SCIENCE AND TECHNOLOGY CORPORATION

NEWSLETTER

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STC-METSAT Involved with Past, Present and Future of Meteorological Satellites

STC's METSAT Division in Fort Collins, Colorado has been a leader in satellite data processing and special studies for satellite-related atmospheric research for 25 years. Under the direction of **Dr. Thomas H. Vonder Haar**, one of the founders of METSAT, continues to push the limits of technology to create processing systems and value-added products for use by the meteorological community. Dr. Vonder Haar was recently elected to the prestigious National Academy of Engineering. Our scientists have also been selected as consultants to industry on future meteorological satellites. We are part of the National Polar Orbiting Operational Environmental Satellite System (NPOESS) Team of Northrup Grumman Space Technology and Raytheon. We are supporting the GOES-R, Next Generation (NG) U.S. geostationary environmental satellites, studies of ITT Space and Communications and Ball Aerospace. STC-METSAT has produced innovative, benchmark datasets to study the global occurrence of clouds and water vapor. These include the Climatological and Historical Analysis of Clouds for Environmental Simulations (CHANCES) global cloud database for military customers. The global, multi-year NASA Water Vapor Project (NVAP) dataset created by STC-

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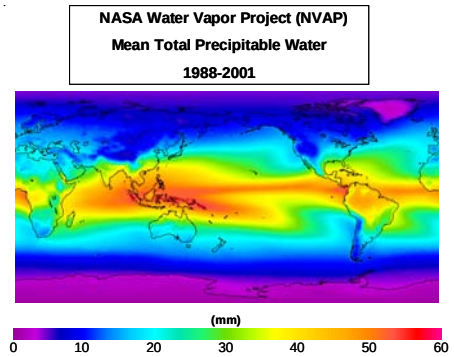

Global average precipitable water calculated from STC-METSAT's NVAP project. Values range from 0 to 60 mm.

Small Payloads at NASA Ames Research Center

Immediately after the Columbia Space Shuttle accident, the President and NASA stated that scientific space exploration would continue. The Small Payloads Team at NASA Ames Research Center (ARC) was tasked to find a way to get useful scientific experiments onboard the International Space Station (ISS) utilizing the Russian Progress unmanned vehicle as the transport vehicle. The criteria were that an experiment would take up little space, have almost no mass, require no power, survive being shipped to Russia and possibly several months with extreme temperatures and no maintenance, before reaching the ISS. Finally, the experiment would have to survive until the Space Shuttle return, a minimum of a year.

Dr. Jacob Cohen, STC Senior Scientist, is a part of the Small Payloads Team at ARC that has the responsibility of getting NASA

(*Continued on page 2; see* **PAYLOADS**)

Honors and Awards

CLASS achieves Carnegie Melon SEI Level 3 Rating

The Comprehensive Large Array-data Stewardship System (CLASS) is NOAA's premiere on-line facility for the distribution of NOAA and Department of Defense Polar-orbiting Operational Environmental Satellite (POES) data and derived data products. In October 2003, the CLASS Project was

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Phil Partain Receives "Recognition of Excellence" Award

Phil Partain of STC's METSAT Division received a "Recognition of Excellence" award from NASA, the Jet Propulsion Laboratory (JPL) and the CloudSat Project for his work in creating the Algorithm Interface Management System (AIMS), a tool that will facilitate the construction of the CloudSat data processing system.

Phil Partain

The CloudSat data processing system will include computer program modules developed at JPL, the University of Utah, and Colorado State University that will work

(*Continued on page 4; see* **PARTAIN**)

John Knaff Receives NOAA David Johnson Award

The prestigious NOAA David Johnson Award was presented to **Dr. John Knaff** at the 47th Annual Goddard Memorial Dinner, hosted by the National Space Club. Dr. Knaff is a CSU research scientist at the CIRA and an STC employee. The Award is presented by the National Space Club in honor of the first Adminstrator of what was to become the National Environmental Satellite, Data, and Information Service (NESDIS). This award was established in 1999 to recognize young scientists who have

John Knaff

(*Continued on page 4; see* **KNAFF**)

TruView's PhotoFlair® Helps Solve Crime

Last July, TruView Imaging Company, the digital imaging subsidiary of STC, received nationwide attention. TruView's digital image enhancement software package, PhotoFlair®, was used to enhance video images which helped police identify and arrest a man accused of sexually assaulting an 11-year-old girl in a Target store in West Virginia.

