah venues. Since hosting the games is probably a once in a lifetime event, I would like to share some of my thoughts about it.



The early groundwork to prepare a bid started on a shoestring budget. Campbell Scientific was approached to provide equipment to monitor weather at potential ski jumping, bobsledding, and cross-country skiing venues in Summit County, east of Salt Lake City. We entered into a good-faith agreement so equipment could be placed in the field immediately, then subsequently paid for as funding was approved by the state legislature. So beginning in January, 1990, critical, site-specific winter weather measurements were recorded. We viewed the business

risk as doing our part to support Utah's Olympic bid effort.

Campbell Scientific is located in Cache Valley, Utah, about 90 miles (150 km) north of Salt Lake City. Our winter weather is similar to that of the skiing venues. As Utahns, we wondered a little about the effort that was put into gathering and presenting weather data because the temperature and precipitation can vary quite a lot from year to year. But if the winter weather data proved encouraging, and Utah was selected, who could argue with success?

Having been supportive of Utah's Olympic proposal, I was chagrined when it was reported that the bid was awarded perhaps not so much on merit as on favors for International Olympic Committee members. Like most Utahns, I was offended by the improprieties. I appreciated the leadership of Utah's governor, who declared that even though the graft did not begin with the Salt Lake Organizing Committee (SLOC) bid, it should end with it. Personnel changes, among other things, were made. In the end, it appears that criminal prosecution of former SLOC members has been dropped, so those who claimed they didn't break the law may have been right. But I hope that future bids will not be tainted with the kind of personal gifts and favors found in pre-bid SLOC activities.

As I write this article in December, we have the prospect of great snow conditions. After more than a year of well-below-average precipitation, several storms during the past several weeks have provided a good base of snow. Hopefully, this winter weather will continue through the end of February.

The events of September 11 have influenced the Olympic Winter Games. The Governor has announced the activation of 1900 members of the Utah National Guard to assist law enforcement agencies with security during the Olympics. There are a couple of employees at Campbell Scientific who are in the Guard, so the rest of us will work a little more to cover for them while they take care of their military duties. We do it willingly and with appreciation for their service.

The Bridgerland Ice Arena, Cache Valley's new year-round skating rink, will open the first of January, just in time to host practices for some Olympic athletes. We are pleased to have the Swiss hockey team, Chinese speed skaters, and the Russian and French figure skaters visit our local community for practice sessions and exhibitions.

If all goes well, I'm sure we will all enjoy the Olympics. We at Campbell Scientific join other Utahns in stating that we are pleased to host the Games. We hope that you will enjoy the Games too.



*Intrepid Campbell Scientific employees install a meteorological tower in preparation for Salt Lake City's Olympic Winter Games bid (winter 1990/91).*

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Use VisualWeather to program and display data from your preconfigured weather station.

## VisualWeather: Your data in just a few minutes

VisualWeather™ software is for customers who want reliable, real-time weather data without worrying about technical details, such as programming the weather station, using client-server technology, or maintaining databases.

VisualWeather helps customers set up and use our preconfigured weather stations—the ET106 or MetData1—in just a few minutes. Each station's program is automatically generated as you select the sensors, scan interval, output interval, and communication path. VisualWeather supports five modes of communication: direct, short haul, phone, phone-to-RF, and RF.

VisualWeather supports multiple weather stations, allowing customers to connect to any ET106 or MetData1 station set up using VisualWeather. Data can be collected manually or by setting the software to make scheduled calls. VisualWeather stores the retrieved data in a database, which is transparent to the user. The data can be exported in comma-separated ASCII format for storage or data processing.

You can create daily, 24 hour, 7-day, or 30-day reports for any station currently in the network. Historical reports can be generated for active stations or for stations that have been removed from the network. Evapotranspiration (ETo), crop water needs, and growing-degree-days can be obtained by entering a few parameters, such as station elevation, latitude, and longitude. Each report contains a graph as well as tabular data in metric or US units. You can also plot custom graphs including wind roses, wind chill, or heat units. These features, combined with a simple user interface, make VisualWeather a powerful software package for novices and experts.

## LoggerNet

Continued from Page 1

PC208W owners can upgrade to LoggerNet for roughly 50 percent of the LoggerNet list price. Free "within-version" patches will be offered from our Web site as they are released (e.g., from LoggerNet 2.0 to 2.1).

