

National Aeronautics and Space Administration

**Earth Science Subcommittee
of the
NASA Advisory Council**

[Teleconference]

August 12, 2010

NASA Headquarters

Washington, D.C.

MEETING SUMMARY

Lucia Tsaoussi
Executive Secretary

Byron Tapley
Chair

Submitted:
Mark Bernstein
Vantech IT Services
August 26, 2010

The NAC Earth Science Subcommittee
August 12, 2010
Teleconference
NASA Headquarters

The teleconference commenced August 12, 2010, at 1:05 p.m.

Lucia Tsaoussi [executive secretary] said the primary purpose of this teleconference was to review the Earth Science program relative to its research metrics, and assign a grade to each category. She noted that the session was a FACA meeting; was being held under the guidelines of the Federal Advisory Committee Act; and it was therefore possible that members of the public might call in.

Byron Tapley [chair] called attention to the fairly complete background document delivered to subcommittee members by Lucia Tsaoussi by email the previous Thursday, and the summary material provided to all concerned the previous day. One task for the group was to decide whether the additional information provided was sufficient. Dr. Tapley restated that the day's primary task was to agree on a 'green,' 'yellow,' 'red' rating for each of six earth science metrics. Lucia Tsaoussi noted that the group may wish to re-write the background that had been provided.

Dr. Tapley said that the teleconference would begin with a report from Mike Freilich, director, Earth Sciences Division, on the status of the Division.

Earth Science Division status report:

Mike Freilich thanked all concerned for joining the teleconference. His presentation, he said, would be brief. He would discuss mission status; address the status of disaster response to the Gulf of Mexico; speak about National Space Policy, and about climate initiative activities. He noted that the division had five foundational missions; all were moving ahead fairly well.

GLORY is scheduled for launch in November-December, 2010. He noted two potential issues – first, the Taurus XL return to flight, an issue that was being fairly well dealt with at high headquarters' level; second, the technical drives on the solar array could potentially be a real problem. A meeting was scheduled for the following day to consider the issue.

Aquarius has been shipped from Argentina to Brazil, where it was currently undergoing environmental tests. The expected launch date was April 2011; a target he termed aggressive but achievable. The main challenge involved had to do with the mission operation system.

On NPP, all five of the instruments have been integrated, mechanically and electrically. The project was into the fourteen-month period leading up to anticipated

launch in October 2011. The LDCM was set for an October 2012 launch and the GPM for a July 2013 launch were both hitting milestones.

Mike Freilich emphasized the fact that launch vehicle costs were increasing dramatically; the Division had no control over this. Given these increases, he said all possible efforts were being made to preserve the full Earth Science program. The Division, he said -- working closely with local launch personnel -- had supplied a set of options to the NASA Administrator. This effort included requests that waivers be issued permitting use of Minotaur IV's in several launches; he believed these waivers might be approved. Freilich noted that the division was moving to maximize its resources while responding to the tension within the Administration -- between the desire to have a robust earth observing program and a robust commercial launch industry.

Mike Freilich noted that the division had supplied considerable support to the Gulf of Mexico oil spill response -- including provision of airborne assets and satellite measurement. He noted failures that had led to postponement of deployment; none had been related to science capabilities. He believed the Division's efforts with the oil spill had brought it considerable favorable notice within the Administration.

The question was posed if a "spin down" option existed for backing off from the oil spill related activities. Mike Freilich said there was. The practice was to respond to interagency requests as these were received from first responders. The Division's response would continue just so long as its assistance was sought. The Division was not, however, putting assets on-line that had not been requested by the first responders.

The question was posed if the number of requests was diminishing or expanding. Mike Freilich said they were diminishing.

On Venture EV1, Mike Freilich said five different airborne investigations had been selected in May 2010. He noted that he had recused himself from that selection, but felt confident that a superb set had been selected to kick off this venture class process. He noted that twenty-three institutions were involved in the five investigations.