Before and after using PhotoFlair®

The South Charleston Police Department sought NASA Langley Research Center's help to improve a poor quality security video that showed a man stalking the girl before leading her into two different areas of the store and assaulting her at knifepoint. NASA researcher Glenn Woodell used PhotoFlair® to enhance the quality of video stills. PhotoFlair® features the STC/NASA co-patented Retinex automatic image enhancement algorithm. This technology was invented for remote sensing applications by **Dr. Zia-Ur Rahman**, now TruView's VP for R&D, and Dan Jobson and Glenn Woodell, both with NASA Langley Research Center.

When the police department received the enhanced video, they were thrilled with the results. Police Chief David Dunlap said an anonymous tip from a person in Kentucky led to the arrest of the suspect. He credited the capture to the PhotoFlair®-enhanced surveillance video and said they expected to use the video in the upcoming court proceedings.

Although everyone at TruView was happy about the suspect's arrest in this unfortunate case, the most gratifying moment came one month later when TruView received an e-mail from the victim's father with the subject: "most satisfied customer ever." It read, in part:

"I am the father of the 11 year old girl that was sexually assaulted at target in south charleston, wv. what you and nasa have done is unbelievable. we not only feel that your work helped in allen coates arrest but will be the most convincing evidence in his conviction. We can never thank you enough!!"

— Dad, W.Virginia, USA

Police in Norfolk and Hampton, VA and Philadelphia have also used PhotoFlair® to investigate bank robberies, murders, and pedophile cases. NASA has also used this software for the Columbia shuttle disaster investigation. The widest applications of PhotoFlair® , however, are in the area of general photography.

TruView® sells PhotoFlair® online at its website, www.truview.com.□

Before and after using PhotoFlair®

PAYLOADS (*Continued from page 1*)

life science payloads to fly, with the goal of ensuring the maximum amount of science possible for the Principal Investigators (PI) of the experiment. The team reviews experiments, works with the PI and hardware developer, and assures the proper documentation and testing are completed prior to flight.

After the Columbia accident, the role of scientists in the Small Payloads team was expanded. The Shuttle being grounded, the Russian Progress and Soyuz vehicles became the only way to get science experiments to the Space Station. Collaborations were soon established, enabling the Small Payloads Team to continue preparing microgravity experiments designed for transport on the Russian space vehicles. Microgravity experiments are small, require little or no power, and can be stowed on vehicles when space is available; thus flight opportunities may arise at very short notice.

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Sharing of flight samples from the first payload, Yeast GAP-1 (Yeast Group Activation Pack-1), with other scientists is facilitated by NASA's Biospecimen Sharing Program. This allows investigation of a biological sample by independent investigators, thus maximizing the scientific return – as well as giving American taxpayers the biggest return for their money.

Another recent payload the Small Payloads Team has participated in is ICE-FIRST (International *C. elegans* Experiment). *C. elgans* is a well studied small worm that is commonly used in biological research. ICE-FIRST is an international payload that was primarily managed by the French space agency, CNES, and included PIs representing six different space agencies (Canada, Europe, France, Japan, Netherlands, and USA). The experiment utilized a Soyuz taxi flight to deliver *C. elegans* up to the ISS and back. This experiment truly represented international cooperation and resolve in order to further man's understanding of the effect the space environment has on living organisms.

In addition to supporting individual PIs with their experiments, the Small Payloads Team has also been involved with producing two model specimen flight Payloads, CEMSS-1 (*C. elegans* Model Specimens for Space-1) and EMMYS-1 (Effects of Microgravity on Model Yeast Specimen-1). In these cases, no PI is attached to the project. The flight experiment is designed such that any scientist can submit a proposal for the samples. A committee reviews all the proposals submitted and awards the samples to those that are most scientifically beneficial. This approach differs from the Biospecimen Sharing Program in that it develops a broad experiment from which individual investigators will share the samples.

The submitted experiments were not only scrutinized by the Small Payloads Team but also underwent extensive review by NASA and international science work groups. For CEMSS-1 and EMMYS-1, the Team conducted a series of tests to determine the conditions that would yield optimal science based on what is normally performed in the scientific community. Currently, the scenario for a payload return is anywhere from 3 to 6 months, or longer; therefore, tests had to be performed on ways of assuring that the organisms and samples survive and return in an adequate state for research analysis. This is a challenge because typical laboratories have multiple methods of maintaining organisms,

(*Continued on page 3; see* **PAYLOADS**)

METSAT (*Continued from page 1*)

METSAT has been referenced in over 75 refereed scientific papers and is used by hundreds of scientists worldwide. STC-METSAT will play a prominent role in the upcoming NASA CloudSat mission, serving as the central data processing center. We occupy the unique niche of providing high-end data processing services while working on the cutting edge of meteorological satellite technology.

