

The transcript of the Earth Science Community Forum held on April 24th, 2023. Times are given in parentheses correspond to the recording of the Forum. The slide numbers refer to the slide deck and both the slide deck and the recording are available at <https://science.nasa.gov/earth-science/esdcommunity-forum> For the introduction and question and answer sections speakers are identified by name (in bold).

Slide 1- Introduction (00:00:15,240)

Wendy Mimh: Good afternoon everyone, good morning to our West Coast attendees. Thank you so much for joining us for today's Earth Science Division Community forum. Our main speaker today will be our Deputy Division Director Dr Julie Robinson. She's going to catch us up on the latest developments here in the Earth Science Division and then we may also be joined by ESD Division Director Dr Karen St Germain. Depending on how her schedule plays out she may hop into the Forum midway. In the meantime, Julie's going to cover some key topics like budget priorities and challenges, Mission Milestones, etc. She'll go through the agenda in just a moment, but I want to clarify that there will be time for Q and A afterward. Before we begin if we could advance to the next slide, I just wanted to cover some housekeeping items for today's WebEx.

Slide 2 (00:01:20,040)

Closed captioning is available if you would like to have it. Those are auto-generated, so they might not be perfect but they're pretty good. You click the little tiny CC box at the bottom left hand part of your screen, looks like a little quote bubble with the letter CC in it. Also, as I mentioned, there will be time for Q & A so please enter your questions into the Q & A feature here in WebEx. To do that you go down to the bottom right hand corner of your screen, there are three tiny little dots. Click on those and you'll see a menu that pops up that says Q & A. You can type your question right there. I wanted to make a note for folks that this webinar will be recorded. Without further ado, let's hand it over to Julie who will walk us through the agenda.

Slide 3 (00:02:16,860)

Julie Robinson: Right. Thanks Wendy well I am sorry to be a slightly late substitution. I love that we're seeing over 300 participants on from our community. At the very last minute, just really minutes ago, Karen was asked to go up to an urgent meeting in the Administrator's office which we think will take only 10 minutes and then she'll be back to join us. So I am going to channel what she has been saying about these topics for the beginning of the of the session and she should be able to drop in part way through. And, of course, we have our whole leadership team that you know well on the call as well today to help support your questions as they go.

So, we have five things we wanted to communicate with you today. First, we really wanted to talk about the budget challenges and priorities. We have now set our FY 23 operating plan, the FY 24 President's Budget submit is out and public. We want the opportunity to talk with you about what those things mean and what we see looking forward into the coming budget planning year as well. We'll

talk about some mission milestones. We'll talk about work that's been going on across the government in defining the roles of different agencies in climate change and what that means for NASA and climate science. We will talk a little bit about the latest on the Earth System Observatory and the Decadal missions as well as the completed missions associated with the Decadal and then talk about some of the things we're doing to help improve the action of the amazing science that you as a community are doing. So that's a lot to pack into I'm going to try to keep the remarks closer to a half an hour so there's plenty of time for questions

Slide 4 (00:04:04,620)

If we could go to the next chart. To first to talk about budget challenges and priorities. Go ahead to the next chart .

Slide 5 (00:04:15,300)

So the FY24 budget priorities that you saw in the President's Budget when it was released are really focused on promoting U.S leadership and Earth system science, advancing open source science and building an innovative and balanced program. Next chart.

Slide 6 (00:04:38,460)

These are what the overall numbers look like. The FY 23 budget that was enacted right before New Year's Eve in the end of 2022 was a record 2.2 billion dollars and an increase of 134 million dollars. That's the largest increase that we've received in Earth Science history. The President's Budget request in FY 24 seeks an additional 278 million dollar annual increase in Earth that's really focused on the need to fund Landsat Next and the Earth System Observatory. If you just look at those numbers, they look really good. You can see below that we gave you the breakdown between the major flight program lines as well as our Applied Sciences, Research, Technology and Data Systems portfolios. The challenge here is not with the numbers, but with the things that we are expected to do with that budget. If we could go to the next chart.

Slide 7 (00:05:42,840)

This just shows you the breakdown from the FY 24 President's Budget of what that looks like with the 22 and 23 history, that bump up in 24 and a still steady climb going on in the out years and you can kind of see here that big difference between FY 23 and FY 24. That's one of the challenges that I'll talk with you about today. If we can go to the next chart.

Slide 8 (00:06:11,160)

This is a really interesting historical view of the combination of the President's Budget submits and the actual budgets over recent history going back to FY 12. Not surprisingly they follow four-year cycles. So if you look back in 2012, 2013, 2014, 2015. and really even to 2016, what we got and what was in the President's Submit tended to match up fairly well. We got used to working in that kind of consensus environment. Then as we look further out in 2016 and 2017 there were projected increases going on. Those didn't actually emerge in the 2018, 2019, 2020, 2021 time frame. And now here we are looking at FY 22 where this Administration, in the President's budget submit, proposed pretty significant increases in Earth Science budgets and that was really to address both the recommendations of the Decadal Survey as well as Administration priorities. But the actuals approved by Congress have been less. So that puts us in a very different kind of environment politically than we've gotten used to being in. So the FY 22 impact of the appropriation was about 189 million less than the President's submit that we had planned for and in FY 23 the operating plan we just baselined was about 216 million dollars less than what we had been planning for. Next chart.

