**National Aeronautics and Space Administration**

**Applied Sciences Advisory Group**

**October 9-10, 2012**

**NASA Headquarters**

**Washington, DC**

**MEETING SUMMARY**

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Peter G. Meister Kass Green

Executive Secretary Chair

**Applied Sciences Advisory Group**

NASA Headquarters

Washington, DC 20546

October 9-10, 2012

**Meeting Summary**

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***Meeting Report prepared by***

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**Applied Sciences Advisory Group**

NASA Headquarters

Washington, DC 20546

October 9-10, 2012

**Meeting Summary**

***Tuesday, October 9, 2012***

**Session 1: Welcome and Meeting Objectives**

Welcome and Opening Remarks

Mr.. Lawrence Friedl, Director, NASA Applied Sciences Program (ASP), convened the Applied Sciences Advisory Group (ASAG) meeting. He introduced Ms. Kass Green, the ASAG Chair, who welcomed everyone to the meeting. She noted that Dr. Michael Freilich, Director, NASA Earth Science Mission (ESM) Earth Science Division (ESD), would be attending the meeting twice at which times he would take questions.

Introductions

At Ms. Green’s request, the ASAG members in attendance, NASA staff, and members from the public introduced themselves and briefly described their backgrounds.

Agenda and Meeting Overview

Mr. Friedl reviewed the meeting agenda and discussed the plans for the next two days. The meeting’s purpose was to inform the ASAG about key issues facing the ASP, give ASAG members an opportunity to provide recommendations, and organize a long-term ASAG analyses to inform ASP and ESD. The meeting’s primary objectives were the following:

* Form an ASAG team to analyze and prepare a paper on Earth science data access issues for applications-oriented users;
* Identify ASAG members to support an ESD-wide Mission and Applications Study;
* Identify metrics and measures to convey a mission’s “applications value;”
* Obtain ASAG members’ experiences on effective ways to close-out projects;
* Identify key issues to consider for an applications test bed and design laboratory; and
* Develop an approach to provide findings on plans for a Capacity Building Assessment.

The principal audience for the ASAG’s efforts was Dr. Freilich.

Mr. Friedl noted that the ASAG would soon be reconstituted as a “committee” and given a new charter. He announced that there would be an opportunity for members of the public to make comments. Anyone wishing to do so was requested to register with the ASAG’s Executive Secretary, Mr. Peter Meister. Ms. Green expressed her appreciation that the meeting agenda gave the ASAG members an opportunity to provide recommendations after each session presentation.

Summary of Earth Science Subcommittee Meeting and Last ASAG Meeting

Mr. Friedl reported that the NASA Earth Science Subcommittee (ESS) had met in person in March 2012, and had a follow-on teleconference in June 2012, to address the findings made in the National Academy’s Mid-Term Assessment of the Earth Science Decadal Survey. The ESS’ general observation was that NASA had responded favorably and aggressively to the Decadal findings. One finding focused upon by the ESS was that a cost constrained approach should be pursued. Another finding, received with significant questions, was for the ESS to consider reestablishing a group similar to the former Payload Advisory Panel. The final recommendations from the ESS have not yet been issued and will be provided to the ASAG when ready. Dr. Friedl briefly summarized the ASAG’s April teleconference.

**Session 2: Ethics Training**

Ms. Green introduced Ms. Rebecca Gilchrist, Esq., Office of General Counsel (OGC), NASA Headquarters. Ms. Gilchrist briefed the ASAG Members on the legal requirements pertaining to ethics. Each ASAG member is a Special Government Employee (SGE) and the government’s ethics laws apply to all SGEs. They are considered to be federal government employees because they are giving advice to the government. The ethics rules are intended to give the public confidence in the advice that is given. Ms. Gilchrist described the criminal statutes, regulations, standards of conduct, and conflicts of interest that affect the ASAG members with respect to ethics. The Ethics Program Tracking System was described. Any ASAG member having a specific issue should bring it to Mr. Meister’s attention, who would then contact the General Counsel’s office. In addition, the members may contact Ms. Gilchrist or the ethics team at the OGC directly.

Ms. Green asked whether visits to the Hill are precluded. Ms. Gilchrist agreed to research the issue and will provide an answer to Ms. Green.

Ms. Green thanked Ms. Gilchrist for her presentation.

**Session 3: Earth Science Division and Applied Sciences Program**

The ASAG was briefed on the ASP status and on programmatic changes within the Program. The briefers were: Mr. Friedl; Mr. John Haynes, Program Manager for Health and Air Quality; Dr. Francis Lindsay, Program Manager for Disasters; Dr. Brad Doorn, Program Manager for Water Resources; and Dr. Nancy Searby, Program Manager for Capacity Building. Applications Readiness Levels (ARLs) were described as a tool being developed for measuring the status of applied sciences projects. There are nine ARLs; these range from level 1 for basic research to level 9 for projects that are approved, deployed operationally, and used in decision-making. The lower ARLs cover discovery and feasibility. The ARLs in the mid-range cover development, test, and validation. The upper ARLs cover partner demonstration and transition. A project’s ARL will be defined to be at the highest level for which all milestones have been met. Issues associated with overestimating and underestimating ARLs were discussed. Several charts were presented on the ARLs for ASP’s projects. ARLs will be used to help select projects, down-select projects, keep projects on track, identify differences across applications areas, measure Program performance and goals, and establish expectations for applications projects.

Ms. Green was pleased to see that many projects were in the higher ARL stages. Dr. William Hooke expressed concern that ARLs might influence project selection with a bias towards those that are easiest to complete. Dr. William Gail cautioned that the ARLs might constrain using other models for applications developments. Mr. Friedl explained that the ARLs are intended to be used as a communications tool to facilitate communications between the Program Manager (PM) and the Principal Investigator (PI). Ms. Green appreciated the development of a metric for applications. Mr. Friedl explained that data on ARL usage needed to be collected for a year before ARLs are evaluated, and that Dr. Freilich had not focused much attention on ARL development. (To clarify, the Program and ESD while using ARLs as an OMB metric is not overly focused on maximizing ARL figures at the expense of quality, substantive projects.) It was observed that the use of ARLs was new to the PIs and was pushing them out of their comfort zone. For some PIs, complying with ARL reporting has become a budget issue for some PIs.. The new Program Associates are doing a great job in facilitating communications between PMs and PIs. In response to reports about PIs’ reluctance to cooperate in developing applications, Dr. Gail counseled that the requirement for applications development, rather than being blamed on the NASA bureaucracy, should be anchored in the Decadal Survey finding that Earth science’s strengths include the fact that it is a combination of fundamental knowledge and societal applications. Mr. Friedl explained that ARLs are now included in solicitations and do not impose a substantive increase in reporting. A PM in the audience added that “feasibility” is included within applied science, and that PIs should not feel that a project’s ARLs indicates success or failure. Dr. Hooke advised that Congress members would have coarser questions, such as “what is the ARL’s value?” Mr. Friedl noted that the ASP’s Annual Report is used to articulate successes and purposely does not include ARLs. Dr. Gail explained that his company, which is associated with technology transfer, would never get anything done if they had to follow the ARL methodology. Ms. Susan Moran suggested putting ARL ratings on a web page because they reflect milestone self-assessments, which would be useful to others. Ms. Green recommended putting it up on a web page without waiting to produce an academic paper.

