Earth Science Subcommittee Report
May 28-29, 2008 Meeting
NASA Headquarters

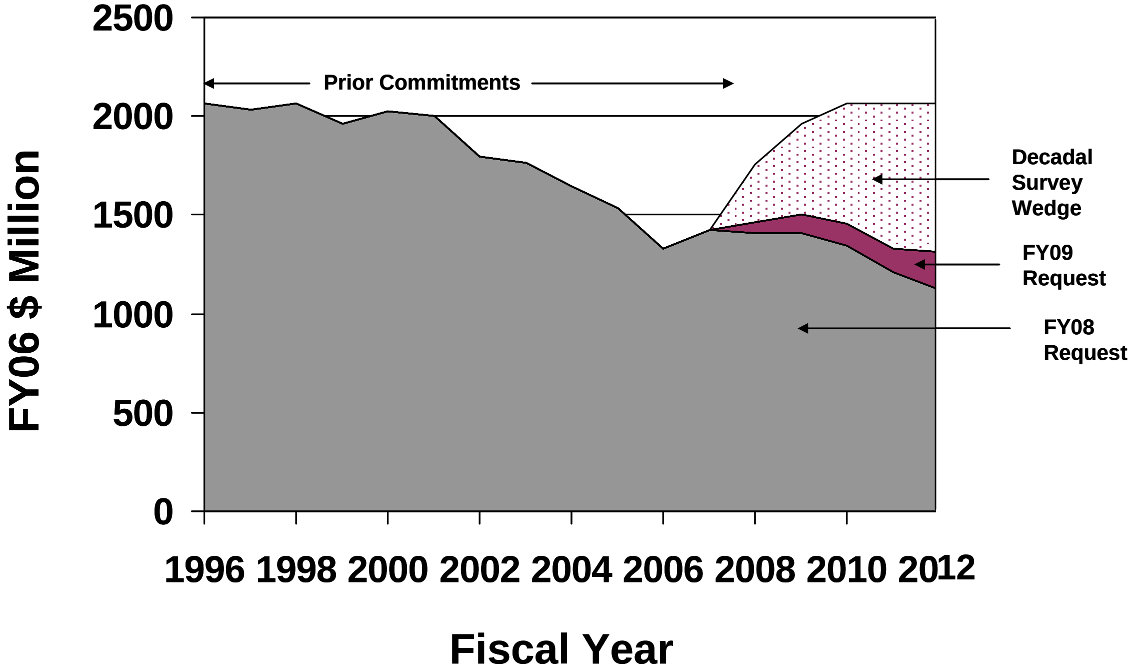
From: The NASA Earth Science Subcommittee – Daniel J. Jacob (chair, djacob@fas.harvard.edu), John R. Christy, Jonathan Foley, James Hansen, Gregory Jenkins, Patricia Matrai, Julian McCreary, Jean-Bernard Minster, Michael Ramsey, Kamal Sarabandi, Mark Simons, Konrad Steffen
To: Edward David, Jr. (Chair, NAC Science Committee)
Cc: Greg Williams (NAC Science Committee Executive Secretary), Paul Iademarco (NAC Executive Director), Michael Freilich (ESD Director), Randy Friedl (ESD Deputy Director for Science), Jack Kaye (ESD Associate Director for Research), Stephen Volz (ESD Associate Director for Flight Program), Teresa Fryberger (Associate Director for Applied Sciences). Lucia Tsaoussi (Earth Science Subcommittee Executive Secretary)
Date: June 23, 2008

Dear Dr. David:

The Earth Science Subcommittee (ESS) met on May 28-29, 2008 at NASA Headquarters. We received updates on ESD (Michael Freilich), and on the NRC Decadal Survey missions (Stephen Volz). We received a briefing on the Instrument Incubator Program (IIP) (Amy Walton) and discussed a proposal initiated by an ESS member (Kamal Sarabandi) for a Basic Science Program. We voted on ESD's performance for the GPRA Science Assessment. We welcomed two newly nominated ESS members (Hoff, Schutz) who are expected to be appointed soon and will officially join us at our next meeting along with other newly nominated members (McCormick, Running, Solomon, Vorosmarty). We expressed our gratitude to our departing members (Avissar, Curran, Jensen, Zipser).