Slide 9 (00:07:51,720)

So there's also an accumulation of other kinds of budget challenges. For example, Landsat Next is about a 1.5 billion dollar program and it actually was not accounted for in the top line of the 2018 Decadal Survey Mission targets which means that we had to take that out of the growth that's been occurring that you saw me present already and that was not originally planned in the thinking on the Decadal Survey. Also, Covid-19 hit several of our programs at the peak staffing point when they were actually assembling and integrating instruments and satellites and that led to about a 300 million dollar in cost growth due to the delays and all the challenges in responding to the global pandemic. Then we had additional technical challenges for NISAR, for PACE and for SWOT. Those were also exacerbated by Covid-19. All together those are about a 250 million dollar cost growth. Then the record inflation you've heard about has really hit the supply chain for satellite missions for electronics, even things like wiring. If you take all of those together, we see cumulative challenge that's accumulated through the 2020s approaching two billion dollars and so this is one of the reasons that we haven't had the resilience within our budget for a number of things that the community has hoped to see. If a mission goes a little bit over cost, we don't have the ability to accommodate that in the in the budgets that we have and we see that challenging us on our missions in for pre-formulation, our missions in formulation, and our missions in development Next chart

Slide 10 (00:09:34,800)

I want to talk a little bit about the mission milestones because, in spite of those challenging budget environments, we really have been making some exciting advances in getting missions into space and starting to operate. Next chart

Slide 11

Let's just skip this chart and go to the next one.

Slide 12 (00:09:50,520)

I will mention you know we are on track in getting our EVI 6 selection made very soon, the Explorers AO announcement is literally coming out any day. So some of those milestones and announcements and things that you as a community have been watching for are very close to being a reality and those opportunities are very close to being public. If you look at our updated Swoosh chart, a couple of things to point out. As you know, closer to the Earth are the older missions and so as you swing out to the outside of the swoosh where the things are in green and orange those are the current missions being developed. We're really excited of course that SWOT is now successfully operating. It's in calibration phase.

Slide 13

We had a successful launch of TEMPO and you can see stepping across on this timeline we've also had a set of Cubesats and we're really watching, as early as this weekend, we'll have the Tropics 2 launch. It is integrated with the with the launch vehicle in New Zealand waiting for a launch in early May for the first and then there'll be a second launch following that for the second set of Cubesats. We're looking forward to a substantial ocean and water mission coming up with PACE and that is in the May 2024 time frame. So things are really moving along across our planned mission milestones. Next chart.

Slide 14 (00:11:37,740)

I wanted to mention just a few highlights from these brand new missions. EMIT, of course, is a global dust measurement mission, But anytime you fly an Imaging spectrometer you can do a million other things with it and one of the most exciting things is the data that EMIT has collected on methane plumes. I think if you click that methane plume image on the top will animate. One of the things that EMIT has done is to detect methane plumes. Methane is, of course, 80 times more potent of a greenhouse gas than carbon dioxide but also with a short dwell time of less than 10 years which means this is a place you could have global impact if you can use remote sensing to help monitor and reduce methane emissions. So we're really excited about that and I'll talk a little more about what we'll be doing across the government with these kinds of info of new pieces of information shortly. Next chart

Slide 15 (00:12:40,860)

SWOT has a brand new vision of ocean circulation at finer scales with a different approach to altimetry that's never been used before and that's incredibly important for helping us understand fine-scale ocean turbulence and eddies and how mixing is occurring and how that modulates sea surface temperature and heat flux and to help in modeling the oceanic uptake of carbon dioxide from the atmosphere. So SWOT is an amazing important mission and as I mentioned SWOT's in its calibration phase.

Slide 16 (00:13:13,320)

Next chart. To give you a visual of that, on the right is SWOT's First Light image from January 21st 2023. We held that back for a little bit while we worked some instrument anomalies but the comparison to the image on the left which is the best jointly gathered set of comparable ocean data that you could get across all of the other missions that can take altimetry measurements around the world and you really get a sense of how much this brings spatial resolution into focus and will really let us understand these processes in the ocean and that's both the wide swath as well as the narrow swath measurements Next chart

Slide 17 (00:14:02,820)

We have 25 early adopters across the globe that have been preparing to incorporate SWOT data into their applications and that's a really exciting thing that we're seeing with all of our missions now where we start with our applications built in from the beginning and just a few examples of those

The Texas water development board will use SWOT data to assess water loss at unmonitored lakes in Texas of which there are numerous ones that are really sources of drinking water to all kinds of people.

Alexandria University in Egypt is preparing to use SWOT data to support their operational systems and improve dam operations and

Stantec Incorporated a consultancy firm will use SWOT data to validate model outputs and Coastal Hazard identification. So those are just a couple examples of these 25 early adopters and we're so glad that they have taken the time to be ready for SWOT data the minute it starts coming down. Next chart.

