FRIGID 2003 Follow Up Web Chat Archive

A special chat session was held on Friday, May 9, 2003 at 9:15am EDT as a follow up to the FRIGID 2003 expedition to the North Pole. This chat session allowed students who participated in the live webcast on April 24th to ask additional questions to the investigators who were conducting fieldwork at the North Pole. Dr. Brent Holben and NASA Mike Comberiate, both from NASA's Goddard Space Flight Center, were the featured guests.

Dr. Holben said, “Good morning everybody! Glad you could join us…in a minute or so we’ll start taking questions just as soon as everyone signs in.”

Dr. Holben said, “Now that all the “good mornings” are out of the way, let’s get this academic chat session underway…I know that I have already received several EXCELLENT questions from a particular classroom on the Upper Peninsula of Michigan, so I’ll answer those one at a time as they come in.”

Karen said, “What was it like at the north pole from your point of view?”

Dr. Holben said, “Hi Karen, the North Pole was a great experience for me to appreciate the vastness of the polar region and to realize how little we know about the atmosphere there. I took advantage of this opportunity to establish a permanent monitoring site with an automatic sun photometer.”

Mike said, “Was it really cold there?”

NASA Mike said, “For the record, we had some really nice weather. It was clear and cold, but not windy. Great for landing a jet on a floating sheet of ice.”

Krysta said, “Why do you have to do a red reading and a green reading on the sun photometer?”

Dr. Holben said, “Great question Krysta… The green is a shorter wavelength than the red. The wavelength of the colors is about the same as the size of the pollution particles, and, therefore, interacts with those particles very well. When colored light strikes a pollution particle it is reflected by the particle at a particular angle. The longer the wavelength the smaller the angle of reflection. We can then use the information colored measurements to determine the size of the pollution particles.”

Karen said, “And why the dark voltage?”

Dr. Holben said, “Good follow up question Karen, and the answer is the dark voltage values the instrument makes when not observing the sun is because the electrical parts make an "instrument signal.” We must subtract that from the total sun measurements to get an accurate measurement of the pollution.”

Jewel said, “Why is the ice melting at the North Pole?”

NASA Mike said, “Jewel, we are in a global warming cycle. The only question is if it is a cycle or is it just going to keep getting warmer.”

Matthew said, “Do you know how long a full day is at the North Pole?”

NASA Mike said, “There is only one day-night cycle at either geographic Pole. Because of the way the Earth’s spin axis is tipped one Pole is facing the sun while the other is in the shadow of the Earth during half the year. Around the equinoxes the sun is near the horizon at both Poles.”

Jewel said, “Why do you have to use the sun photometer?”

Dr. Holben said, “Jewel, that is a very important question. These data are very useful to tell us how much pollution is in the air over us. Pollution particles can make people uncomfortable and in heavy concentrations over time make people sick. So knowing the pollution levels is important. Pollution contributes to changing the climate, making it warmer or colder or drier or wetter depending in the type of pollution and clouds. Also for satellite pictures of the earth, pollution makes these fuzzier. Knowing the amount of pollution that you measure in the red and green colors allows us to make the pictures clearer so we can see the Earth's surface better.”

Stevenm said, “Did you like going there and do you want to go back?”

Dr. Holben said, “Hi stevenm, I would very much like to go back, but not to live. I left a permanent station with a Russian scientist to collect measurements through the polar day, which is six months. I also left a station at 78 degrees North. Both of these must be retrieved around October so we can study the data and recalibrate the instruments, so I do expect to return.”

Jake said, “What do you use the info for?”

Dr. Holben said, “Jake, similar to Jewel asked, we use the information to determine the amount of pollution, to understand the health effects, and to correct satellite pictures.”

NASA Mike said, “I have a question for the students: do you think there is an ozone hole in the Arctic and why?”

Dirtridirx said, “yes, but I don’t know why.”

Jake said, “Yes, because it’s the time of year when the ice melts.”

NASA Mike said, “There is no giant ozone hole over the Arctic even though there are more CFC’s in the Northern Hemisphere. It is not cold enough long enough up there, as it is over Antarctica. However, small holes appear in various places when the conditions are right.”

SPIOffice said, “The ozone hole over the Arctic is considered variable by many experts, but there are satellites such as TOMS (Total Ozone Mapping Spectrometer) helping scientists to the study the ozone layer. I know that there was another question sent to Dr. Holben before hand that asked, “Why does the sun photometer have to be pointed directly at the sun?”

Dr. Holben said, “Well, the sun photometer must be pointed directly at the sun because we know exactly the brightness of the sun. The difference between the brightness of the sun above the atmosphere compared to the brightness we measure where we are standing is due to the atmosphere and the pollution (aerosols) specifically. If the instrument is not pointed exactly at the sun our reading will be smaller than they should be because the detectors are only seeing part of the sun. We would then think from studying the data that there is more pollution then there actually is.”

Ms said, “Dr. Holben and NASA Mike, thank you so much for your answers and your patience.”

Andy said, “Will the Algoma steel factory and paper factory make our readings different?”

Dr. Holben said, “Andy, you pose an excellent question. If the factories are putting out any type of pollution that you can see, the sun photometer will see it also.”

Why said, “Why do you have to do three readings on the sun photometer?”

Dr. Holben said, “Why, the reason we have three readings is very important. Since you have to remember the maximum value from a display that is often changing it is important to make sure you really make sure that it is what you think it is. Taking three or more measurements allows you student scientists to insure that you have a correct value for the conditions you are measuring. If conditions are partly cloudy to overcast the numbers will often change even when you choose the maximum value. Collection of 3 or more measurements allows us to know when it is cloudy by the high variability in the readings.”

Mary said, “What is a normal or typical reading for the sun photometer?”

Dr. Holben said, “Mary, a typical reading depends on each instrument calibration. Because of that the range maybe from several hundred to several thousand. The clearer the conditions the higher the number you will see on the display. When the sun is low in the sky and there is a lot of pollution the number will be smaller.”

Ms said, “I learned last night that we have two EPA sponsored air quality monitors in the Sault. Will you be able to access their data too?”

Dr. Holben said, “Dear Ms, if EPA has air pollution monitors then the data is part of the public record and is available for everyone. We often work with other groups to compare our data with theirs to ensure that we are deriving approximately the same information and complementing our respective data sets. Usually EPA data is available through the web.”

Sonny said, “Can you read the sun photometer even if it’s cloudy?”

Dr. Holben said, “Sonny, that’s a great concluding question for this chat session. If clouds are in front of the sun the voltages measured by the sun photometer will be greatly reduced which would suggest that you have a lot of pollution when in fact it is only cloudy. The best solution is not to take measurements when it is cloudy, but the GLOBE protocol requires at least three measurements. The variability we would see during cloudy conditions allows us to screen out these observations.”

SPI Office said, “This is Steve, and I want to thank everyone who participated today, especially Dr. Holben and NASA Mike for sharing their knowledge and enthusiasm for science and exploration with us…even more so, thanks to all of the students who sent in some great questions for our guests to answer…it is very evident that you did your homework and asked some very applicable questions…I hope that you learn something and even have some fun while using the sun photometers.”

Dr. Holben said, “It was great chatting with you all, have a great weekend. Cheers, Brent.”

Ms said, “Thank you all for the opportunity to chat with you today. Ms. Browning and the fifth graders at Soo Township.”

SPI Office said, “ Enjoy the weekend, and for more information about the FRIGID 2003 expedition go to http://spioffice.gsfc.nasa.gov/frigid2003.”