Our summary recommendations and statements are presented in bold. We request that you transmit to the NAC one of our recommendations, "**Establishing a Venture-Class Mission Line in ESD"**. We elaborate on this recommendation in an Appendix following the standard format.

A major topic of discussion at the meeting, as in our previous two meetings, was the implementation of the NRC Decadal Survey (DS) as a blueprint for ESD's strategy over the next decade. Our June 2007 and January 2008 letters applauded ESD's commitment to execute the DS. However, we pointed out that the ESD budget (reduced by 30% since 2000) does not allow for execution of the DS at a reasonable pace. We called for an Earth Science Initiative involving a 30% increase in ESD budgets, i.e., a restoration to 2000 levels. The FY09 budget does include an Earth Science Initiative and we are pleased that it reverses the course of continued erosion of ESD funding. However, this Initiative is anemic compared to what is actually needed for implementation of the DS (see Figure on next page). It may allow launch of at most 4 of the 14 DS missions over the DS time horizon (2011-2020). Many Earth Science areas will not have a mission in the next decade under this scenario. The DS viewed its ensemble of 14 complementary missions for 2011-2020 as a minimum program for Earth Science in the next decade, at a time of increasing societal concern over Earth Science issues. The FY09 budget falls far short of what is needed for a healthy Earth



Long-term trend in ESD budgets, Decadal Survey Request, and FY09 Request

Science program at NASA. We are also dismayed that the resources for this Initiative came from redistribution of resources within SMD, rather than an increase in the SMD budget. This obviously does not generate goodwill from the Space Science divisions (although we note that they were largely spared the past budget cuts inflicted on ESD) and it very much limits the resources that can be applied to the Initiative. **NASA needs to recognize that a much stronger Earth Science Initiative than that implemented in the FY09 budget is urgently needed to deliver a viable fraction of the program of critical Earth Science missions outlined in the NRC Decadal Survey. Resources for this Initiative should come from outside SMD.**

Despite this dire situation, we applaud ESD for moving aggressively to implement the first cohort of DS missions (SMAP, ICE-SatII, DESDynI, CLARREO) and initiating working groups to develop plans for the second and third cohorts. But we are concerned that a combination of minimal budgets and aggressive schedule to execute the first cohort of DS missions adds risk to those missions and could imperil the R&A program if schedules slip and cost overruns occur. We have stressed in past ESS letters that the R&A program must be protected. It serves an essential purpose for exploiting Earth Science observations from space and laying the groundwork for the next generation of space missions. Dollar for dollar, the R&A program is arguably the most effective use of ESD resources. **Aggressive implementation of Decadal Survey missions should not come at the expense of R&A budgets.**

Another major topic of discussion at our meeting was the role and scope of Venture-class missions in the ESD portfolio. As stated in our previous letters, we view these missions as a critical component of the DS implementation program. They are intended to be $100-$200M budget missions focused on scientific deliverables (as opposed to new technology). They are to enable grass-roots infusion of new ideas to complement the strategic package of

DS missions, and provide a vehicle for training the next generation of space mission scientists. Michael Freilich informed us that he might be able to support a yearly call for Venture-class missions without compromising the schedule of DS missions, and he asked our advice on whether this would be a good thing to do and what the scope of that program should be.

A first issue that we debated is whether these Venture calls should be restricted to space missions. Space missions are probably most in the spirit of the DS vision for a Venture-class program. However, ambitious suborbital missions (also discussed as a need in the DS) can also offer an important complement to the suite of DS strategic satellite missions, and there is presently no mechanism for funding those within ESD programs. **We recommend that the Venture-class mission program include opportunities for suborbital as well as space missions.** Space-based and suborbital missions should not compete against each other, most importantly because the cost requirements are not commensurate. **We recommend that calls for Venture-class space-based and suborbital missions be made separately in alternate years.** We concurred that a call for Venture-class space-based missions every two years would be sufficient to maintain the vitality of the community and serve the purpose of the program. If possible, each space-based mission call should produce two awards.