Mike Freilich noted that the National Space Policy had been issued and that the Earth Science Division figured prominently and positively in this policy. He noted, first, that many aspects of earth science within NASA were explicit in the policy; second, that the policy reiterated the importance of international collaboration which he felt was a strength of the Division. Relative to the National Space Policy issued by President Bush, he said the new policy was less unilateral and directed.

On the climate initiative plan, he reported that all subcommittee members had received copies. For the plan to be enacted, he noted, Congressional approval of the President's FY'11 budget was required. He believed this would happen in the near future: all four draft bills which had come to his attention called for full funding for earth science. It was asked if the climate plan was a public document. Mike Freilich said that it was. Lucia Tsaoussi said it was available on her website.

Mike Freilich noted that one part of the National Space Policy called for a long-term terrestrial imaging system; on this, he said, the Division was working in complete harmony

with the United States Geological Survey and the Executive Office to develop such a plan. Discussions were occurring at a high level: a key perspective shared by NASA and USGS was that the organization that undertakes to manage the system should be the agency receiving the funding – i.e. USGS. Under any circumstance, NASA is to be the implementing arm. Bernard Minster asked whether an endorsement or statement of support from this group would be helpful. Freilich welcomed this question, but said that as current discussions were fully amicable, it might be useful to defer such an action until hurdles were encountered. He did not anticipate any such hurdles.

Mike Freilich noted, relative to missions in formulation and pre-formulation, that, until each was launched, discussions would continue with a view to keeping the whole program together and balancing capabilities and costs so that the entire program could be executed. The work being done by science teams, project teams and at headquarters was neither easy nor rapid, but he was confident that the Division would continue to have an executable program.

Bernard Minster asked whether some future meeting might present information on ICESaT-2, DEDynI and CLARREO. He was concerned that these three missions, in aggregate, might stretch the limits of what could be accomplished. Mike Freilich said the matter could be addressed in detail at the group's next meeting. At headquarters, he said, the approach being taken was that mission capabilities were to be tailored to available funding. Persons involved would not become so wedded to a set a capabilities that the program became impossible to do. It may be the case, he said, that all would have to step back and answer the question: do these capabilities result in a scientifically-viable mission? This subcommittee may be asked to make that determination. This question will be: "Is this mission scientifically viable?" Not, 'Is this the mission we would most like to have?' Minster said this was his concern. He thought there was a general question: at one point did a policy of extending the duration of missions begin to break down. The comment was made that the approach being used allowed one to determine the best science one can have within the budget allocation. Freilich noted that the climate initiative plan had costs, schedules and capabilities built into it.

Bernard Minster requested an update on discussions with the Europeans over their receptivity to collaboration. Mike Freilich said the story was absolutely positive. Since November 2009, he, Steve Briggs and others had worked on creating a more expansive NASA/ESA framework. An extraordinarily productive joint meeting had been held in early April 2010; it hinged on the decision by the Europeans to endorse free and open on data exchange. Three areas of collaboration have been identified – mission collaboration; field experiments; and ground system and data set harmonization – with a working group established in each. His own view was that relationships with ESA were proceeding optimally.

Bernard Minster asked if the European Community was likely to adopt a similar policy. Mike Freilich said he expected a recommendation to be made to EU by ESA by the end of the year. In response to a query from Minster, Freilich said the draft agreement was open and available. Lucia Tsaoussi said she would email a copy to him. Byron Tapley thanked Freilich for his presentation. He noted that both the Science Plan and the Climate

Initiative Plan were well written documents that provided a very useful view of the Division's activities.

Grading the Science Metrics:

Byron Tapley noted that subcommittee members had received documents from Lucia Tsaoussi listing six areas of measurement. He suggested the group undertake a general review; target what changes might be needed; and then determine who would write the necessary revision. He noted that the descriptions of what the Division had done in each area were not complete; the group might wish to review these further.

Sub-Goal 3A: Study Earth from space to advance scientific understanding and meet societal needs.

Outcome 3A.1: Progress in understanding and improving predictive capability for changes in the ozone layer, climate forcing, and air quality associated with changes in atmospheric composition.