### Client-Server Power

LoggerNet consists of a server application and several client applications. The server application is the heart of LoggerNet communications. Client applications connect to the server to change its settings, use its features, and extract data. One example of client/server architecture is email. When you send email, you're working with a client application on your PC (e.g., Outlook, Eudora, Pegasus). The client application sends messages to a server. The server connects with the Internet to send and receive email messages for you and others. You can instruct your client email program to connect to the server and retrieve any email message stored on the server for you.

Similarly, the LoggerNet server is the program that runs on the main PC, which uses TCP/IP to communicate with client applications. You set up the network to use phone modems, telephony devices, RF modems, TCP/IP sockets and other devices to communicate with the dataloggers. The server stores the data in ASCII files. Both client and server applications can run on the same PC providing the "one

computer feel" of PC208W. Alternatively, any PC can "talk to" the server via TCP/IP allowing the client PCs to be anywhere. Client applications set or change the network, request real-time connections to dataloggers (for setting the clock, sending programs, monitoring, etc.), or create new ASCII files. For LoggerNet 2.0, this only benefits those who use RTMC to view data from another PC. In future versions, other client applications will be able to use this function.

One of LoggerNet's new applications is the Real Time Monitoring and Control Client (RTMC). RTMC allows users to configure their screens to display and set input locations, flags and ports as well as view final storage data. It provides digital, tabular, graphical, and binary data objects, and alarms. RTMC can display data from any number of dataloggers in the network and organize the data on multi-tabbed displays. It offers a variety of background graphics, but allows you to supply your own graphics to customize your screen. RTMC saves forms that can be displayed on a run-time basis.

We're excited about the versatility and power that LoggerNet 2.0 brings to our customers. Combining the functionality of PC208W, LoggerNet 1.0, and RTMS into LoggerNet 2.0 provides the ability to mix and match dataloggers and data acquisition needs on a common software platform. LoggerNet 2.0 is poised to take advantage of the new communications protocols now available, providing easy access to TCP/IP protocols and third party software programs.

## New LoggerNet handles both data file formats

The standard operating systems of our CR510, CR10X, CR23X, and CR7 dataloggers store data in an array-based format. The standard operating systems of our CR5000 and CR9000 store data in the table-based format. While PC208W only supports dataloggers with array-based

data format and LoggerNet 1.x only supports table-based data format, LoggerNet 2.0 can support both data file formats, allowing dataloggers with either operating system to be in the same network. As a result, we've added the table-data operating systems to our US price list.

### AM16/32 replaces AM416 Multiplexer

The AM416 Multiplexer has been retired, but technical support and repair will continue to be available. The AM16/32 replaces the AM416, and offers several design improvements including a smaller footprint, break before make relays, and the ability to manually switch between "2 x 32" and "4 x 16" modes.

### CR23X memory boosted

The onboard memory contained in the standard CR23X has increased from 1 to 2 megabytes. Despite the doubling of memory storage capacity, the price of the CR23X remains the same.



# Water content reflectometer gives improved accuracy

A new version of the Water Content Reflectometer, the CS616, is available from Campbell Scientific. The CS616 improves upon the measurement accuracy of the CS615 while matching its resolution and precision. New features include improved electrostatic discharge protection and reduced measurement time and sensitivity to signal attenuation. The improvements come from a refined circuit



The CS616 water content reflectometer (shown with the CR10X) improves upon the measurement accuracy of the CS615 while matching its resolution and precision.

design and use of new surface-mount electronic components that provide better high-frequency performance. The CS616 can be ordered with lead lengths up to 1000 feet.

Like the CS615, the CS616 consists of two 30 cm stainless steel rods that connect to an epoxy-encapsulated printed circuit board. The differentially driven rods form a transmission line with a wave propagation velocity that is dependent on the dielectric permittivity of the medium surrounding the rods. Nanosecond rise-times produce waveform reflections characteristic of an open-ended transmission line.

The return of the reflection from the rod ends triggers a logic state change that initiates propagation of a new wavefront. Since water has a dielectric permittivity significantly larger than other soil constituents, the resulting oscillation frequency is dependent upon the average water content of the medium surrounding the rods.

The megahertz oscillation frequency is scaled down and easily read by Campbell Scientific's CR510, CR10X, CR23X or CR5000 dataloggers. The probe rods can be inserted from the surface or buried at any orientation to the surface.

Each CS616 requires a single-ended input channel along with a control port to enable the probe. Multiple probes can use a single control port. Instruction 138 has been developed to measure the CS616 with the CR510, CR10X, and CR23X; measurement time is approximately 0.5 milliseconds. The period averaging instruction, 27, can also be used with the CR510, CR10X, and CR23X dataloggers. The CR5000 uses the PortSet and PeriodAvg instructions to measure the probe. Consult our product literature for versions of PC208W, LoggerNet, and datalogger OS that support Instruction 138.