Mr. Friedl advised that the ASP is developing a web-based database. The ASAG discussed the need for a definition for the term “application.” Ms. Moran noted that one had been drafted in a prior ASAG meeting and had not been accepted.

Dr. Doorn described a Water Resources Strategic Transition Study (the “Study”) that had been performed by an outside consultant, Global Marketing Insights, Inc., at ARP’s request. The Study’s findings were reviewed. Dr. Doorn reported that the study indicated that the water resources management industry is fragmented, and there is no real authority for data gathering, vetting, and validation. The overall perception about NASA satellite data is very positive; however, many users did not realize that the data they were using came from NASA. Due to its small funding levels, the Research Opportunities in Space and Earth Sciences (ROSES) procurement system does not have a significant impact on applications. The study indicated NASA data is difficult to find, access, and use. The Study recommended that NASA ASP Water Resources create a “bridge” between the current science community and the water resources management industry. The next step would be to develop a NASA ASP Water Resources “APPATHON” to work directly with state and federal agencies, private industry, and other international water management groups. The effort is intended to mimic a similar cooperation between private industry, federal agencies, and state agencies in homeland security “Hackathons.” Additional steps will include building an interactive private “scientific community” website to serve as a community repository for project results, algorithms, models, and papers to facilitate the development and deployment of water resource tools and applications. NASA ASP Water Resources should become the “Underwriters Laboratory of Water Resource Management.” The Study concluded that NASA ASP must actively engage with the water resource management industry in a transparent way and share NASA’s knowledge base and capabilities through modern, interactive, and easy-to-access devices and methods.

Dr. Gail counseled that intermediaries should be used to help NASA reach the final end users. Ms. Green observed that the Study appeared to be a study of ASP Water Resources interaction with industry, whereas she thought that they were going to look at the market demand curve and perform a more traditional market study. A study is needed on the economic benefits that NASA can bring to the water resources industry. She noted that the Western Landsat Advisory Group has been doing good work on how water data could be used. Dr. Doorn explained that they would need someone in the community who understands what NASA is trying to do, and that finding the right person to do the study would be difficult. Ms. Nancy Dickson opined that there is an opportunity for ASP Water Resources to identify boundary organizations and bridging partnerships that already exist, and thereby eliminate the need for ASP to be the bridging organization. She identified the Gulf of Mexico Alliance (GOMA) and the new climate change science centers as examples. Ms. Green concurred. Dr. Gail advised that there is an opportunity to build a more thorough model on how to interact with the community. He described a primary and secondary value chain. In the primary value chain, a public agency, such as the weather service, works directly with the public. The secondary value chain adds value, which is important in getting information to the final end user. NASA is missing the opportunity to use the secondary value chain if NASA is going directly to the end users. By finding people who know the end use application in great detail and have the ability to tailor the data, NASA can greatly reduce the number of people it has to reach directly.

Mr. Friedl discussed the National Research Council (NRC) 2012 report “Earth Science and Applications from Space: A Midterm Assessment of NASA's Implementation of the Decadal Survey.” The NRC found that NASA had responded favorably and aggressively to the Decadal Survey. Other findings were that NASA had made considerable efforts to secure international partnerships, and that NASA’s ASP was engaging applied researchers and operational users on mission science definition and application teams. The NRC recommended that ESD should implement its missions via a cost-constrained approach. The NRC also recommended that NASA should consider increasing the frequency of Earth Venture stand-alone space-based missions.

Mr. Friedl noted that ESD is looking for ways to identify applications opportunities throughout mission design, planning, and life-cycle. ASP is engaging the applications community and integrating it into the mission science and requirements development. Methods include incorporating “applications people” in science definition teams, sponsoring community workshops, and using early adopters, such as the Soil Moisture Active-Passive (SMAP) mission and, potentially, the Ice, Cloud, and land Elevation Satellite-2 (ICESat-2) mission. The Cyclone Global Navigation Satellite System was described. This is a constellation of eight microsatellites to measure ocean surface wind speeds.

Dr. Hooke suggested that there is a need for a high level discussion on how to accelerate the notion that there is societal benefit from basic science. He acknowledged that this problem goes beyond just NASA or the federal government. Dr. Pietro Ceccato opined that partnerships are important and that ASP is on the right track.

Mr. Friedl discussed a recent applications workshop that ESD sponsored for the Suomi National Polar-orbiting Partnership (NPP). Ms. Green explained that data continuity is required for applications and operations. She noted that outstanding operations applications have been developed using data from the Moderate Resolution Imaging Spectroradiometer (MODIS) instrument, and she reported that she has heard complaints that there would not be MODIS data continuity. Dr. Doorn acknowledged that spatial resolution has deteriorated. Mr. Haynes suggested that the product development teams would have the opportunity to respond to the concerns and develop new products as funds become available. Ms. Green described what she asserted to be a serious inconsistency: applications are supposed to be included in mission development, yet a sensor that is important because it is used in many agencies’ operations is being eliminated; therefore, applications clearly had not been included in mission development. Mr. Friedl observed that the lesson learned from this is that applications have to be included in mission planning. Ms. Green concurred. Mr. Hayes observed that more work has to be done with NASA researchers and with the science community to help them understand the needs of the applied science community. Ms. Dickson noted that MODIS is the only instrument that continually receives a high utility rating among the public sector users. Dr. Susan Moran counseled that it is almost never too late to add applications into a mission. She explained that SMAP is to be launched in 2014 and decisions are still being made on data access, data format, latency, and delivery. Letting users know that decisions are still being made and can be influenced is a key to getting applications people involved in the mission planning.

The possibility for an applications design lab and a test bed center was discussed by Mr. Friedl. The functions would include training and capacity building, first mile support, culture-bridging from research to operations, last mile support, knowledge generation, knowledge management, knowledge preservation, capturing end-user requirements, building partner engagement, negotiating end-user commitment, and resource distribution. In response to a question from Ms. Green, Mr. Friedl explained that funding would have to come from within the ASP, although it could be proposed as a new initiative. Ms. Green noted that Xerox Park is a private sector test bed example. Dr. Hooke cited NOAA’s Program for Regional Observing and Forecasting Services as another example. Dr. Moran noted that the Land Information System is an interagency test bed for land surface modeling and data assimilation. Dr. Gail advised that the ASP may need rapid design capabilities that are not innovative. Ms. Green explained that she is skeptical about those prospects due to budgetary considerations and the “disconnect” among end-users. Ms. Green further said she would prefer an agricultural application area to this testbed. Dr. Ceccato counseled that it would be advisable to begin from the user perspective, then go to demand, and then go to the product. Dr. Moran liked the test bed concept and explained that it is a top down, rather than bottom up, approach that can happen with or without funding.