FY 2009 Annual Performance Goal	FY 07	FY08	FY09	FY10
Demonstrate progress in understanding and improving predictive capability for changes in the ozone layer, climate forcing, and air quality associated with changes in atmospheric composition. Progress will be evaluated by external expert review	Green	Green	Green	

Byron Tapley said he welcomed the inclusion of a paragraph summary statement for each goal. It was suggested that this be called an executive summary rather than an introduction. William Large commented that the portion of the outcome statement – 'progress in understanding' – was fine, but that he did not agree the statement 'improving predictive capability' was supported by what appeared. There was, he added, nothing about skill scores; nothing about how predictive capacity had been improved. If, he said, the real charge to the group was to improve predictive capability, and then identifiable and demonstrated improvement needed to be shown. Perhaps 'improving predictive capability' should be removed as an achievement. The comment was made that much of the work cited, while it might not improve predictability in a formal sense, did improve the predictive capability of models. William Large said the work just referenced had the *potential* to improve predictability; however, predictions, were 'tricky things' -- one could improve physics and degrade predictability at the same time. He stressed he was not unhappy with the quality of the work done; however, he was reluctant to take on faith that something had been accomplished.

Lucia Tsaoussi said the report included cross-cutting elements, so that some of what could appear here had been reported in other sections. She noted that the metrics the group was addressing were ones passed forward from previous years: review of these will be reflected in future metrics, but not in the ones currently before the group. Bryon Tapley said he had reviewed the backup material associated with 3A.2 and thought the difficulty with 3A.1 may in part be the way the information was parsed out. William Large suggested that attention be called to this in the executive summary. As matters stood, 3A.1 was the outcome that dealt with changes in atmospheric composition; therefore, it was an appropriate place to address how changes in atmospheric composition affect predictability. The comment was made the historically questions of air quality had fallen under atmospheric composition. Bernard Minster commented that the presentation was likely to confuse people lacking a strong background in the subject.

The question was raised whether the six areas for review were adopted by the Division or imposed upon it. Lucia Tsaoussi said the Division developed the list, which then received concurrence from the Office of Management and Budget [OMB]. She noted that there was a one-year delay between the time the metrics were adopted and the time they were used in ratings.

Raymond Hoff said he believed the backup material was impressive; the area was strong and should be given a 'green.' Similar sentiments were expressed. Byron Tapley called for a hand vote. William Large was the only participant opposed to such a rating: he believed the present review was an opportunity to tell people doing work in the area that, to fulfill the entire outcome, they needed to extend their collaboration to include people who could do quantitative measurements. William Large said demonstrating predictive capability was commonly done; the particular application in front of the group, however, did not show it had been done in this case.

Lucia Tsaoussi commented that this discussion was a point at which additional material targeted to this particular issue might be provided. Byron Tapley said he believed this was a good idea. She noted that the committee, though not unanimous, favored a rating of 'green.'

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Outcome 3A.2: Progress in enabling improved predictive capability for weather and extreme weather events.

FY 2009 Annual Performance Goal	FY 07	FY08	FY09	FY10
Demonstrate progress in enabling improved predictive capability for weather and extreme weather events. Progress will be evaluated by external expert review	Green	Green	Green	

Lucia Tsaoussi said she had hoped to receive lead comments on this section from Gregory Jenkins, but he was in Barbados. He had stated that he would attempt to call in. This posed the question of who would act as lead for this item. Raymond Hoff said extreme weather was not his area of expertise. He believed the fact that only a single paragraph was devoted to this item was out of balance with the rest of the report; he offered to make an effort to flesh it out, inviting Tsaoussi to work on it further. Tsaoussi said Raymond Hoff could edit; alternately, people might be willing to do reviews by email. Tsaoussi said she did not know when Jenkins would be in touch. Hoff said he had he saw no difficulty in identifying supporting material to make a stronger case. Byron Tapley asked how this might affect the timing for obtaining a letter vote. Tsaoussi said that, ideally, ratings would be made at this meeting. The comment was made that longer-term activities, including some from Goddard and papers written on the 2005 hurricane season, were not included under work done. Tapley said he believed a 'green' rating should be given unless an obvious omission was identified. John Christy supported a 'green' rating: he was aware that NASA was doing a great deal for predictive capability of NASA forecasters. Responding to Tapley's request, John Christy said he would write a 'half paragraph' to strengthen the submission. Tapley said clarity was needed to tie individual accomplishments to overall objectives. Christy suggested that one thing to include was the development of activities for lightning detection for satellites, which he believed would have a significant impact. He was also that the National Oceanographic and Atmospheric Administration [NOAA] had reported on this; he thought it equally appropriate for NASA to do so. William Large said 3A.2 included a wonderful example of how prediction of hurricanes has improved; he believed the wording was almost transferable to this section. Tapley welcomed a vote of 'green' for this section, with the caveat that a redrafted section would be submitted to Tsaoussi. That rating was affirmed.