Slide 18 (00:15:11,100)

Our most recent launch is TEMPO. That is the first space-based instrument for hourly monitoring of daytime air pollutants across North America it joins GEMS and Sentinel 4 in Asia and Europe to also give a near global coverage or at least Northern Hemisphere coverage. As someone who has often paid attention to people with asthma and really paid attention to the diurnal cycles in air pollution, it is really exciting to finally have this temporal variability piece of information. This science is of interest, not only for Earth System science, but for end users at NOAA and EPA as well. Next chart

Slide 19 (00:15:57,960)

Tropics is our very next launch from New Zealand as early as early May. It is a constellation of four Cubesats to give time resolved observations of the structure of storm intensity especially looking at things like eyewall replenishment cycles and so this is going to be another way that we can look at temporal and spatial variability using a great constellation of Cubesats. Next chart

Slide 20 (00:16:30,420)

PACE is the next major mission that's coming. That advances our ocean science and it is integrated. It looks like the real thing when you visit Goddard Space Flight Center. It will help us monitor fisheries, respond to toxic algae blooms and provide all kinds of key ocean and atmosphere data for forecasting air quality and improving our understanding of the climate. Next chart

Slide 21 (00:16:55,320)

If we can advance one more.

Slide 22

So in the government there's been a lot of discussion of what the role is of NASA in climate science overall. Our structure, for decades, has been based on a view of Earth System science and the importance of understanding how all of these things go together. To NASA we see those processes as the focus of our scientific endeavors. Climate, for us, is far more than just looking at weather over time it's really understanding the how and the why underneath it Next chart

Slide 23 (00:17:31,860)

Our view has been that sometimes with credit, sometimes without credit, we can help many other government agencies by providing our science data to those other agencies so that they can then have climate information rolling into the services that they provide whatever those services may be. From the USDA the U.S Geological Survey or FEMA and Disaster Response, EPA for air and water quality. Next chart

Slide 24 (00:18:00,900)

There was a fast track advisory committee that was requested by the White House that had participation of 17 federal government departments and agencies. They were tasked to really go look at Climate Services across the government and how should the government take an approach to overall response to climate and that's everything from research to the services themselves. This report was recently released, it's a really interesting one. I recommend you take a look. They recommended that the U.S Global Change Research Program serve as a mechanism for a whole of government's solution to Climate Services as it provides a whole of government opportunity for coordination of climate research. Next chart

Slide 25 (00:18:53,760)

One thing that we find really useful in this report is the way that it represents the value chain, the core links in U.S government climate services from generating information, developing services, delivering those Climate Services, using the Climate Services, and evaluating and understanding um the costs and benefit that has been achieved. For NASA our role is really on the left side of this value chain. I think if you click there should be a little pop up. So of course, you as a community are key for generating much of the climate information used in the government, especially the expertise in modeling and simulation, incorporating indigenous and traditional knowledge as well. We help develop Climate Services because we translate science into usable information. We do have our Applied Sciences that does a lot of co-production and application development. Where it says deliver Climate Services, those are things that we really support as well, mapping and visualization, providing information that could then be used by extension services operated by other government agencies and training and capacity building. So that's the strength that you as a community when you work with NASA help bring to the federal response to changing climate. Next chart.

Slide 27 (00:20:20,580)

In terms of our opportunity chain and those that are coming. EVI-6 we are expecting an announcement very shortly from that competition, so stand by for that. Then the Earth System Explorers, that AO has been in draft form. We are expecting the final AO to be released also in a matter of days and we know that many of you are waiting for that and have been working on proposals along the way. So that is coming very soon. Next chart

Slide 28 (00:21:00,120)

And a few highlights from ROSES. ROSES 23 came out in February and thanks to everyone both those proposing and those supporting the peer review process across the different elements. We have 15 elements with defined due dates, 17 are listed as TBD, because there has been a lot of definition that we've been doing as we proceed and especially with the kinds of budget uncertainties that you see. We have five elements this year that are using Dual Anonymous Peer Review and those are listed there. We have one element that calls for an inclusion plan and two no due date elements: rapid response and novel research and of course we will continue to support FINESST, the Early Career solicitations. Next chart

Slide 29 (00:21:55,620)

One big change in ROSES 22 is Earth Venture suborbital. Those step one proposals were due in February. Step two proposals are due in just a few days and those focus on Mission Concepts. Then the selected proposals will form a basis for new solicitations for team members. We have made some progress in response to increasing the participation of minority serving institutions in Earth Science surface-based measurement networks. So we're really excited about that, and we are in the process of deploying those instruments in partnership with those institutions. Next chart

Slide 30 (00:22:36,240)

Our Student Airborne Research Program is something we're really proud of. And this year for the first time, there will be two locations for SARP: the ongoing one in California but also a SARP East based in Virginia. There were test runs of that and we're really excited to see the participation and you can see all the universities listed here. There are over 44 unique schools representing many that are new to Student Airborne research. There are 14 schools participating for the first time, five minority serving institutions and one HBCU. We're really excited to see the success of this and the number of students that are getting a chance to participate in research and the fact that we've doubled the number of students that can participate. Next chart.