Operating specifications (VWC = volumetric water content)

- probe-to-probe variability:  $\pm 0.5\%$  VWC in dry soil,  $\pm 1.5\%$  VWC in typical saturated soil
- accuracy  $\pm 2\%$  VWC using standard calibration with bulk electrical conductivity  $\leq 0.5$  deciSiemen meter<sup>-1</sup> in the 0% to 50% VWC measurement range
- precision 0.05% VWC
- resolution 0.1% VWC

## View data without opening enclosure with the CD294

Campbell Scientific Australia's CD294 "DataView" is a two-line, 32-character LCD that displays a datalogger's real-time input location value, its description, and measurement units. Two buttons allow you to scroll through 20 selected input locations. The CD294 is synchronized to the datalogger's Table 1 execution interval, so measurements can be displayed as they are made.

To conserve power, the DataView goes into a low power mode that draws only 12 microamps if a button has not been pressed within two minutes. The CD294 is designed to mount into the lid of an environmental enclosure; a template for an enclosure cutout, mounting screws, and O-rings are provided. The DataView is easily programmed using PC294W software and a PC programming cable, both of which are included.

## Assess duff moisture on-site

Campbell Scientific and the USFS Rocky Mountain Research Station have collaborated in the development of a duff moisture meter. Foresters and other land managers can use the DMM600 to make decisions for prescribed burns and fire fighting.

The water content of duff is an important factor in the propagation of fires (duff is decaying leaves and other forest litter that covers the forest floor.). Historically, duff water content was determined by collecting field samples in plastic bags and transporting the samples to a laboratory for analysis. The DMM600 allows quick and accurate on-site measurements using circuitry similar to our water content reflectometers.

To begin the measurement process, duff is placed in the measurement chamber of the DMM600. The crank is turned by hand to compress the sample to the measurement density, and the reading is automatically taken.

Volumetric water content measurements derived from a standard calibration and one user-defined calibration is alternately displayed until the sample is removed. The time required to determine water content is essentially the time required to load the sample. The actual measurement time is only tens of milliseconds.

Powered by a single 9-volt battery, the DMM600 is portable and robust enough for field use. It has a 3.5 inch diameter, is 10 inches long, and weighs approximately 3.7 pounds.

The DMM600 will be available in March, 2002.



Avoid the time delay and expense of lab analyses with the DMM600.



Automate leaf and soil surface temperature measurements using the compact IRTS-P. (Inset photos show recessed lens and mount.)

## New infra-red sensor measures temperatures

By Bruce Bugbee  
Apogee Instruments, Inc.

Accurate measurement of leaf and soil surface temperature has long been important to plant and soil scientists. Infra-red thermometers make this measurement based on the emitted radiation from the surface of an object. The unique, self-powered Precision Infra-red Thermocouple Sensor (IRTS-P) from Apogee Instruments measures emitted radiation and provides the surface temperatures as a type-K thermocouple output. The detector is custom built for Apogee by Exergen Corporation. The detector is modified to improve measurement accuracy with Campbell Scientific dataloggers. An aluminum body stabilizes the reference temperature, and a second thermocouple output measures sensor body temperature.

Accuracy is further enhanced by the precision thermocouple measurements that can be made with Campbell Scientific dataloggers. Each sensor is supplied with a 12-instruction datalogger program that adjusts for the effect of sensor body temperature on target temperature. The sensor is designed to make continuous measurements in field conditions. A threaded hole facilitates mounting to a standard camera tripod or weather station tower. Complete specifications are available at [www.apogee-inst.com](http://www.apogee-inst.com)

Access new Raven II via the Internet

## Cellular modem efficient, rugged

Our 2002 price list includes a new cellular modem/transceiver, the Raven II. Manufactured by AirLink, the Raven II is a full-duplex unit that supports telecommunications via a cellular digital packet data (CDPD) network. CDPD modems are IP based, requiring an Internet address assigned by your service provider. By using the Internet to access your modem, you can eliminate long distance charges and dial-up time, pay for data throughput instead of airtime, and realize faster data throughput. Operating costs, initial equipment investment, and current drain are lower than analog cellular systems.