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Outcome 3A.3: Progress in quantifying global land cover change and terrestrial and marine productivity, and in improving carbon cycle and ecosystem models.

FY 2009 Annual Performance Goal	FY 07	FY08	FY09	FY10
Demonstrate progress in quantifying global land cover change and terrestrial and marine productivity, and in improving carbon cycle and ecosystem models. Progress will be evaluated by external expert review	Green	Green	Green	

Byron Tapley asked Steven Running if he could head efforts on this section. Running said the section was already in good shape; he noted that four papers pertinent to this section would be published in the next two weeks, either in *Science* or in *Nature*: could they be included? Lucia Tsaoussi said the report covered the fiscal year; therefore, these materials could be included. David Siegel said the section's ocean portion constituted important

contributions. Pat McCormack said the final name section – on ‘improving carbon cycle and ecosystem models’ – was the east well covered; only two sentences in the summary related to it. Running said one forthcoming paper would be of value to this. Tapley noted that the longer summaries distributed last week also contained information that may be pertinent. McCormick suggested that Running make a first effort at a revision; she would take an additional look.

William Large expressed some confusion: the phrase in the supplementary material about having ‘challenged the entire understanding’ needed some kind of reference. He believed this section should be given a ‘green.’ Dr. Running suggested that someone from the ocean community might want to do the editing of the ocean section; he would write a summary of the four new terrestrial papers. Dr. Siegel and Dr. Michalak volunteered to provide details on the carbon cycle ocean section.

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Outcome 3A.4: Progress in quantifying the key reservoirs and fluxes in the global water cycle and in improving models of water cycle change and fresh water availability.

FY 2009 Annual Performance Goal	FY 07	FY08	FY09	FY10
Demonstrate progress in quantifying the key reservoirs and fluxes in the global water cycle and in improving models of water cycle change and fresh water availability. Progress will be evaluated by external expert review	Green	Green	Green	

Byron Tapley asked if David Siegel and Koni Steffen would assemble comments on this section. Siegel said it was not his area of expertise. Steven Running noted this was another area in which a publication was pending. Tapley asked who on the subcommittee was most appropriate to address it. Koni Steffen offered to provide summary sentences on the cryogenic frost cycle; while he was not completely familiar with the progress in this area, he believed some reading on his part would fill the gap. Tapley said no subcommittee member had deep experience on the water cycle; perhaps Charles Vorosmarty could be asked to comment. Lucia Tsaoussi noted that a new member slated to join the group in the fall had such expertise. Tapley believed a lot had been accomplished in this area. Steffen proposed giving the section a ‘green.’ This was the consensus of the group. Steffen said he would contribute several sentences related to snow and ice.

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Outcome 3A.5: Progress in understanding the role of oceans, atmosphere, and ice in the climate system and in improving predictive capability for its future evolution.

FY 2009 Annual Performance Goal	FY 07	FY08	FY09	FY10
Demonstrate progress in understanding the role of oceans, atmosphere, and ice in the climate system and in improving predictive capability for its future evolution. Progress will be evaluated by external expert review	Green	Green	Green	

Byron Tapley said he hoped William Large, Anna Michalak and David Siegel for editorial leadership on this section. Koni Steffen suggested that in the background material, the word 'promising' be substituted for the word 'tremendous' related to work on development in ice sheet models. Further, there was some disconnect in the supporting material; material should be placed into a better format. Tapley said that, in reviewing the title, he believed sufficient emphasis had not been placed on the atmosphere. Tapley added he believed there was definite agreement that the group was happy with 3.5. No dissent was expressed.