Slide 31 (00:23:29,580)

EVI 6 announcement of opportunity. These are pegged to a relatively low-cost cap 37 million in FY 24 with NASA determining the platform and launch vehicles. This is really part of that EVI spirit of innovation with class D instruments and Cubesats. Watch for that announcement very soon. Next chart

Slide 32 (00:23:58,380)

Landsat Next proceeded into formulation this year and it is going to be what we're calling 'super spectral'. Moving beyond Landsat 8 and 9 to have a wider division of spectral bands, nine-day global land revisit frequency, 26 total spectral bands, 21 visual, 5 thermal and the target launch readiness date is November 2030. KDP-A in November and we're expecting RFPs for instruments the drafts may be out. We're really excited about that and how that progresses land imaging for the next decade or more. Next chart

Slide 33 (00:24:46,440)

A big part of our emphasis in our work over the last year has been in getting Earth System Observatory through pre-formulation and ready to move into formulation.

Slide 34 (00:25:17,040)

Earth System Observatory moves from the five designated observables to a set of four core missions that we've moved into formulation. There are actually two missions in AOS: AOS Storm and AOS Sky, Surface Biology and Geology and Mass Change. All passed their KDP-A so they're now officially in formulation. For Surface Deformation and Change, we're going to leave that in extended study, because the NISAR mission, which will launch in 2024, basically addresses that observable and will teach us a lot about how to design the next mission that would make those observations. We went through the ESO independent review board, as you all heard, and we continue to work through all of the formulation issues on these missions. Next chart

Slide 35 (00:26:14,760)

The Explorers AO is in draft form and we are anticipating the final AO any day. It has a PI managed cost cap of about 310 million in FY 24 dollars. Once again with NASA providing launch vehicle services that's a two-step selection process. We are in the process of standing up a Program Office to coordinate the next phases of those selections. That Program Office will be located at Goddard and it is going through its SRR and SDR review process in the NASA approach that we take to these. Next chart

Slide 36 (00:26:55,620)

We held an ESO industry day on April 11th. It was attended by over 60 industry representatives. One of the purposes of that industry day was to keep the industries, who will propose to contribute both components instruments and spacecraft and other things to this endeavor, up to speed on everything that was learned as we came through pre-formulation and to get the latest information on the next steps to come forward. That's something we will now host on a regular basis. If we can advance one more chart

Slide 37 (00:27:34,620)

So just a few philosophical areas. We continue to work to develop our overall Earth Action strategy and that is that emphasis on going from Earth System observations of the as the foundation of everything we do, Earth System science is the way we understand those observations but then to make sure that we are moving solutions that use that information on to being as impactful as possible in helping the world respond to climate change. The new Earth Information Center as a way that the public can have visibility into the way that we and you as part of the NASA Enterprise see the Earth and have that shared in ways that help them to understand climate change and respond to information. Next chart

Slide 38 (00:28:21,300)

This is the Year of Open Science and we continue with our goals of having people get trained in open science, increasing understanding adoption and increasing the participation of underrepresented groups. This is a five-year, one-time, transformation to open science surge activity to increase the understanding and use of open science across our communities Next chart

Slide 39 (00:28:51,540)

That includes publicity, visibility, capacity sharing, free training, open science curriculums, incentives like the open science badge you can encourage your grad students and postdocs to go and get those and get one yourself and then identifying better ways to be more open including open meetings sharing hidden knowledge, being more inclusive in collaboration, and in the way we run our science team meetings Next chart

Slide 40 (00:29:23,100)

A few highlights. Our Disaster Response Support- we supported 18 major disaster events in 2022: four flooding, one earthquake, three tropical storms or hurricanes, three volcanic eruptions, one man-made conflict in the Ukraine and six other compound disasters which were mixes of hydro-meteorological events (landslides and debris flows). This is one of the ways that we really directly take Earth Science data and make the world just a slightly better place, by helping people respond to these kinds of events. Next chart

Slide 41 (00:30:01,860)

Another area that we're really proud of, that has advanced in the past year, is work we've been doing with the USDA and USGS to improve agriculture approaches. That includes Acres where NASA has launched a new consortium to bring together leaders from the public and private sectors in understanding how to use NASA data and changing the ways that we use NASA data by getting it in the hands of U.S agricultural producers. Open ET helps farmers to actually calculate the evapotranspiration occurring at a field level and make improvements in their water management. We've had a series of listening events across the Midwest both in August and then more recently in Florida at the Commodities Classic that has really helped us shape the way that we interface with the agriculture community as well. I think that Karen has joined us. Karen do you want to hand off or do you want me to keep going ?

Karen St Germain: Why don't you go ahead and take us on home, but I'm here for the duration now Thank you.