**Session 4: ASAG Discussion with ESD Leadership**

Ms. Green introduced Dr. Freilich and thanked him for the opportunity to present questions. She asked whether the future vision for applied sciences has changed in NASA as a whole and specifically in the ASP. Dr. Freilich advised that there is not going to be a big change in resources. He acknowledged that while ASP represents only two percent of ESD’s budget, the perception of what ASP does is disproportionately larger than its share of the budget. He attributed that to the ASAG’s advice and to the leadership that Mr. Friedl and his team have brought to the Program. Dr. Hooke asked for a description on the focus for applications. Dr. Freilich explained that while there are applications in user groups throughout ESD, the real discretionary money for innovative ideas that focus on applications is in Mr. Friedl’s budget. Applications workshops are now included in every new mission. In response to a question from Dr. Gail, Dr. Freilich explained that ASP should focus on both societal benefits and on applications research. The “nuggets” of societal benefit, however, seem to receive disproportionate credit by the Agency. Mr. Friedl and the Program have been able to link the two together. Dr. Gail expressed concern that publications are not used as a success metric. Dr. Freilich questioned the need for tracking publications. Mr. Friedl noted that ASP encourages publications, but does not track them. Dr. Freilich acknowledged that a program that did not publish would be difficult to support. On the other hand, he explained, a program focused only on publications would lose the potential to develop nuggets of increased user capability and satellite data productivity. The ASP is a bridge between the data and knowledge that is produced, on one hand, and the needs of the not necessarily satellite-savvy community that can benefit from the new information. In a bridge, you cannot focus on one side over the other. Dr. Gail asserted that academic knowledge is the “boots on the ground” and leads to increased benefits. Ms. Green added that it is important to consider the same factors that are considered by universities. Dr. Ceccato observed that NASA has an emphasis on research and advised that it should spend more time with the community that uses NASA’s products. He asked about the plan to bridge the gap with the user community. Dr. Freilich responded that that is the reason for the ASP and ASAG. Dr. Hooke questioned whether enough was being done to get through the 21st century. Dr. Freilich acknowledged that the nation’s elected leaders do not share the perception that more resources should be put into the Program. The strategy is to build on the Program’s credibility and point to accomplishments, rather than aspirations. Ms. Green asserted that this would require a significant investment in communications. Dr. Freilich agreed that increase communications are necessary; however, it is not evident that there is a huge trove of accomplishment that can be branded as applications. Increased substance and meaningful metrics are key aspects.

In response to a question from Ms. Green, Dr. Freilich observed that there is no reason for optimism that the nation will develop a robust land imaging program. Landsat 8 will be a stellar mission and keep a crisis from developing for several years if it launches successfully. Dr. Hooke asserted that the issues could be addressed more effectively if there were a national policy on sustained Earth observations. Dr. Freilich noted that the Office of Science and Technology Programs (OSTP) is developing into a “super-agency” that may be able to cut through enough interagency considerations to make a difference. Ms. Green noted that the largest source for data among the operational agencies using NASA data, other than Landsat, is MODIS, and that there is a concern that the spatial resolution will be getting coarser. She asked how to involve all the end-users during mission requirements development. Dr. Freilich responded that the mission costs have to be balanced against the rest of the program. Bringing people who have a desire, but not resources, into a requirements-setting discussion is a very delicate task. He believes people should show value in their involvement by making an investment. Ms. Green concurred. Dr. Freilich described his concern that operational needs for data can be argued far more compellingly than the need to do the research that enables the operational need. NASA would stagnate if it fell into that trap. NASA has to focus on Earth system’s knowledge development because no one else has responsibility for that research. Dr. Moran observed that applications research in the missions is taking place before the missions are launched and the process is working well. The best way to accomplish this is to get data to early adopters through the Land Processes Distributed Active Archive Center (DAAC).  The DAAC’s mandate is to provide products after launch and it is doing that the best it can to provide data pre-launch, but there is insufficient funding Dr. Freilich responded that a change could be considered because funding the DAAC to provide pre-launch data would not require significant additional resources. In response to a question from Dr. Gail, Dr. Freilich explained that the need for balance between science priorities and missions was a key principle established in the Decadal Study.

Ms. Green thanked Dr. Freilich for giving the ASAG an opportunity to meet with him.

**Session 5: National and International Activities**

Ms. Green introduced Ms. Patricia Jacobberger-Jellison, Senior Advisor for Inter-Organizational Environmental Science, NASA Science Mission Directorate (SMD), ESD. She briefed the ASAG on ESD’s leadership role in three national activities and international committees: the National Earth Observation Strategy and Assessment (NEO), the National Climate Assessment (NCA), and the Committee on Earth Observing Satellites (CEOS). NEO is legislatively mandated and is one of several efforts the President is taking related to space weather. Its strategy document will be included in the President’s 2014 budget request and will be updated every three years. Numerous representatives were brought together to generate key observing questions and needs. The process involves multiple workshops and discussions. It has produced an analysis of the impact of the many Earth observing systems and what would happen if a resource was lost. The NCA is conducted pursuant to the Global Change Research Act, which requires a report every four years to the President and the Congress, that evaluates, integrates and interprets the findings of the $2.6 billion federal research program on global change.

The NCA is primarily funded by NASA and operates on a very lean budget. The National Climate Assessment and Development Advisory Committee (NCADAC) is a federal advisory committee that oversees the NCA’s activities. It is supported through the National Oceanic and Atmospheric Administration (NOAA). Most members are end-users, not scientists. The NCA’s next report is due for release in 2013. It will be a collaborative and cooperative report with several hundred authors. The draft report is 1100 pages. The executive summary has not yet been written.

CEOS coordinates civil space-borne observations of the Earth.  Its membership comprises space agencies, national organizations, and international organizations. The members have to be a space-faring entity with a “bird in the air.” Participating agencies strive to enhance international coordination and data exchange and to optimize societal benefit. The value of satellite-derived land products for science applications and research is dependent upon the known accuracy of the data. CEOS plays an important role in coordinating the validation process.

Ms. Green thanked Ms. Jacobberger-Jellison for her presentation.

**Session 6: Applications Users and Earth Science Data Access**

Introduction of Topic

Mr. Friedl explained that this session would examine data access issues that are faced by applications users. He noted that NASA has both an interest and an obligation in making data accessible and available. A chart was presented showing the increase in satellite data and products since FY2000. Mr. Friedl explained that data access has different meanings and gives rise to different expectations depending on the user and the user community. Different users are accustomed to obtaining data in different ways. A hypothetical data distribution system using a conjectural amazon.com webpage was shown.