NVAP

STC-METSAT has been a partner with NASA since the mid-1990's to produce the NVAP dataset. Our core science team has remained intact during these 10 years. The scientific value of NVAP continues to grow as more years and measurements are added to this important climate record. NVAP is the standard for global, long-term observations of Earth's water vapor and cloud liquid water. The data set is unbroken for 14 years and has become a U.S. contribution to global Climate Data Records.

STC-METSAT team members (from left to right): Phil Partain, Tom Vonder Haar, Stan Kidder, Dave Randel, John Forsythe, Shannon Woo, and Ben Ruston.

Water vapor is the most important greenhouse gas and the NVAP products address important science questions such as is Earth's hydrologic cycle accelerating and is water vapor increasing in the atmosphere. STC-METSAT brought together satellite data from the SSM/I, AMSU, ATOVS, TMI, SSM/T-2, and NASA TOVS Pathfinder programs to create this daily global view of water vapor. These instruments were sponsored by NOAA, NASA and the DoD, reflecting the basic need for measurements of water vapor by many agencies. The NVAP dataset currently covers 1988–2001, and STC-METSAT intends to continue to produce NVAP further into the 21st century until it can overlap the new NASA EOS satellites.

John Forsythe is the NVAP project leader and team members include Dr. Tom Vonder Haar**, Shannon Woo, Dr. Dave Randel,** and **Ben Ruston**. Data for years 2000 and 2001 were completed in July 2003 and delivered to the NASA archive center at Langley Research Center for distribution to the science community. STC-METSAT has produced a highly successful CD-ROM about NVAP that will be distributed via the Global Energy and Water Cycle (GEWEX) project office in Silver Spring, Maryland.

CloudSat

STC-METSAT is under contract to Colorado State University (CSU) and NASA Principal Investigator, Dr. Graeme Stephens, to help build and manage the CloudSat Data Processing Center. CloudSat is a NASA Earth System Science Pathfinder (ESSP) mission that will measure the vertical structure of clouds on a global scale. Scheduled to launch in November 2004, the CloudSat satellite will carry a first-time-in-space 94 GHz cloud radar into polar orbit that will profile the Earth's atmosphere along its ground track. The radar will be capable of recording returns from clouds ranging from precipitation-laden thunderstorms to thin cirrus. Mission goals include the acquisition of data needed to evaluate and improve cloud parameterizations in numerical weather prediction and climate models leading to improved weather forecasts and climate change research. The satellite will fly in formation with EOS-PM (Aqua), ESSP-3 (CALIPSO), and up to two other small satellites providing an unparalleled opportunity for research employing multiple platforms and sensors.

STC-METSAT is helping to build the data processing system that will ingest the CloudSat radar data along with data from the MODIS instrument flown on Aqua and the ECMWF (European Centre for Medium-Range Weather Forecasts) numerical weather prediction model to produce data products that can be used by the science community. In addition to its work on development of the processing system infrastructure, STC-METSAT is responsible for working with the CloudSat Science Team members and integrating their science algorithms into the system. During the operational phase of the mission, STC-METSAT will manage the Data Processing Center and its various functions including data processing, quality assessment, data storage, and product distribution. **Phil Partain** is the lead science programmer. Following the CloudSat launch in April 15, 2005, STC-METSAT will support CSU data processing operations for several years.

Future Satellite Systems

Dr. Stan Kidder is the lead for our support to ITT Industries of Fort Wayne, Indiana on the GOES Advanced Baseline Imager (ABI) competition. In the 2010 timeframe, the ABI will become the prime weather-monitoring instrument over the United States and adjacent oceans. It will warn of hurricanes, severe thunderstorms and snowstorms. Data from ABI will be used to create the satellite animations seen on every newscast nationwide. STC-METSAT is addressing issues related to image quality, channel selection, and forecaster factors that will influence the design of ABI.

Dr. Vonder Haar and a number of senior science associates are currently supporting the Northrup-Grumman science team for NPOESS. NPOESS will be the primary weather-sensing polar-orbiting platform in 2010 and beyond.□

PAYLOADS (*Continued from page 2*)

preserving and possessing samples. To achieve this goal, the Team has conducted numerous experiments and tests on methods to preserve/stabilize and store samples in a dormant state to be activated just prior to return to earth. Tests were also conducted on methods of drying yeast samples, whether or not chemicals and solutions are stable at room temperature for long periods of time, etc. These tests, besides assuring a successful and safe experiment, also will have the benefit of producing methods that might be beneficial for scientists conducting research in other extreme areas such as field biology.