Slide 42 (00:31:13,440)

Julie Robinson: Great so in our Fire Sense projects we're also working with the Forest Service and USGS as well as Cal Fire, NOAA, and EPA across all stages of fires. This is, to me, an example of how Earth System science helps the way that you look at a problem that may be exacerbated by climate change. Because we can do work looking at pre-fire risk and fire prevention, understanding why those conditions are occurring. Then in active fire times we can help with of course satellite tracking, and of course our Aeronautics area is working on better ways to have multiple flights going on in active fire regions. Then post fire, we have the ability to aid in understanding burn severity and improve ecosystem rehabilitation efforts. So that comprehensive and system-wide look really makes a difference in fire. In addition to that, we have the ability and the knowledge to really track and characterize air quality impacts of fires that can be very far downwind from the active event. Next chart

Slide 43 (00:32:17,940)

We have been asked to work across the government to stand up a new Greenhouse Gas Monitoring and Information Center that is just starting up now as a new activity and its focus is really to extend accessible and integrated greenhouse gas data and modeling from both U.S government data as well as

from private sector data and address the most urgent needs. We've worked with the EPA to identify three use cases. One of those is to improve a one-time access to gridded ground data that the EPA has and make that more of a continuing product that's updated on a regular basis. A second use case is to complement that data by looking at all the natural greenhouse gas emissions and fluxes from local to regional to national scales. Then the third use case I started talking about when I mentioned EMIT, which is better understanding how we can use satellite data to monitor super emitting events and then how an end user like the EPA could take that information and use it to make an impact on the ground. Those are the three pilot use cases that we'll be working on and it's a really strong partnership with EPA NOAA and NIST (the Institute of Standards and Technology) Next chart

Slide 44 (00:33:46,020)

As I mentioned at the top of the pyramid is the Earth Information Center, where we really want to be sure that it's not just scientists or even other government agencies and end users that use satellite data that have that view that we have from NASA data about the Earth but it's how to let the public see how the Earth is changing to mitigate adapt and respond to the changes. Next chart

Slide 45 (00:34:19,140)

As we head into June, we will be having a rollout of the NASA Earth Information Center. It will be the first of multiple opportunities to view the Earth in, for those of you who have seen the hyper wall that we bring to conferences, it will be larger than that and more substantive than that. There will be an immersive view and a lot of information available for people and then there are partnerships with other government agencies and with other exhibit spaces so that this information can be made available and experienced by a broad number of people and I think that is my last chart in this deck and Karen is here to answer all of your questions and thanks again for being patient with us as we as we juggled the urgent needs of the day.

Q&A

Wendy Mihm: Hi everyone I also wanted to hop back on it's Wendy Mihm again I wanted to hop back on and just let folks know that we don't have much in the way of questions yet. If you do have questions for our panel of experts, please let me direct you to the Q &A function again. It's at the bottom right part of your screen there are three little dots you click on those and then you'll see some options and one of those options will be Q&A so click there if you have a question. Please do type it into there and we will work to find you the best expert to get your question answered so we'll just pause there and wait to see what rolls in.

Karen St Germain: And while we're waiting perhaps I can just say hello, apologize again for not being able to join from the beginning. We had some, as Julie I'm sure mentioned, some late breaking demands that we had to handle that were important to our community that we jump on so we did.

Julie and I work together really closely as a team and so I think you've probably got all of the information. There we go, maybe, we see questions starting to roll in. All right so Wendy are you are you moderating questions?

Wendy Mihm: Yep. Here we go we've got a few coming in. I'll attack the easiest one first. Will today's PowerPoint deck be shared later? Yes, we can send that deck along to the participants afterwards

Julie Robinson: There were a bunch of questions in the chat rather than in the Q&A just about the PACE launch date. We show, in these charts, the commitment date that we make to Congress rather than the actual expected launch date. I think we generated some confusion there. We show what we call our agency baseline commitment which is when we get in trouble if we haven't launched by then rather than the expected um launch date. Hopefully that helps

Karen St Germain: Right and we generally update that launch date six months out

Wendy Mihm : Okay we also have a question about the Earth Action strategy as an ongoing development. Could you share more about this process and timeline beyond what has already been shared?

Karen St Germain: So this strategy, it is evolving and maturing and we'll continue to do so, over the coming year and the implementation will continue to evolve for well beyond that as we mature all the elements of the strategy. We'll be talking a lot more about this over the coming year.

Wendy Mihm: Okay. Thank you. We have an additional question that's come in. Could you please describe what an inclusion plan is? And we have Jack Kaye online who can help address that question. Jack you can unmute yourself and talk about inclusion plans. Thank you

Jack Kaye: So this is something that the Science Mission Directorate started as an option that can be made as part of ROSES solicitations. It's a way for the PI to explain what they're going to do in the context of setting up their efforts related to inclusion and diversity but inclusion in particular. It's only been in a limited number of ROSES elements within Earth Science I think it's just a couple. In the interdisciplinary science call that we did in ROSES 22 we had that because those allow for larger sort of multi-departmental or in some cases multi-institutional teams and it's a good way for those writing the proposal to explain their thinking and how they how they create their teams and how they take diversity and inclusion into it and write down what they're going to do. Those plans are evaluated and we look to provide constructive feedback on that. At this point, they don't factor into the rating as I understand it but if the inclusion plan is felt to be inadequate then we'll ask you to work on this. I think in ROSES 23, there may be some that I missed, but I know the Earth Surface and Interior has that in there. We've only done that in the limited number of cases but again it does provide the opportunity for the proposer to put into writing the things that they're going to do to make their effort an inclusive one for their participants and the way that they're going to look to populate their team by taking the diversity equity inclusion accessibility into their planning. So we're still learning in terms of the review process we'll be providing feedback and thank those who've been supporting process including those who are helping us with reviewing. So I think that's about as much as I can say. Read the language carefully it's new to everybody