Data Access: ESD Data Systems

Mr. Friedl introduced Dr.. Steve Berrick, NASA ESD. Dr. Berrick described NASA’s Earth Science Data and Information Policy and noted that it promotes data usage by making data available to all users without a period of exclusive access and at no cost, except where otherwise agreed upon by the international partners. The Earth Observing System Data and Information System (EOSDIS) is a key core capability in NASA’s Earth Science Data Systems Program. It provides end-to-end capabilities for managing NASA’s Earth science data from satellites, aircraft, field measurements, and other programs. Charts describing EOSDIS key metrics and facilities were presented. Dr. Berrick observed that some application users and operational agencies, for example those engaged in weather forecasting and firefighting, need Earth Observing System (EOS) products sooner than routine science processing allows and are willing to trade science product quality for timely access. In response to this need, NASA has developed the Land Atmosphere Near Real-time Capability for EOS (LANCE), which provides that data in near-real time, usually within three hours. LANCE products were described. The EOSDIS Global Image Browse Service (GIBS) was discussed. It provides standards-based access to EOSDIS imagery with global coverage at full resolution via services using Google Maps. Reverb is a web-based client for discovering, accessing, and invoking EOS data products and services. It can be accessed at <http://reverb.echo.nasa.gov/reverb>. The Advancing Collaborative Connections in Earth System Science (ACCESS) Program was described. Its primary objective is to enhance, extend, and improve existing components of NASA’s distributed and heterogeneous data and information systems infrastructure. Dr. Gail asked whether there was a way to track how people were using the data, and he was informed that that was not being done. He advised that the most valuable information in the private sector is how clients are using the company’s products. Dr. Moran noted that the data is easy to access now, which is appreciated by the users. Dr. Ceccato advised that none of the products using NASA’s rainfall data are good and that bad data produces bad policy.

Ms. Green thanked Dr. Berrick for his presentation.

Data Access: A Users Perspective

Mr. Friedl introduced Dr.. Erin Robinson, Information and Virtual Community Director, Federation for Earth Science Information Partners (ESIP). She described her experience working with NASA’s data. She leverages her knowledge of environmental information, in particular collaborative web technologies, to support the diverse communities that make up the Federation. Her current research interests include improving collaboration among distributed partners by enhancing connections at various levels in the interoperability stack, coordinating events to enhance human-to-human relationships, developing collaborative sites that integrate social media to facilitate knowledge exchange, and sharing Earth observations through standard data access. She described the technical challenge that arises in analyzing data for air pollution. There are seven parameters or dimensions and no single instrument measures all seven. Traditionally, users have had difficulty finding, accessing, evaluating, and merging air-quality data. The Sea-viewing Wide Field-of-view Sensor (SeaWiFS) Project was described. Its purpose was to provide quantitative data on global ocean bio-optical properties to the Earth science community. Dr. Robinson explained that applications research will be enhanced by improving the user experience. She described how air quality observations are being obtained through social media. There is a Twitter community with over one thousand followers interested in air-quality events. The information interoperability stack was described. ESIP will continue to be used as a test bed and incubator for new ideas. She favors standardized interfaces and advised that the more data is visualized, the more it becomes usable. In response to a question from Ms. Green, Dr. Robinson explained that what NASA is doing now works well, and that it is understood that NASA cannot do everything; however, the government needs to do more to make data accessible.

Ms. Green thanked Dr. Robinson for her presentation.

Data Access: A Users Perspective

Mr. Friedl introduced Mr. Tim Dye, Senior Vice-President, Sonoma Technology Inc. Mr. Dye described how his company uses NASA data. Slides were presented on BlueSky-SmartFire and the AirNow Satellite Data Processor. Both are ROSES projects. He explained that data is obtained from brokers, distributors, and intermediaries, not directly from NASA. Data access challenges were discussed. NASA’s data sets are immense, making it difficult to find data. One ESD employee, Ms. Diane Davies, made a difference by reaching out proactively. From a public relations standpoint, her actions were important. He suggested that NASA reach out to the users and ask “How can we get you the data you want?” A data concierge could be created. Finding data can be made easy and fun. Creative people are working on ways to make data visualization easy. Ms. Green observed that there does not appear to be a problem with scientists holding onto data and not releasing it. Dr. Hooke observed that the government is not nimble enough to compete with private enterprise and should focus on providing “a richer ore” that could be mined. He added that additional investment would accelerate data usage at a time in human history when that is needed. The ASAG should advocate for making the data resources available to the taxpayers. Dr. Moran agreed that a concierge desk would be useful. In response to a question from Dr. Gail, Ms. Martha Maiden advised that NASA is not allowed to license data. Mr. Dye recommended that NASA should work with the data intermediaries and let them figure out what users want. Dr. Gail concurred. Mr. Friedl noted that NASA could use Space Act Agreements to enter into partnerships with intermediaries. Ms. Maiden added that anyone can use government data to provide products. Mr. Dye suggested that intermediaries can be identified by asking users. He emphasized that knowing how to find data quickly is very important.

**Session 7: Open Discussion and Day 1 Review**

Dr. Moran referred the ASAG to an ASP finding from user workshops that users are concerned with operational capabilities, such as latency, access, and data formats, rather than measurement specifications. Dr. Ceccato encouraged NASA to use brokers in order to ease access to data. Dr. Moran concurred. Dr. Gail advised that there are simple diagnostics that can be performed to determine the success that people have when seeking access to data. Mr. Friedl agreed to explore that if it has not already been done by the DAAC. Ms. Green observed that there may be a consensus for an ASAG white paper. Dr. Moran identified three issues: improving pre-launch data access, giving more attention to the user’s perspective than the DAAC is providing, and promoting value added data access. Mr. Friedl briefly reviewed the day’s events and the agenda for the next day.

**Public Input**

Ms. Green asked the members of the public attending the meeting whether any of them would like to briefly address the ASAG. There were no comments.

ASAG asked for a programmatic overview to be given at the beginning of Day 2.

Mr. Meister adjourned the ASAG meeting for the day at 5:35 p.m.

***Wednesday, October 10, 2012***

Mr. Meister convened the ASAG meeting, and Mr. Friedl welcomed everyone back to the second day. At Mr. Friedl’s request, the ASAG members and visitors introduced themselves.

**Programmatic Overview**

Mr. Friedl described ASP’s three goals: enhance applications research, increase collaboration, and accelerate applications. ASP has two lines of business. The first is in the applications area and focuses on discovering and demonstrating applications targeted at integrating Earth observations. It has an emphasis on applications for health, water, disasters, and ecological forecasting. The second line of business is the Capacity Building Program, where the focus is on building skills that that will improve new users’ ability to use data. ASP has four initiatives. SERVIR is a NASA and U.S. Agency for International Development (USAID)-sponsored initiative that integrates satellite observations, ground-based data, and forecast models to monitor and forecast environmental changes and to improve response to natural disasters in Central America and Africa. DEVELOP is a NASA Applied Sciences training and development program that fosters an interdisciplinary research environment for students and young professionals to work on Earth science application projects. The Gulf of Mexico Initiative (GOMI) addresses regional priorities defined by GOMA, a partnership of the states of Alabama, Florida, Louisiana, Mississippi, Texas and 13 federal agencies whose goal is to significantly increase regional collaboration to enhance the ecological and economic health of the Gulf of Mexico. The Applied Remote SEnsing Training (ARSET) Program develops training modules on the acquisition, visualization, analysis, use and application of NASA Earth science, with current efforts focusing on air quality and water resources.