The Small Payloads Team not only tests the science aspect of the CEMSS-1 and EMMYS-1 payloads, but also has the responsibility of testing the flight hardware compatibility with the experimental scenario. Every facet of the experiment is tested. These tests are critical in assessing and ultimately mitigating problems that might arise with using specific flight hardware for scientific research.

Jacob Cohen

This approach to testing the science and hardware has ultimately found approval with the safety and QA personnel.

With the new presidential Human Research Initiative, the direction of NASA is shifting towards specific experiments aimed at sending humans to the moon, Mars and beyond. The Small Payloads Team has also shifted to meet the new initiative. The findings will be geared towards answering questions about long-term human travel.□

STC Recognizes Staff at STC Corporate With Over 15 Years Service

Delores Shackelford
March 1987

Linda Schofield
March 1987

Carla Coombs
September 1987

Chand Deepak
August 1988

Tonda Winston
August 1988

AnnaMaria Clack
March 1989

STC Part of Winning Dugway Team

STC is part of the winning team for Range Support and Laboratory Operations at Dugway Proving Ground, Utah. Jacobs Sverdrup, our current teaming partner at Aberdeen Test Center, Maryland, is the prime contractor on this new, potentially 15-year contract to provide test range services and operations of the chemical and biological laboratories at Dugway. Also joining the team were Mellor Engineering, of Lehi, UT, our teaming partner for the past six years for the laboratory operations at Deseret Chemical Depot (DCD), Tooele, UT and Geo-Met Technologies, of Germantown, MD.

The new contract began on 23 March 2004. STC currently has 18 employees and will grow as the workload increases over time. **Wes Ercanbrack**, previously with our DCD contract, has moved to take the lead STC position on this new effort. **Steve Freudenberger**, manager of the STC Deseret contract, was a key part of the orals team presentation and will remain at DCD to coordinate the efforts of both contracts. Overall management of this contract will fall under the STC Edgewood Region, headed by **Dick Gilligan** who was the STC capture manager in pursuit of this effort.

This is an important win for STC, since it can go for 15 years and cements our relationship with Jacobs Sverdrup as we search for new opportunities in related fields in the future.□

New Contracts

We have received new contracts and subcontracts valued at over $27 million from our government and commercial/prime customers, including $0.9 million from NOAA, $0.25 million from NAVAIR, $0.8 million from the U.S. Army (CRREL), and most notably, a 15-year subcontract from Jacobs-Sverdrup Technologies at Dugway Proving Ground with a projected value of over $24.8 million.

CLASS (*Continued from page 1*)

independently reviewed by a Carnegie Melon Software Engineering Institute (SEI)-approved Lead Evaluator and received a Capability Maturity Model (CMM) rating of Level 3. There are 5 CMM levels. An organization which operates with no defined processes is considered at Level 1. Level 2 corresponds to Repeatable, Level 3 to Defined, Level 4 to Managed and Level 5 to Optimizing. The higher the level, the more reliable and defined the organization's processes. Achieving Level 3 was an example of a combined effort among **STC-CSC-NESDIS** management and it shows how well the team works together. While this was not an easy effort, it is an accomplishment to be proud of and build upon. Congratulations to the CLASS team!□

PARTAIN (*Continued from page 1*)

together to produce science data products. The modules will be run sequentially and each will create data products that serve as input to downstream modules.

AIMS is a web-based application that allows the code developers to define data output information for their modules and provides the functionality to ensure the availability of input data. The system includes automatic error checking on data specifications and has an integrated change log that notifies downstream users of updates on previously entered fields. AIMS will serve as the primary information source and configuration control mechanism for interfacing the modules and integrating them into the CloudSat data processing system.□

KNAFF (*Continued from page 1*)

developed an innovative use of Earth observation satellite data (alone, or in combination with non-satellite data) that is, or could be, used for operational purposes to assess and/or predict atmospheric, oceanic or terrestrial conditions. John, in a part-time capacity, has supported some of the STC-METSAT satellite projects.

Dr. Knaff is being recognized for basic research for improving the understanding of tropical phenomenon and predicting tropical cyclone intensity, accompanied by exemplary transfer of the results into operational products. He will receive his award 19 March 2004 at the 47th Annual Goddard Memorial Dinner hosted by the National Space Club. John Knaff and his wife traveled to Washington, DC to receive the award in March 2004.□