Wendy Mihm: All right thanks Jack. Another question popped in You mentioned that the Earth Information Center could be part of other exhibits in the future. How will that opportunity materialize? I think we have Laura on the line who might be able to address that question

Laura Rogers: Sure I'd be happy to address that and Karen and Julie if you want to add anything to it. We are seeking other partners, whether they're in the DC area or other centers or even potentially looking at our interagency partners. So we've been reaching out broadly because we do want to spread the message of what we can understand through science and how this impacts the human aspects here. So again looking at partners in the DC area and we're moving forward quickly on that as well as others because everything we've built is designed to be modular so we can reproduce anything we we've done in the lobby and a very easy factor and we also plan to have a virtual component to this to reach those who are not coming to DC for our Earth information so Karen and Julie if you want to add to that and happy to have you add but thanks for the question.

Karen St Germain: Laura I think you did a great job covering that. We have some partnerships that are further along in discussions than others, but the idea is as Laura said the content is intended to be scalable and tailorable, really enabling partners to shape it and include it in their own locations. But those of you who know, generally speaking, the process is not a speedy one for NASA to establish a formal partnership whether it's with another agency or a museum. NASA centers would be the speediest of all the options but going outside of NASA it takes a while to get those agreements in place. So we've got some time on that one but we do think that the content could be really interesting to people around the world. We know we know from our experiences with the visitors to the Earth Science Center out at JPL and with the hyperwall at Goddard and even with our experiences at conferences that when you have the large visuals and the compelling stories they move people in a way that looking at something small in their computer screen doesn't really do. We do think it is important that we have more than one location for this and I'll stop there.

Wendy Mihm: And one quick follow-up question for you Karen or Laura, from the group Will there be media invited to the opening of the EIC ?

Karen St. Germain: Our office of communications is managing that rollout so I don't have all of the details on exactly how that will work. I think it will depend on the level and who in terms of dignitaries that show up. That will get managed once we know what the guest list will look like, but our office of communications is all over it. So if you're part of the media you'll want to stay in touch with them.

Wendy Mihm: All right. Thanks Karen. Okay next question. Pivoting to a new topic. Any updates on the IIP? IIP being the instrument incubator program and I believe we have Mike online to address that. Mike Seabloom, go ahead.

Mike Seabloom: As you notice in ROSES it is listed as TBD we are expecting a solicitation to be posted later this year, so please look forward to that. I apologize for the delay.

Wendy Mihm : Awesome, okay moving on. Is there an expected due date for the Early Career Investigator program? In the NSPIRES system so far it says TBD. Jack we're going to pivot to you and if you can address that question please.

Jack Kaye: We definitely are planning on soliciting that this year. I don't have a due date. As with other ROSES solicitations, the general rule is it will be open for a minimum of 90 days between the time that the solicitation is opened in NSPIRES and when the proposals would be due. I don't want to give you a date and have that be wrong but that's something that we will be working on. We definitely intend to have that this year and you will have at least 90 days on that.

Wendy Mihm: All right Jack. Follow-up question for you. Will there be a ROSES NIP call this year?

Jack Kaye: The NIP is what we're changing to Early Career Research. So what I just said for Early Career Research that's the new name from New Investigator Program.

Wendy Mihm: Okay, next question. A question has come in about EVC-2. Are there any specific plans for what EVC-2 will focus on?

Karen St Germain: The answer is, not at this time. We are going through the planning process in the next couple of months. We're adjusting or considering adjustments to the Earth Venture program as a result of the feedback we got from the Academy. Once we get through the next award, we're going to actually take a look at the whole... Actually I should say the feedback we got from the academy on the Venture class missions as well as adjustments we're making as we stand up the Earth Explorers line and making adjustments to the whole portfolio so we're going to be going through that process in the next couple of months and then we'll be ready to talk more about that

Wendy Mihm: Right. Okay thank you Karen. Next question up is for Mike Seabloom. The question is could you speak to how NASA Earth Science Division is viewing the use of digital engineering and mbsc in the acquisition and implementation of instruments and Space Systems ?

Mike Seabloom: So I can't give you a particularly direct answer, to this question other than to say that this is an agency-wide initiative that is being led out of our digital transformation team. It's being led by the Office of Chief Engineer. It's been ongoing for a couple of years. So a lot of the initiatives that they're pushing forward in the mbsc area we will be adopting. But we're not leading that per se, that's really coming from the Office of Chief Engineer. It is an area of great interest I know. It's something that we will be adhering to in the future.

Wendy Mihm: Excellent thanks Mike. EIC is popular. We're going to pivot to another EIC question. Will there be a strong virtual and online presence for the EIC in addition to the single location in DC? So that could be Karen that could be Laura or you guys can tag team of course. Laura do you want to open on that one?

Laura Rogers: You got it Karen go ahead.

Karen St Germain: The idea is yes, we recognize two things one, many people will not come to DC for the purpose of going to the EIC. We want to make sure that there are more locations across the country but also they can get to some of the information online. We also talk about wanting the experience to be 'sticky'. In other words, if they come to the EIC and it sparks their interest we want

to have ways for them to continue to engage and that means through virtual content. We will be developing and evolving the online content as well as the in-person content over time. Laura did you want to add anything on that?