Mr. Friedl reviewed charts on ESD’s FY12 budget and the President’s FY13 Budget Request. He noted that NASA is operating under a continuing resolution. Charts were presented on ASP’s plans for FY09 through FY17 and ASP’s program strategy for FY13 through FY 17. Dr. Gail observed that knowledge acquisition is not shown among the program’s goals. Mr. Friedl explained that applications knowledge is intended to be included in the goal to enhance applications research, and it will be made more obvious.

**Session 8: Recent or Upcoming Assesments**

Introduction: Earth Science Data Latency

Mr. Friedl introduced Dr. Francis Lindsay, NASA ESD. Dr. Lindsay noted that latency in applications is a major issue, and that advice from the ASAG on that topic is vital. He explained that if the latency needs of the science users and applications users can be understood at the outset, it may be possible to cause the mission to have more applications and also keep the science users satisfied. The ASP is conducting a study on data latency needs and requirements. The study is intended to be an actionable document that will be taken to new missions and used to show how existing resources can be leveraged to satisfy budgetary needs and improve data access.

Data Latency Study

Dr. Lindsay introduced Dr.. Molly Brown, who is a leading the latency study team. She explained that latency is the period between when an instrument acquires data and when the product is released. For science users, a long latency is usually not problematic. For some applications that use satellite data, products may be needed in a timely manner. “Timely” means less than three hours. Dr. Brown stated that the study will examine data latency across all missions to determine common causes of delay, describe the needs of the applications community for products, and assess the way to meet the needs of that community.[Note: ESD clarified that the study is primarily characterizing needs for timeliness of products – both high and low latency.] ASP has identified members for a steering committee for the study. A chart on the study’s plan and timeline was presented. Dr. Brown discussed the causes for long latency times. The largest delay typically occurs while processing raw data into usable data products. Latency in processing raw data is attributable to the time it takes to transfer data from the receiving station to the processing system, the availability of computing resources, and the algorithms. Multiple algorithms may be involved, the algorithms may not be optimized for the system; also, the algorithms may need to be run in series, rather than in parallel. Restraints may have been placed on data distribution by the science team. It is important to understand the requirements that different products have for precision and accuracy and the trade-offs between latency and accuracy must be understood.

Dr. Gail recommended asking two questions: What is the latency that is needed? What is latest that the data can be used? Dr. Brown noted that some operational facilities require data that meets real-time reporting deadlines. Mr. Friedl explained that some users may need data in real-time, while others may prefer perfect data with no concern for timeliness. He is concerned that the study will focus on those who have real-time needs. Dr. Gail asserted that there is a distribution curve. Dr. Hooke counseled that the pressure in weather is the long delay between first seeing the instrument and seeing the data. Ms. Green concurred and opined that the move from science to delivery is more important than latency. Dr. Gail asserted that there are two objectives: satisfy near-term needs, and facilitate follow-on operational missions. Dr. Hooke observed that this reflects the need for the White House to coordinate agencies. In response to a question from Dr. Gail, Dr. Brown responded that a cost-benefit economic analysis is beyond the study scope. NASA does not have much experience performing cost-benefit analyses. Dr. Gail suggested that conceiving a metric to serve as a proxy for cost-benefit would be better than doing nothing. Dr. Ceccato advised that the trade-off between latency and accuracy is important. Dr. Moran recommended going beyond common products when asking about latency, and she predicted surprises from the users when the study questions them about latency versus accuracy. Dr. Gail and Dr. Ceccato, at Mr. Friedl’s request, agreed to serve as the ASAG liaison to the study.

Ms. Green thanked Dr. Lindsay and Dr. Brown for their presentation.

Capacity Building Assessment

Mr. Friedl introduced Dr. Nancy Searby, NASA ESD, who briefed the ASAG on ASP’s Capacity Building program assessment. The program was created in 2011 as a new ASP “line of business” by combining SERVIR, DEVELOP, GOMI, and ARSET. Efforts to find synergy and leverage among the four projects are ongoing. The program assessment was initiated in May 2012. The assessment panel includes ASAG members Ms. Dickson and Dr. Ceccato, as well as experts in Earth observations, capacity building, strategic management, and program evaluation and performance. Dr. Searby discussed the ten questions covered in the assessment and presented a chart showing how the questions were assigned to individual panel members. The draft findings from the assessment were reviewed. The current definition for capacity building makes sense. Easy access to NASA products should be a central goal. User demand will grow quickly. The four activities combined into the program are a good framework for an overarching structure. Access into NASA’s data and products should be eased. A formal mechanism for user community feedback on new applications and tools is needed. Preparations should be made to capture demand for capacity building to demonstrate program value. Boundary organizations that represent larger communities should be surveyed. Better anticipation about possible options in upcoming missions is needed. Users other than government users should be considered. Dr. Searby explained that the next steps in the Capacity Building program assessment are to complete the analysis, prepare a draft report, and discuss the draft report with the ASAG. It was agreed that a teleconference would be held in January 2013. Mr. Meister will prepare an appropriate notice for the Federal Register.

Ms. Green thanked Dr. Searby for her presentation.

**Session 9: Applications and Missions**

Mr. Friedl led a discussion on the applications value of missions. ESD is looking for ways to identify and assess applications opportunities throughout mission design, planning, and life-cycle. ASP has been pursuing approaches to engage and integrate the applications community into the mission science and requirements development. One example would be early adopters, such as the SMAP Mission and, potentially, ICESat-2. Other approaches involve: use mission program application leads at NASA Headquarters; define “science” to include applications, applied science, and research; include “applications people” in science definition teams; include applications sessions at science workshops; and conduct community workshops. The term “applications value” is an abstract concept. The ESS has asked that the term be defined.

The ASAG’s assistance is sought in assessing, for applications value, the approaches being used to engage the applications community and the design choices and trade-offs within missions. A slide was presented showing planned Earth science missions from 2012 through 2023. Possible factors and qualities for consideration were discussed. A chart showing the typical NASA flight project lifecycle was presented. Mr. Friedl explained that NASA is now bringing in the applications team at the start of mission development. This could help expand the number of applications per mission and also increase the number of application users. Dr. Gail advised that operations and science people are more aligned than is generally assumed. Ms. Green questioned NASA’s wisdom in abandoning projects that are showing operational value (i.e., need for continuity). Dr. Hooke concurred and explained that it would absorb too much funding. Ms. Green advised that there is a need to look at the risks and do a cost-benefit analysis. Dr. Hooke noted that benefits are more difficult to ascertain than costs. Dr. Gail agreed it is a difficult problem and suggested asking the missions to describe what a follow-on mission should look like and how it would function operationally.