The Raven II is a rugged, lightweight modem that operates over  $-30^{\circ}$  to  $+70^{\circ}\text{C}$  and 5% to 95% RH. The data transmission rate is up to 19.2 Kbps via TCP/IP. Dialing delays are not required, allowing quick response for data communication. Built-in encryption maintains security of the data while transmitting.

The Raven II is a 600 mW modem with a typical current drain of 50 mA while receiving and 280 mA during transmission. A power cable included with the modem connects to the datalogger's 12 V or switched 12 V terminal. Connection to the switched 12 V terminal allows the datalogger to switch power to the modem



The Raven II allows you to shift from analog to digital cellular technology.

during scheduled transmission intervals, thereby conserving power. If this method is used, the modem can be powered with a BP12 battery and an MSX10 solar panel.

Components required are a Campbell Scientific datalogger, serial interface, Raven II modem, antenna, power supply, environmental enclosure, and instrument mount. Two antennas are available: a compact 2 dB whip antenna and an 8 dB Yagi antenna. If the site is near the edge of the CDPD coverage, you may need the Yagi. Contact your local cellular company to verify CDPD service is available at your site.

## CSBUOY: Floating data, minimal setup

The CSBUOY is a wireless, floating, self-contained package that can be deployed with a minimal amount of setup. It offers a fish farmer or water resource manager the ability to monitor critical water quality parameters from the convenience of their office.

The CSBUOY monitor/transmitter is housed in a protective polyurethane buoy. It is powered by a 7 Ahr, 12 Vdc rechargeable battery continuously charged by a 5 W solar panel mounted on the buoy. Deployed anywhere in the pond, the CSBUOY transmits data back to the pond-side monitoring and control system via spread spectrum radio, thus eliminating the cost and inconvenience of burying cable. In typical applications, the CSBUOY can transmit up to three miles. Where greater distances are needed, a higher gain 3 dB antenna with a clear line-of-site can transmit over 10 miles. This wireless method also allows the option of moving the buoy from pond to pond. Two CSBUOY models are available.



Completely self-contained, the CSBUOY measures water quality parameters in fresh water.

The CSBUOY-DT is preprogrammed and includes water temperature and dissolved oxygen probes. An agitator brush attached to the dissolved oxygen probe cleans the membrane to eliminate biological fouling.

The CSBUOY-NS is a platform without probes. A variety of water quality probes, including SDI-12 models, are compatible with this buoy. Custom programming is required.

## Kipp & Zonen sensors measure solar radiation

### New Pyranometer

Kipp & Zonen's SP-LITE Pyranometer has been added to our 2002 price list. The SP-LITE measures incoming solar radiation for the spectral range of 400 to 1100 nm. The sensor uses a photodiode to measure radiation, and includes a shunt resistor to convert the output signal to mV. All SP-LITE sensors have a sensitivity of  $10 \mu\text{V}/(\text{W m}^{-2})$ . The 14282 leveling fixture is used to mount the SP-LITE to the 015ARM or 025STAND.

### NR-LITE Net Radiometer

The NR-LITE Net Radiometer measures net radiation in the 0 to  $100 \mu\text{m}$  spectral range. It includes two black conical absorbers, one facing up, the other facing down. The absorbers are coated in Teflon® making them resistant to weather without requiring a fragile plastic dome. The 14264 bracket is used to mount the NR-LITE directly to a vertical pipe or to a UT018 Tower Mounting Bracket and Crossarm.

### CNR1 Radiometer

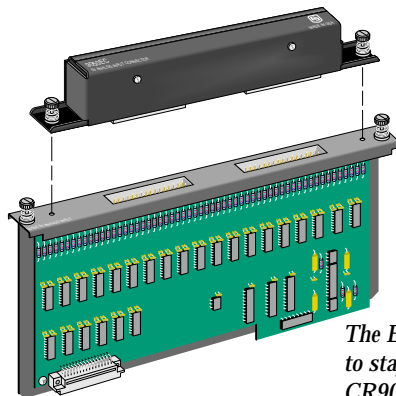
The CNR1 Net Radiometer is for applications requiring research-grade solar radiation measurements. The CNR1 consists of four radiation sensors—two pyranometers measure short-wave radiation, two pyrgeometers measure far infrared radiation. One upward-facing pyranometer/pyrgeometer pair measures incoming radiation while a complementary, downward-facing pair measures reflected radiation. The CNR1 also includes an RTD to measure the internal temperature and a heater to prevent condensation. A Campbell Scientific 4WPB100 100 Ohm Four-Wire PRT Bridge Module is included to interface the RTD to our dataloggers. The 14264 bracket is used to mount the CNR1 directly to a vertical pipe or to a UT018 Tower Mounting Bracket and Crossarm.