Laura Rogers: I'll just add that we also want to build on the GIS framework and get information and data in the hands of those who can use it in the most successful way possible. Through research we found that many people want it in a GIS framework so we're really going to build on that. Again this will be continuing to evolve over time. Thank you for that and I appreciate any input as well, if there's something specific you would love to see. Thank you

Wendy Mihm: All right. Moving on to the next question. Do you anticipate instrument AOs for AOS, SBG and MC and when might those be?

Karen St. Germain: I can take this one for our flight team. We did just have an Industry Day for the ESO missions including AOS SBG and Mass Change. Generally speaking though, the instruments will be solicited by RFP not AO and that's because of the way we developed the architectures for each of these missions. Generally there'll be RFP not AO. For the timelines. I think we had those in our chart deck. I'll tell you what Wendy why don't we go on to the next question and I'll see if I can track down the time frame for those RFPs in parallel.

Wendy Mihm: Sure thing. Okay sifting through a few different options here. Please stand by. All right, here's a good Landsat Next question. The Landsat Next slide showed a nine day revisit, this is less than shown in earlier presentations which showed a six day revisit. Has the baseline for net Landsat Next revisit time changed?

Karen St Germain: I'm just flipping through the slides on that to see where it said that.

Wendy Mihm: Well if you want to search for that we have another one that we can address first if you wanted to take a moment on that

Karen St Germain: I think the answer on that one is that is the minimum requirement. But with the with the current planned constellation as you can see down in the bang box at the bottom, the repeat coverage will actually be better than Landsat 8 and Landsat 9 combined. So I think that's a question of the threshold requirement versus the performance we expect, So the nine day I think is the threshold requirement.

Wendy Mihm: Excellent. Thanks a lot Karen. Okay the next one is for Julie. What does NASA's process look like for incorporating the responses to the RFI for the greenhouse gas monitoring and information system into its strategy?

Julie Robinson: Thanks for that question. As some of you may know, there is an Interagency Greenhouse Gas Working Group that is run by the Office of Science and Technology Policy. They asked NASA, on their behalf, to put out what is essentially a strategic RFI. It is asking, across all kinds of potential inputs, what the overall government strategy for greenhouse gas monitoring should be. So that is a very broad scope, whereas the greenhouse gas information system I talked about with the three use cases is a relatively narrow scope project that we receive funding for in FY 23 and FY 24 as a demonstration project. They are aware of each other. We are matrixing the things that are in the project plan for this two-year activity to the overall strategy that has been released by OSTP and

then that strategy will be informed and updated based on the RFI inputs but they won't necessarily affect this initial two years of the Greenhouse Gas Information system implementation.

Wendy Mihm: All right. Thanks Julie. Okay we have sort of a philosophical question. Julie and Karen can maybe arm wrestle or tag team for or maybe Emily might want to weigh in. As we seek to engage a broader community, inviting them to partner with us, toward the goal of helping us take better care of our planet, are we also able to show the skeptical parts of the community that, for example, not only is NASA using its data and technology to monitor and measure climate change but also the human impacts of our proposed Earth preservation solutions on an economically diverse population?

Karen St. Germain: Emily just turned her camera on. Do you want to take the first swing at this Emily ?

Emily Sylak-Glassman: Sure. First, I'll just thank the writer for this I think really important and multi-faceted question. I think, in general, the approach we're trying to take is to meet all sorts of users where they are, whether they already bought into the power of Earth science to benefit society or not. We try to do that through a variety of different settings. One of the things that was really successful is the Space for Ag road tour that that Karen St Germain went on with a large portion of our agriculture program. There is a huge awareness building component of that that before we even get to the value of information. In terms of looking at impacts, I think this question of impacts is big important again multifaceted because we met there are so many different types of impacts that we measure. There are the ones we report on, that are you know these really quantifiable metrics about project progress but, there's also looking at socioeconomic impacts which is a really active field of research that we're trying to build the scientific and economic community to do. So I think there's no one way that we're trying to tackle that question. The answer is yes we're trying to tackle it in a lot of different ways. Karen I'll put this one back over to you to see if there's anything you want to add here.

Karen St. Germain: Emily you pointed to the example that I would have pointed to but I think more generally, when we go out and we talk to people about how the Earth System is changing, we are finding more and more that the distributed impacts of climate change are very real to people. I think this is part of the storytelling that's been a challenge for our community because we often talk about climate change in terms of global average temperature increase of one, two, three degrees C. And of course, that's not how most humans will experience climate change. The skeptical communities will say things like 'look the temperature swing just from last night to this morning was 20 degrees why do I care about an average one degree change in temperature?' And of course we all know that again that's not how humans will experience this. Humans will experience climate change as the impact of all that extra energy in the system the application of the water cycle so that's flooding, that's drought, that's fires, that's changing ecosystems and so forth. When we talk about those kinds of things with different user communities, Emily mentioned, agriculture, that's a big one, but also transportation, coastal communities in terms of coastal resilience and that's again in terms of sea level rise as well as changing biology in the coastlines. When we talk about the work we do in the context of the kinds of impacts that people in communities across the country are seeing, we get a very different response. I think the

answer is yes, this is what we're trying to do and it's part of the strategy with the Earth Information Center to speak in terms of stories that people understand and recognize as connected to their lives. And then tracing back uphill to what is NASA doing to improve the decision-making environment for people, whether they are policy-makers local leaders or individuals or sectors of the economy individual companies etc., what are we doing to try to help them make better decisions day by day. So that's how we're trying to do it, lead with the things that people recognize as being true and things that are important to them and then move back upstream and talk about our stories does that make sense?