Mr. Friedl noted that ASP has been working to broaden the user community beyond users who already know how to use the data products, in order to maximize exposure. Ms. Green approved and observed that the greater the focus, the greater the probability for failure. Dr. Gail advised that defining the term may be simple to resolve in specific cases, but hard to do in general. He recommended finding specific examples where value is well defined and to extrapolate from that. Ms. Green concurred and noted that that principle had been utilized by the LandSat Advisory Committee, where the cost for forgoing the ten “hottest” items was used to establish value. Dr. Gail explained that a cost to benefit analysis typically comes out 100 to 1, and that the more credible approach is to find good anchor examples.

Dr. Moran described how early adopters, who knew they wanted to use the sensor in the SMAP mission and were willing to invest their own funds to develop the infrastructure to assimilate the data pre-launch, were “super engaged” in the design phase. Dr. Green believed that this is a great approach, and counseled that the economic factor is what affects the Hill. Dr. Hooke cautioned that current weather data users work to add to the customer base, and that ignoring them would be a disaster.

Dr. Moran explained that a lot had been learned from their application workshops. The Decadal Survey had informed them on what the applications from SMAP should be. They established contacts at each user level. Ms. Green explained that that was a good approach to sales that has been around forever. She counseled the ASP that if it is wrong in evaluating value, somebody will tell them, and that that is the only way to move forward. Dr. Gail concurred and added that understanding this is an important ASP role. Dr. Moran agreed to serve as the ASAG liaison for the Missions and Applications Study. Ms. Green noted that an ASAG white paper would not be necessary because there was going to be an ASP study. Dr. Hooke recommended a disciplined effort to look for proposals in the knowledge generation area, although it would require funding for a sustained effort. Ms. Green observed that China and India are more applications oriented than the United States.

**Session 10: Applied Sciences Grand Challenges**

Introduction of Topic

Mr. Friedl noted that the ASAG, at a previous meeting, had requested that the ASP applications areas identify potential “Grand Challenges.” A Grand Challenge, for this purpose, is a fundamental problem in science and engineering whose solution would be enabled by Earth observations. The ASP PMs presented possible Grand Challenges in their respective areas. The ASAG was asked whether the topics presented were suitable and whether they were specific enough.

Grand Challenges

Dr. Brad Doorn presented the Grand Challenge for Water Resources. The challenge is to identify, develop, and justify a U.S. water supply indicator based, in whole or part, on remote-sensing observations. The indicator must relate to a standard water management method, be comparable to historical values, be produced with existing technology, and be produced with sustainable enhancements to operations. The goal is to enhance the ability of water resource managers to anticipate conditions associated with water availability and effectively communicate these risks. It would help water resource managers find a balance between reducing the risk of water overflows and securing water supplies during water deficits. Ms. Moran recommended using ARLs when offering a grand challenge. Dr. Doorn suggested that this challenge would be ARL seven or eight. [Note: Friedl noted that the Grand Challenges are much broader than the focus of the ARLs. Grand Challenges are broadly enabling.]

Mr. John Haynes presented three grand challenges for Health and Air Quality. The first challenge is to develop a unified dynamic global or “super-regional” malaria risk model. This would provide economic savings by increasing scale, and by eliminating duplicative and competing models. Mr. Friedl noted that there would also be a health benefit. Ms. Green added that lives would be saved. Dr. Gail opined that a multiple model approach would be best because no single model is going to be superior all the time. The second Grand Challenge is to obtain accurate ground-level aerosol and constituent measurements from remotely-sensed columnar values. The World Bank’s investment in ground sensors will decrease in the next few years, making satellite observations for air quality increasingly important. This is particularly significant in regard to climate change. The third challenge is to develop a “one health” community of practice. The integration of human medicine, veterinary medicine, and environmental science is now seen as crucial in tackling the health and air quality challenges facing the planet. The “one health” strategy has been embraced by the U.S. Group on Earth Observations (USGEO).

Mr. Lindsay presented two challenges for Disasters. The first challenge is to improve the accuracy, resolution, and predictive capabilities of flood mapping and modeling systems. This would help improve flood products used by relief organizations and also improve the quantification of human-induced changes to River basin hydrology. The second challenge is to improve the capability to detect and characterize earthquakes and other geo-hazard events for early warning. Even a warning of 30 seconds could be enough for a doctor to halt surgery, for a factory to shut down sensitive equipment, for a train to stop before it reaches a vulnerable bridge, and for controllers to prevent planes from landing or taking off.

Dr. Searby presented three challenges for Capacity Building. The first challenge is to improve the ability to evaluate the effect that Capacity Building efforts have on using EOS observations for decision-making. Societal and economic benefit analyses are not conventionally part of NASA’s Applied Science research portfolio. This challenge would help mobilize greater support for the ASP. The second challenge is to enable cell phones to disseminate EOS applications in developing countries where good Internet access is frequently unavailable. This would engage people who are affected by resource management policies, provide an opportunity to collect vast quantities of data, and foster individual engagement with EOS observations and applications. The third challenge is to develop training modules fast enough to meet the growing demand for training in the use of remote sensing data and models. This would improve the applicability, sustainability, and transferability of Capacity Building programs. Ms. Greene noted that Mississippi State University had developed on-line training modules funded by NASA and suggested that this would be a good resource.

In Mr. Woody Turner’s absence, Mr. Friedl presented two challenges for Ecological Forecasting. The first challenge is to redress the lack of times series of *in situ* biological observations. This would enable predictive models to be developed that properly coordinate biological observations with changes in climate, land cover, and other environmental parameters derived from NASA satellite imagery. Better models will help to improve the ability to estimate the impact that changing climate and changing land and sea use has on managed species and landscapes. The second challenge is to develop ecological forecasting model interoperability. Typically, ecological forecasts use different models from different communities. This issue runs across all Applied Sciences program elements applying climate or land-use model outputs to the discipline models of their applications areas.

The ASAG discussed the PMs’ Grand Challenges. Dr. Gail indicated that he liked the challenges and that more work should be done on their wording after talking with more people. Ms. Green noted that she resonated most strongly with the challenges, like Dr. Doorn’s that were user driven. Dr. Hook explained that the challenges should cause people to think it could change the human prospect and that Earth observations from space would accomplish that. Ms. Dickson observed that eliminating duplication is underscored in everything she heard. Dr. Moran observed that the challenges covered all the major topics. This reflects the fact that the PMs have talked with the users and know what is going on in their respective areas. Mr. Friedl observed that some proposed challenges were not revolutionary and disruptive grand challenges.

Ms. Green thanked Mr. Friedl and the PMs for their excellent work.