The second issue that we debated is the overlap between Venture-class and strategic DS missions. Mike Freilich expressed concern that Venture-class space-based missions proposing to deliver on latter-tier DS mission concepts might upset the strategic order and integrity of the DS mission suite. We discussed the issue extensively and concluded that DS mission concepts should not be excluded from competition for Venture-class missions, for several reasons:

(1) Missions in the 2nd and 3rd cohorts of the DS will most likely launch far beyond the end of the DS time horizon (2020), and will likely be re-examined by the next DS. It seems punitive to exclude these missions or their components from the opportunity to compete for an earlier launch at a low cost;

(2) Opportunities to fly components of DS missions at low cost because of unforeseen opportunities from a shared launch, interagency cooperation, or new technology should be seized;

(3) Venture-class missions might be a suitable vehicle for pilot versions of DS missions;

(4) Excluding DS mission concepts from a Venture mission call would be difficult to state and likely lead to confusion about the boundary of exclusion;

(5) The Venture-class mission line is intended to enable the grass-roots infusion of new ideas, technologies, and opportunities into the DS process and address scientific urgency of some of the DS strategic areas; restrictions on the scope of ideas would counter the purpose.

Therefore, **We recommend that calls for proposals for Venture-class missions be as broad as possible and without restrictions imposed by the suite and order of DS missions.**

We received a brief NPOESS update but time constraints prevented substantial discussion. The descoping of climate-monitoring sensors on NPOESS platforms to resolve cost overruns was a major focus of concern in past ESS letters. We remain concerned about the issue and plan a thorough discussion of NPP and NPOESS at our next meeting. In the meantime, **we recommend that NASA exert continued vigilance to maintain the climate monitoring capabilities of NPOESS sensors.**

Mike Freilich presented to us statistics for the processing and selection of proposals submitted to ESD. We were impressed that ESD has been able to maintain success rates of about 30% for submitted proposals. This is a healthy rate (significantly higher would mean that funding opportunities are too few, significantly lower would be unfair to proposers and reviewers). We were also impressed by the successful efforts of the ESD leadership and staff to reduce time between proposal submission and decision – now averaging less than six months. We were further impressed by the improvement in obligation rates, an important step to avoid rescission. **We commend the ESD leadership and staff for streamlining the ROSES calls to achieve adequate success rates, speeding up the time to selection, and ensuring timely spending on funded proposals.**

One concern that we have is ESD's current trend towards 4-year proposals. We understand the advantages that this provides for proposal administration but are concerned by the consequent reduction in opportunities. The recent Modeling and Analysis Program (MAP) call received an alarmingly large number of proposals (152), and one contributing factor may have been that it called for 4-year proposals. Three-year proposals have long been the standard for federal agencies funding Earth Science, and this duration appears to appropriately balance the administrative and proposers' burdens on the one hand, and the availability of funding opportunities on the other hand. We recognize that some NASA programs may benefit from longer-term funding commitments but that should not be the standard. **We recommend that ESD retain a standard duration of three years for funding research projects.**

We are pleased that ESD is continuing its program of graduate fellowships (NESSF). We view this as a cost-effective program to develop and promote the next generation of Earth scientists. It would be to ESD's advantage to keep a record of the career paths of past Fellows in order to demonstrate the effectiveness of the program. **We recommend that a survey be conducted of past recipients of NASA Earth science graduate fellowships in order to quantify the contribution of this program to the development of the next generation of Earth scientists.**

Steve Volz briefed us on the organization of a blue-ribbon panel to review the costs of Earth Science missions and address the perception that these missions may be unduly more expensive than Space Science missions. We had recommended the formation of such a panel at our last meeting and are delighted to see it happen. Steve Volz told us that the panel would focus its analysis on completed missions, for which actual costs can be established, but we re-emphasize that the ultimate goal of the panel should be to evaluate the cost of Earth Science missions in the DS portfolio. This is essential to address the perception expressed by NASA upper management that Earth Science missions are inordinately expensive and hence that the DS portfolio of missions is unrealistic. It will also help to put the costing of DS missions on firmer ground, allowing for better projection of resources and a more reliable mission pipeline. The OCO and Glory missions are presently incurring large cost overruns, delaying the start of new missions; a task of the panel should be to take the lessons learned from these overruns towards a better costing model for Earth Science missions. **We recommend that the newly appointed panel reviewing the cost of Earth Science missions include in its purview the current cost analyses of DS missions.**