## CR9000 analog modules now include Easy Connectors

Our CR9050E, CR9052DC, and CR9055E now include a corresponding "Easy Connector" module. Sensor leads wire directly into an easy connector mod-

ule, which is easily removed from the CR9000 by loosening two thumbscrews. Additional easy connector modules can be purchased, allowing the sensors and the easy connector module to be left in place.

These complementary modules allow sensor wiring to stay intact, yet free the datalogger for other purposes such as: taking it to another site, installing it into another test vehicle, storing it in a safe location until further testing is required (hotel rooms at night), moving it to other test cells for similar tests, or relocating it to another monitoring location on a large structure.



The Easy Connector module (above left) allows sensor wiring to stay intact while the analog input module (lower left) and CR9000 are used elsewhere.

## Campbell Scientific Calendar

Date	Event	Location
<b>January</b> 27-30	Aquaculture America	San Diego, CA
<b>February</b> 4-7	IMAC-XX	Los Angeles, CA
6-8	Fish Farming Trade Show	Greenville, MS
7-9	GCSAA Golf Course Mtg. and Show	Orlando, FL
14, 15	Data 2002	Richardson, Ft. Worth TX
26-March 1	Utah Rural Water Assoc. Annual Conf.	St. George, UT
<b>March</b> 4-7	SAE International Expo	Detroit, MI
12, 14	Data 2002	Clearwater, Cape Canaveral, FL
26-28	TRWA Texas Rural Water	Corpus Christi, TX
<b>April</b> 2-5	Texas Water 2002	San Antonio, TX
8-10	American Water Resources Association	Soldotna, AK
<b>May</b> 7-10	ALERT Conf. on Flood Warning Systems	Santa Barbara, CA
20-23	Western Snow Conference	Granby, CO
20-24	Conference on Ag and Forest Meteorology	Norfolk, VA
21-23	Nat'l Water Quality Monitoring Conf.	Madison, WI
<b>June</b> 17-20	Northeast Forest Fire Supervisors	Gettysburg, PA
23-27	A&WMA Exhibit	Baltimore, MD

visit our website for additional listings and training class schedules



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Photography by Dan Judd

*Poised on Mt. Ogden overlooking the Snow Basin venue, a Campbell Scientific weather station shares space with a communications tower. Snow Basin will host a variety of alpine skiing events.*

### APPLICATION AT A GLANCE

Application type:  
Meteorological monitoring

Project area:  
Olympic venues, northern Utah,  
USA

Author:  
Dr. John Horel, et. al.,  
University of Utah

Contracting agencies:  
State of Utah

Datalogger(s):  
Campbell Scientific CR10(X)

Communication links:  
UHF radio, telephone,  
phone-to-RF

Measured parameters:  
Temperature, RH, wind speed,  
wind direction, precipitation,  
snow depth, snow temperature

*Multi-agency forecasting team relies on  
CSI stations to provide venue-specific data*

# Weather support vital for Olympic Winter Games

**W**hen Salt Lake City opens its doors to the world for the 2002 Winter Olympic and Paralympic Games this winter, adverse weather will be more than a casual concern. Not only could weather delay sporting events, it could also leave surface streets and highways encrusted in snow and ice, impeding venue access for athletes, Olympic officials, international media and spectators.

The effects of snowstorms and other large-scale weather systems are widespread throughout northern Utah. Hazardous winter weather including lake-effect snowstorms, ice fog, gap winds, downslope windstorms and low visibility over mountain passes are often related to local terrain features, the Wasatch Mountains and Great Salt Lake being the most prominent. As such, planning for a weather support system began in 1995, shortly after the International Olympic Committee designated Salt Lake City as host for the 2002 Games.

Managed by the Salt Lake Organizing Committee



*A station stands at Soldier Hollow Stadium, venue for the biathlon, all cross-country skiing events and the nordic combined.*