**Session 11: ASAG Meeting Summary**

Initial Discussion of Key Findings

Ms. Green led a discussion on the information learned during the meeting and the messages that the ASAG would want to transmit to Dr. Freilich. Dr. Hooke explained that he was pleased with what the ASP had accomplished with two percent of ESD’s funds and would like to think about what could be accomplished with three percent. Dr. Gail observed that the ASP is still not able to demonstrate its real value, which needs to be shown to Congress; the Grand Challenges can help, as well as a better understanding on applications value. Dr. Ceccato felt that continuity in providing environmental data was important. In response to a question from Dr. Moran about the impact of ASP’s Annual Report, Mr. Friedl responded that Dr. Freilich thinks it is good, but unclear how much he uses it outside the Division. Ms. Green opined that the ASP is a well-led and productive organization. The only problem she saw was that it has only two percent of the budget. Dr. Hooke added that ASP is not idea limited; it is only resource limited. He recommended increasing capacity through rapid prototyping and developing valuation. Ms. Green noted that two PM positions were being filled in an acting capacity and should be made permanent.

ESD Leadership Follow-on

Dr. Freilich rejoined the meeting. Ms. Green advised him that the ASP is a very productive and well-led organization. The work accomplished by the few people in the organization is impressive, and there are no in-organizational weaknesses. Improving data access, latency, and capacity in the community are robust strategies. Integrating applications into mission planning and improving the test bed will increase applications. The organization is not idea limited; it is resource limited. The Annual Report contains many “nuggets” and demonstrates accomplishments that need to be advertised. Dr. Hooke advised that increasing ASP funds would enable ESD to grow by building Congressional and political support. Dr. Gail noted that a clear elucidation of the Program’s economic value would help Congress. Ms. Dickson suggested that cost-effectiveness could be achieved by reducing duplication and developing partnerships across agencies. In response to a question from Ms. Green, Dr. Freilich agreed that a white paper on data access would be useful. Ms. Green noted that moving to operations would be important. At Dr. Freilich’s request, she clarified that comment to mean data used by agencies and private enterprise that can be relied on without concern that its continuity is threatened. Dr. Freilich agreed that demonstrating potential is important to the Agency; however, perpetuating use is not NASA’s responsibility. The ASAG should become satisfied with appropriate demonstrations versus producing information in a sustained way. He requested assistance from the ASAG on how to achieve this balance.

Ms. Green observed that a methodology is needed to determine the value of applications. Dr. Freilich responded that a change is possible if value becomes greatly apparent; however, they are not going to redesign the government. If the receiving agency has insufficient resources, there is no way for a planned transition to occur. Ms. Green noted that Congress trusts NASA more than the receiving agencies, and that the wins of the applications will resonate with the funders. In response to a suggestion from Ms. Dickson to support institutions outside the federal government, Dr. Freilich indicated that the cost would be at the expense of the Program. He advised that if the ASAG recommends that something is important and requires additional money, the interpretation will be that it is more important than anything else that is being funded by the Program. In response to a concern expressed by Dr. Gail over the difficulty that the Program has in demonstrating its value, Dr. Freilich requested that the ASAG provide programmatic guidance on how that could be accomplished. He indicated that there is a need for thought and assistance from the ASAG, and that they would not be able to contract that out. Dr. Freilich thanked the ASAG members for their time and told them that he looks forward to the ASAG’s continuing guidance.

Ms. Green thanked Dr. Freilich for attending the meeting and sharing his thoughts with the ASAG.

Synthesis and Discussion of Key Findings

Ms. Green led a discussion on what should be included in the ASAG’s letter to the ESS. Dr. Hooke suggested that the letter address two categories: applications of science, and advancing applications of science as a discipline. Ms. Green concurred. The letter will restate the ASP’s strategic goals. It will include the ASAG’s findings that the ASP is well-led and staffed, and that there is rigor in the ASP’s strategies for increasing the adoption of NASA science data for applications. It will assert the need for additional permanent positions in the ASP. The letter will acknowledge that ARLs can be a useful concept. It will include the ASAG’s findings that the most impressive Grand Challenges are those that are user-driven and those that would have a large impact. Mr. Friedl indicated that the challenges could be improved if they were rewritten. The letter will recommend that the ASAG prepare a report on how to improve data access in the applications community. Additional findings were approved for inclusion in the letter. There is a need to make the DAACs data more user-friendly. The Annual Report is important as a communications tool for both ASP and ESD. Rapid prototyping should become more collaborative. Pre-launch simulated data is needed for pre-launch applications research. Small increases in data access could have large benefits. Further progress in the field requires a better understanding on how to value applications. An in-house capacity to focus on this research is recommended. Determining the value of applications is a fundamental and intellectual problem that should be worked on and solved by the ASP. The letter should reiterate that market research is a key to understanding the user’s needs. There is an important role for data intermediaries that are in the secondary value chain.

Project Close-Outs

Mr. Friedl asked the ASAG members to make suggestions based on their experience for effective ways to conduct project close-outs. He explained that ASP’s projects typically end simply with the PI and team completing a final report. Ms. Dickson noted that publications won’t show up for several years after a project ends. Dr. Moran suggested including the project in the Annual Report. That would help the project get follow-on funding as a “highlighted project” from other sources. Ms. Green noted that press releases have been issued and parties have been thrown. Ms. Dickson suggested that close-out requirements be included in the solicitation so that there is a budget for it.

Review Meeting, Actions, Next Steps

The ASAG discussed possible topics for its next meeting. Ms. Green thanked everyone for attending the meeting and for their participation.

Adjournment

Mr. Meister adjourned the ASAG meeting at 3:00 p.m.