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Outcome 3A.6: Progress in characterizing and understanding Earth surface changes and variability of Earth's gravitational and magnetic fields.

FY 2009 Annual Performance Goal	FY 07	FY08	FY09	FY10
Demonstrate progress in characterizing and understanding Earth surface changes and variability of Earth's gravitational and magnetic fields. Progress will be evaluated by external expert review	Green	Green	Green	

Byron Tapley suggested that Bernard Minster take the lead with this section. He did not believe the topic and its exposition were well matched. Minster said he frequently heard about GNSS and GPS and the efforts to put reflectors on the next generation of GPS satellites; he believed this would tighten the performance of the global geodesy. He believed ongoing activities included visible and novel accomplishments: GRACE had demonstrated its ability; Jason II looked good; ISAT has ceased operations, but the science had not stopped.

Bernard Minster identified the major points that he believed came across: First, the use of the word 'assimilation' is a major step forward: it includes a time dependence that had been known about for a long time and a time dependence on telemetry that had had been known for a shorter time. This, he said, would provide the capability to look at longer-

term phenomenon such as ice sheet coverage, and at more immediate phenomenon such as tidal waves and earthquakes. Second, the International Terrestrial Reference Frame was now recognized internationally; everyone recognizes that the reference frame is time dependent. Minster stated that it appeared every important mission scheduled for the next two decades depended on a robust set of geodesic assets; he believed this needed to be stated more clearly. His final point was that anything done in this field in the next quarter-century would involve technology transfer from research to either national application, including military; or civil application, such as automotive GPS use. He believed this needed repeated emphasis. Byron Tapley said a summary of this material should be prepared and substituted for what was now in use. Bob Schutz thanked Minster for his summary. Minster said he thought the title used differed from the one in the science plan. Tapley said that, by requirement, the current title was required; the new would be used in 2011. Lucia Tsaoussi affirmed this.

Dr. Schutz observed that one activity of the group on earth and its interior was to provide assessments of events – e.g. of the oil spill. He expressed surprised that no mention had been made in the supporting materials of the many NASA-funded scientists who made use of international data sets to respond to events such as the Peruvian earthquake. Much of what Bernard Minster described did not appear in the overview: he suggested reference be included in the ice section to the UAV deployment in Greenland and Iceland: this had been a great success in general and which had provided information about how ice responds to changing boundary conditions. Bob Schutz suggested the material might be better placed into 3.A.5; much was being aggregated under 3.A.6. Tapley suggested that Bernard Minster and Mark Simons might collaborate on completing a paragraph on the importance of the geodetic related measurement to a wide range of circumstances. Clarifying, Tapley said the short document was of greater importance.

Mark Simons noted that in the longer document made reference to science leading to earthquake prediction; he believed this an overstatement. Byron Tapley suggested this be called out as questionable. The suggestion was made that the word 'predictability' be substituted for the word 'prediction.' Simons said he would be 'more draconian' than that. Bob Schutz expressed some concern about the broadness of the statement made about characterizing and understanding the changes in the earth's surface. He had no doubt that the area was 'green' – at the same time, he believed there were several omissions that needed to be addressed, including the ISAT contributions to the ice, sea ice and related areas. Bernard Minster said he believed a statement on sea ice could be placed in either 3.A.5 or 3.A.6. Tapley noted that the consensus was that while the area was 'green,' the justification in the draft was too narrow. This would be addressed in part by an introductory paragraph from Simons and Minster.