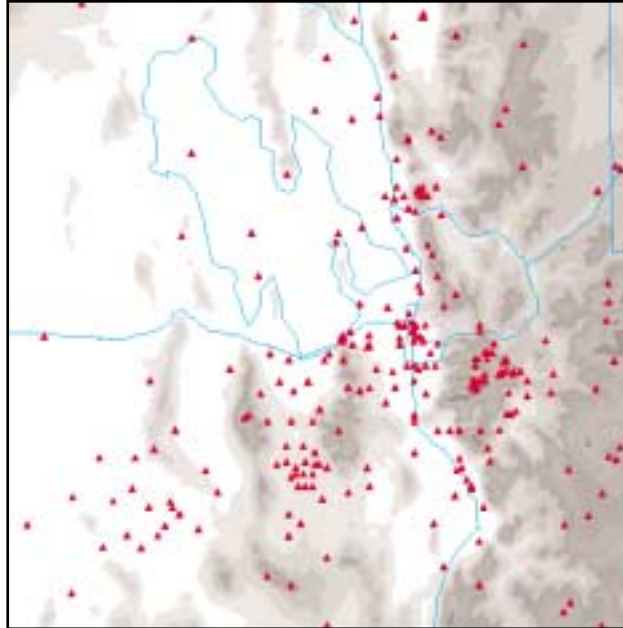
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(SLOC), the system, which includes Campbell Scientific automated weather stations, relies upon meteorologists from the public, private, and academic sectors of the atmospheric science community. It spans the network of indoor Olympic venues along the Wasatch Front (the metropolitan corridor west of the Wasatch Mountains that is home to the bulk of Utah's population and runs 110 km at ~1,300 m in elevation) and outdoor venues on the eastern flanks of the Wasatch Mountains which range in elevation from 2,826 m (9,270 ft) at the top of the men's downhill course, to 1,670 m (5,480 ft) at the cross country/ biathlon course. The variations in weather and climate from venue to venue are tremendous.

Forecasting responsibilities are likewise varied. Olympic weather support has traditionally been led by the host country's primary weather agency. But weather forecasting duties for the 2002 Winter Games will be shared by forecasters from the National Weather Service and KSL, Salt Lake City's National Broadcasting Company (NBC) affiliate. Individuals from other agencies, including the NWS Salt Lake Weather Forecast Office, the NOAA Cooperative Institute for Regional Prediction (CIRP), the NWS Western Region Scientific Services Division, the Aviation Security Operations Center (ASOC) at Hill Air Force Base, and the Utah Avalanche Center will provide data, resources and forecasts for specific Olympic-related applications. The SLOC weather support group also includes weather volunteers, including undergraduate and graduate students from the University of Utah and other local residents. Close coordination of all groups involved, therefore, will be vital if consistent forecasts are to be ensured.

The KSL team consists of 13 private-sector meteorologists charged with providing detailed microscale weather forecasts for the five outdoor venues. Assembled by Mark Eubank, KSL chief meteorologist, the venue forecast team has extensive experience forecasting northern Utah weather. Venue forecasters will have on-site access to the latest weather observations, graphics, and model data. Weather forecasts will be issued three times daily with updates issued as needed. Forecast fields include: sky cover, precipitation type and amount,



**(Left)** Red triangles mark the location of 278 weather stations (most of which are Campbell Scientific equipment) throughout northern Utah.

**(Below)** Four PCs at the NWS office in Salt Lake City use PC208W to call remote stations.

**(Bottom)** Shooting Star Jump Station on the downhill course.



air temperature, wind direction, wind speed, wind gusts, wind chill, visibility, humidity, and snow temperature. A joint weather phone conference will be conducted each morning between forecasters at the venues, the NWS Salt Lake field office, and the ASOC. Official manual weather observations will be started one hour before each outdoor event begins and will continue at 15-minute intervals throughout the event.

Since documentation of weather conditions prior to the Olympics was required for planning (and during the Games for operations) weather equipment was installed at venues and other key locations in northern Utah beginning in 1996. Portable weather stations manufactured by Campbell Scientific, Inc., that were deployed by the NWS Southern Region for the 1996 Atlanta Summer Olympic Games, were made available to the NWS Western Region after the summer games were completed. Also during 1996, the NWS Western Region and the National Severe Storms Laboratory began a research project in the vicinity of Salt Lake City to validate WSR-88D radar algorithms in regions of complex terrain. In support of that project, weather equipment was deployed at eight locations (four within the Wasatch Front and four at Olympic venues).

Forecasting and weather-data recording in preparation for the 2002 Olympic Winter Games have allowed a unique partnership to evolve since 1996, with government, commercial, and research



communities sharing weather information in northern Utah and throughout the western United States. Initially referred to as the Utah Mesonet, the collection of data outside of Utah led to its redesignation as MesoWest in January 2000. Now, during February and March 2002, weather observations will be available from over 278 locations in the northern Utah region.

*This article was derived from a manuscript submitted to the Bulletin of the American Meteorological Society. The full text is available at <http://www.met.utah.edu/olympics/>*



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