**APPLIED SCIENCES ADVISORY GROUP**

October 9-10, 2012

NASA Headquarters, Washington, DC

**Day 1: October 9, 2012 – Room 9H40**

***Gathering and Set-up 8:00 - 8:30***

**Session 1: Welcome and Meeting Objectives**

**Welcome and Opening Remarks** *(Green, Friedl, Meister)* **8:30 – 8:45**

**Introductions** *(All)* **8:45 – 8:50**

**Agenda and Meeting Overview** *(Green, Friedl)* **8:50 – 9:00**

**Summary of Recent ESS Meeting & Last ASAG Telecon** *(Green)* **9:00 – 9:10**

**Session 2: Ethics Training**

**Ethics Training** *(NASA Office of General Counsel)* **9:10 – 10:10**

***Break 10:10 – 10:30***

**Session 3: ESD and Applied Sciences**

**ESD Applied Sciences** *(Friedl and others)* **10:30 – 12:15**

***Break 12:15 – 12:30***

***Working Lunch with Session 4***

**Session 4: ESD Leadership**

**ASAG Discussion with ESD Leadership** *(Green and Michael Freilich, ESD)*  **12:30 – 13:30**

**Session 5: National and International Activities**

**NEO, NCA and CEOS** *(Pat Jacobberger-Jellison, NASA ESD)* **13:30 – 14:15**

**Session 6: Applications Users and Earth Science Data Access**

**Introduction of Topic** *(Friedl)* **14:15 – 14:20**

**Data Access: A Users Perspective** *(Erin Robinson, ESIP Federation)* **14:20 – 14:40**

**Data Access: ESD Data Systems** *(Steve Berrick & Martha Maiden, NASA ESD)* **14:40 – 15:00**

***Break 15:00 – 15:20***

**Data Access: A Users Perspective** *(Tim Dye, Sonoma Technology Inc.)* **15:20 – 15:40**

**Discussion** *(Led by Green, Friedl, or Meister)* **15:40 – 16:40**

**Session 7: Open Discussion and Day 1 Review**

**Discussion** *(Led by Green, Friedl, Meister)*  **16:40 – 17:20**

**Review of Day 1 and Day 2** *(Green, Friedl, Meister)*  **17:20 – 17:30**

***Adjourn for Day 1 17:30***

**Day 2: October 10, 2012 – Room 9H40**

***Gathering and Set-up 8:00 - 8:15***

**Session 8: Recent or Upcoming Assessments**

**Introduction: Earth Science Data Latency** *(Lindsay)* **8:15 – 8:20**

**Data Latency Study** *(Molly Brown/NASA-GSFC, Mark Carroll/Sigma Space)*  **8:20 – 8:40**

**Discussion 8:40 – 9:00**

**Capacity Building Assessment** *(Searby)*  **9:00 – 9:40**

***Break 9:40 – 9:55***

**Session 9: Applications & Missions**

**Applications Value of Missions** *(Friedl)*  **9:55 – 10:45**

**Session 10: Applied Sciences Grand Challenges**

**Introduction of Topic** *(Friedl)* **10:45 – 10:50**

**Grand Challenges** *(Program Managers)* **10:50 – 11:25**

**Discussion 11:25 – 11:50**

**Session 11: ASAG Meeting Summary**

**Initial Discussion of Key Findings** *(Green)*  **10:50 – 12:05**

**ESD Leadership Follow-on** *(Green)*  **12:05 – 12:30**

***Break 12:30 – 12:40***

***Working Lunch with Session 11***

**Synthesis and Discussion of Key Findings** *(Green)*  **12:40 – 14:15**

**Review Meeting, Actions, Next Steps** *(Green, Friedl, Meister)*  **14:15 – 14:30**

***Adjourn ASAG 14:30***

**NASA Applied Science Advisory Group (ASAG) Members**

**October 2012**

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| --- | --- |
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| **Dr. Molly Macauley**Senior Fellow and Research DirectorResources for the Future1616 P Street, NWWashington, DC 20036Phone: 202-328-5043macauley@rff.org | **Dr. Bill Hooke**AMS Policy Program and Senior Policy FellowDisasters Roundtable1120 G Street, NW, Suite 800Washington, DC 20005Phone: 202-737-9032 X420hooke@ametsoc.org |
| **Dr. Pietro Ceccato**Research ScientistInternational Research Institute for Climate & SocietyThe Earth Institute, Columbia University,  Lamont Campus61 Rt. 9 WestPalisades, NY 10964Phone: 845-680-4425pceccato@iri.columbia.edu | **Dr. William B. Gail**Director, Strategic DevelopmentMicrosoft1690 38th StreetBoulder, CO 80301Phone: 303-546-1429Fax: 303-583-0246bgail@microsoft.com |
| **Dr. Susan Moran**Adjunct Professor, University of ArizonaHydrologistUSDA Southwest Watershed Research Center2000 E. Allen Rd.Tucson, AZ 85719Phone: 520-670-6380 X171susan.moran@ars.usda.gov |  |

**Applied Science Advisory Group (ASAG)**

**NASA Headquarters**

**Washington, DC**

**October 9-10, 2012**

**MEETING ATTENDEES**

***ASAG Members:***

Green, Kass (Chair) Kass Green & Associates

Ceccato, Pietro International Research Institute for Climate & Society

Dickson, Nancy Harvard Kennedy School

Gail, Bill Global Weather Corporation

Hooke, Bill Disasters Roundtable

Meister, Peter (Executive Secretary) NASA Headquarters

Moran, Susan [via WebEx] University of Arizona

***NASA Attendees:***

Berrick, S. NASA HQ

Brown, Molly NASA GSFC

Burgess-Herbert, Sarah NASA HQ

Carroll, Mark NASA GSFC

Doorn, Bradley NASA HQ

Eckman, Richard NASA HQ

Escobar, Vanessa NASA GSFC

Freilich, Michael NASA HQ

Friedl, Lawrence NASA HQ

Haynes, John NASA HQ

Komar, George NASA ESTO

Lee, Christine NASA HQ

Lindsay, Francis NASA HQ

Maid, Martha NASA HQ

Murphy, Kevin NASA GSFC

Seeblon, Michael NASA HQ

Shannon Kelly NASA HQ

Walton, Amy NASA HQ

Yuhas, Cheryl NASA HQ

***Other Attendees:***

Robinson, Erin ESIP

Dye, Tim Sonoma Technology, Inc.

Hennings, Sarah USRA

Frankel, David Zantech/PB Frankel LLC

**Applied Science Advisory Group (ASAG)**

**NASA Headquarters**

**Washington, DC**

**October 9-10, 2012**

**LIST OF ELECTRONIC PRESENTATIONS**

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ASAG - 3x - ESD Applied Sciences - ARL.pptx

ASAG - 3x - ESD Applied Sciences - Mrkt Research Water.pptx

ASAG - 3x - ESD Applied Sciences - SERVIR AppSciTeam.pptx

ASAG - 3x - Input to ESD app sci ASAG April.pptx

ASAG - 4 - ESD Leadership.pptx

ASAG - 5 - Natl-Intl - NCA-CEOS-NEO.pptx

ASAG - 6 - Data Access.pptx

ASAG - 6x - Data Access - Berrick.pptx

ASAG - 6x - Data Access - Robinson.ppt

ASAG - 7 - Open Discussion n Day 1 Rvw.pptx

ASAG - 7x - Walk On Item MM.pptx

ASAG - 8 - Recent or Upcoming Assmnts.pptx

ASAG - 8A - Latency.pptx

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ASAG - 9 - Applications and Missions.pptx

ASAG - Intro - EAA Beginning.pptx

ASAG - Intro2 - EAA Beginning - With Movies.pptx

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ASAG - x11 - ASAG Meeting Summary.pptx

SGE Ethics Briefing 2012 - Triangle-RLG.ppt

**ADDITIONAL MATERIAL DISTRIBUTED AT THE MEETING**

*Earth Science Serving Society - NASA Applied Sciences Program*

*2011 Annual Report - NASA Earth Science Applied Sciences Program*

Earth Science Subcommittee – Earth Science Applications and Satellite Mission Planning;

 Background Information – March 2012 Meeting