Raymond Hoff called attention to the statement about the 'decline in the global geodetic infrastructure' and that Earth Science Institute [ESI] had been an advocate to reverse this. He noted that while the advocacy was attributed to ESI, the report was being compiled by the Earth Science Subcommittee [ESS]: further, he thought the statement was "whiney." Byron Tapley suggested that rather than emphasize the decline; focus should be placed on the growing international realization of the importance of having a global reference frame. William Large commented that this was an ESS piece of writing; it might not be easy to include some of the glowing NASA statements review. He believed the group had more freedom to rewrite than it had been exercising. Lucia Tsaoussi noted that the

background was not sent; the documentation was retained, but it remained background rather than part of the review.

A consensus existed to give the area s 'green' rating. Koni Steffen said any changes or suggestions for main document should be sent to Lucia Tsaoussi, with a copy sent to Byron Tapley. Tsaoussi said the deadline for the document was in two weeks.

* * *

Next meeting:

Mike Freilich characterized the meeting as 'super-productive' and thanked all involved for reviewing the material prior to the session.

Lucia Tsaoussi noted that the proposed dates for next subcommittee session, November 2-3, 2010, conflicted with the Group on Earth Observations [GEO] ministerial meeting scheduled that same week in Peking; this might prompt rescheduling the ESS meeting to mid-November. Further, a major meeting was set for the following week at Potsdam. She requested all present provide information about potential scheduling conflicts.

Appendix A:

Membership: NASA Advisory Council [NAC] Earth Science Subcommittee

Byron D. Tapley <i>Chair</i>	University of Texas, Austin - Center for Space Research
Lucia S. Tsaoussi <i>Exec. Secretary</i>	NASA Headquarters - Science Mission Directorate: Earth Science Division
John R. Christy	University of Alabama in Huntsville - Earth System Science Center
Judith Curry	Georgia Institute of Technology - School of Earth and Atmospheric Sciences
James Hansen	Goddard Institute of Space Studies
Raymond M. Hoff	University of Maryland Baltimore County - Joint Center for Earth Systems Technology And Goddard Earth Science & Technology Center
Daniel Jacob	Harvard University - Department of Earth & Planetary Sciences
Gregory S. Jenkins	Howard University - Department of Physics & Astronomy
William Large	National Center for Atmospheric Research - Oceanography Section
Patrick McCormick	Hampton University - Center for Atmospheric Sciences
Anna M. Michalak	The University of Michigan - Department of Civil and Environmental Engineering - Department of Atmospheric, Oceanic and Space Sciences
Jean-Bernard Minster	University of California San Diego - Institute of Geophysics & Planetary Physics
Steve Running	University of Montana - Department of Ecosystem and Conservation Science
Robert Schutz	The University of Texas - Center for Space Research
Hank Shugart	University of Virginia - Department of Environmental Sciences
David A. Siegel	University of California, Santa Barbara - Department of Geography and Institute For Computational Earth System Science
Mark Simons	California Institute of Technology - Division of Geological & Planetary Sciences
Konrad Steffen	University of Colorado at Boulder - Cooperative Institute for Research in Environmental Science
Charles Vorosmarty	University of New Hampshire - Institute of the Study of Earth, Oceans, & Space

APPENDIX B:

Participants: August 12, 2010 Teleconference:

Mike Freilich	Director, Earth Science Division
Lucia Tsaoussi	Executive Secretary

Subcommittee members:

John Christy	University of Alabama, Huntsville
Raymond Hoff	UMBC
Daniel Jacob	Harvard University
William Large	National Center for Atmospheric Research
Pat McCormick	Hampton University
Anna Michalak	University of Michigan
Bernard Minster	UC/San Diego
Steven Running	University of Montana
Bob Schutz	University of Texas
Hank Shugart	University of Virginia
David Siegel	UC/Santa Barbara
Mark Simons	California Institute of Technology
Koni Steffen	University of Colorado
Byron Tapley	University of Texas

Other Participants:

Mark Bernstein	Note taker
Craig Dobson	NASA Headquarters
Jared Entin	NASA Headquarters
David Halpern	NASA Headquarters
David Hermreck	National Oceanographic and Atmospheric Administration
Ramesh Kakar	NASA Headquarters
Eric Lindstrom	NASA Headquarters
Diane Wickland	NASA Headquarters