We received an update from Amy Walton on the IIP and its recent selection of new projects. We applaud the IIP's focus on developing instrumentation that will serve the needs of the DS missions. The IIP is an important program and it addresses its purpose well. **In the period where NASA will focus heavily on DS missions, IIP is a core element in promoting innovation in NASA's ESD technology development for R&A efforts.**

Kamal Sarabandi presented a proposal for a new Basic Science Program at ESD. He remarked that ESD does not presently have a vehicle to fund high-risk, fundamental projects that may yield long-term transformative results for remote sensing of Earth from space. These projects may include new sensors, new retrieval algorithms, or new approaches to data analysis. The Program would fund projects at a small level (<$100K/y) and for a limited period (at most 3 years). We agreed that there is a need to fund such fundamental research and that this need is not presently well served by the ROSES calls, which tend to favor larger-budget proposals with near-term deliverables. The Mars Fundamental Research Program was cited as an example of a Basic Science Program in the Planetary Science Division. However, we are concerned about the management overhead involved in starting a new program and the definition of such a program as funding 'fundamental high-risk' science. Supporting such research might be done within existing ROSES elements if the opportunities were properly articulated in the calls. Or it might be done through small unsolicited proposals, following the "sugar grant" (~$50K, 1-year) model at NSF. In the end, we feel that the ESD leadership is best placed to decide how to encourage high-risk fundamental research. The important point is that this research deserves more encouragement than it is presently getting. **ESS recommends that more effort be made within ESD to encourage and support low-cost proposals for fundamental research that may yield long-term transformative benefits for Earth observation from space.**

Finally, we were asked to rate ESD's performance on its six target outcomes for FY08 as requested by the Government Performance Results Act (GPRA). We were satisfied that NASA has made significant progress toward these outcomes and therefore gave "green" ratings for all. We noticed, however, that the listing of ESD accomplishments and publications in the GPRA report was very limited and somewhat random, and did not do justice to the scope and depth of ESD's actual accomplishments. ESD could easily do a better job of tracking the publications, honors, and other significant accomplishments of its grantees. This would assist not only the GPRA report but also other opportunities to advertise the quality and volume of science enabled by ESD. For this and other purposes, **We recommend that ESD capture and document the existing reporting requirements in progress reports from ESD grantees to include publications, honors, and other significant accomplishments. These should be entered in an ESD data base to enable better reporting of ESD's performance and could be distributed to the public annually.**

Our next meeting will be in January 2009.

Sincerely,

Daniel J. Jacob

The Earth Science Subcommittee (Daniel J. Jacob, chair)

APPENDIX 1: Proposed Recommendation for the NAC Science Committee

Subcommittee Name: Earth Science

Chair: Daniel J. Jacob

Date of Public Deliberation: May 28-29, 2008

Date of Transmission: June 23, 2008

Short Title of Proposed Recommendation: **Establishing a Venture-Class Mission Line in ESD**

Short Description of Proposed Recommendation:

We recommend that ESD issue yearly calls for Venture-Class missions, with space-based and suborbital missions to be competed in alternate years. Opportunities for space-based missions should place no restriction on possible overlaps with Decadal Survey strategic missions.

Outline of the Major Reasons for Proposing the Recommendation:

Venture-class missions are a critical component of the NRC Decadal Survey (DS) program. They are intended to be $100-$200M missions focused on scientific deliverables. They are to enable grass-roots infusion of new ideas and technologies to complement the strategic package of DS missions, and provide a vehicle for training the next generation of space mission scientists. Suborbital as well as space-based missions can serve this purpose, and therefore we recommend that both be included in the Venture-class mission program. Calls for space-based and suborbital missions should be separate, and calls for each in alternate years would maintain a good level of opportunity. Restrictions on the scope of missions that can be proposed to the Venture-class program, in particular to avoid overlap with strategic DS missions, would be counterproductive. Calls for Venture-class missions should be as broad as possible.

Outline of the Consequences of No Action on the Proposed Recommendation:

The opportunity to infuse new ideas and technologies in the suite of Earth Science missions for the next decade will be missed.