Emily Sylak- Glassman: Can I add one other thing that I forgot to mention, Karen? I think one of the really exciting parts of how the ESD portfolio is evolving is an increased emphasis on equity and environmental justice. Just to hit on that economic diversity angle to the question. So there are a number of equity environmental justice dedicated projects that are going on in our community action portfolio within capacity. We're also seeing an increased focus on equity and environmental justice in some of our other portfolio areas like health and air quality because we know, just as Karen was saying, that a global average can feel really different in different communities. Some of the communities that are hardest hit are the ones that are at an economic disadvantage. We are doing really exciting work in that area bringing socioeconomic data together with Earth Science information

Wendy Mihm: All right. Thank you. We're going to go to a different topic completely for a question about soil moisture. The question is how was NASA integrating /meshing/overlying/fusing data for soil moisture from different missions? For example, NISAR with empirical data on the surface, to better understand changes in soil moisture. I believe we have Jack on tap to tackle that one.

Jack Kaye: I'll address that in a more general sense, not so much about the particulars for soil moisture but really how we deal with the integration of data sets, especially existing ones and new ones. When a mission comes along. It's the job of the people with the mission to produce the products that are made available to the scientific community. Once those products are there, then there's opportunities to do things with them. After launch, there'll be a competed science opportunity, which in the past would be referred to as data exploitation but it also included data set integration or alternative algorithms, additional products and enhanced cal/val. Those solicitations are never exclusive to the new data products, but they're typically very supportive of integration of new data with existing data whether they're from NASA products or other products. There will be other solicitations as well, in the area of soil moisture. In ROSES 23 there's a SMAP science team call, CYGNSS is there and soil moisture is a big part of CYGNSS. And there's disciplinary calls some of which there may be some years and not in others like Terrestrial Hydrology. There's always opportunities in FINESST or when we do Early Career Investigator and every three years when they do Remote Sensing Theory where the focus is both new types of remote sensing approaches as well as data set integration. So that's the way we look to encourage and facilitate those who looking to create integrated data products or to intercompare or synthesize but I really can't speak to the particulars of a single data product. For that I would encourage you to reach out to the Program Scientist or Program Managers most closely related with the topic at hand. If you don't know who they are the SARA NASA website lists the program officers and contact information relative to their disciplines and the solicitations.

Wendy Mihm: All right. Thanks Jack. The next question in the queue. Can you share more on partnership or agreement with ESRI? and offering NASA data within a GIS framework? And for that we have Joel on the line.

Joel Scott: Thank you. It's a pleasure to be here and thank you for that question. I'm a program executive for Earth Science Data Systems so I can comment on this. In mid-November of last year, 2022, a Space Act Agreement was signed between ESRI and NASA and this agreement is administered through NASA Headquarters. It will allow NASA and ESRI to collaborate so that NASA can benefit from ESRI's extensive knowledge of user communities as well as broaden the NASA geospatial data user community. Furthermore, this agreement will put more NASA data directly into decision support system in both state and local governments as well as for industry, nonprofit and academia. I have two more links that are relevant to this that I will drop in the chat. Thank you for that question

Wendy Mihm: Okay we have a budget related question next. I have seen multiple times the attribution of ESD budget challenges in part due to the Decadal Survey not taking into account Landsat Next. It is the first reason given. It was taken into account and is clearly shown in figure 3.3 in the Decadal Survey referred to as sustained land imaging. Karen and Julie we'll toss that one to you.

Karen St. Germain: We should probably sharpen up our talking point on that one because there was a flat level in there which isn't actually enough to build out Landsat Next. The other element is the inflation that was assumed and so forth that is not necessarily built into our budget process. I think we should sharpen up that Landsat point to say there was a flat Landsat or SLI amount in there and that's not actually enough to build Landsat Next in terms of total amount. So that's what we're dealing with but you're right it wasn't zero.

Wendy Mihm: All right. Thank you, Karen. Next question what are the current projects going on related to fires and climate change? Any information or links would be appreciated and for the future directions and interests. That goes to Jack with the assist from Mike or the other way around.

Jack Kaye: I'll start I guess and turn it over to Mike. We've been doing a lot around the ESD ,across really all the components, on fires and climate. Whether it's from just characterizing the distributions and nature of fires, looking at the conditions that lead to them, what happens after them, scattered around the programs. So I'll talk a little bit about some of what's been in Research and want to make sure that, among others, Mike Seabloom gets to talk about the developing Fire Sense program. There's a variety of things that that we do. Fires have been a big part of the Land Cover Land Use Change program. In regions that are affected by fires we've done some focused field campaigns, especially the FIREX AQ campaign that the Tropospheric Chemistry Program did in 2019 with NOAA, following up on the weekend campaign that NSF did in 2018. With FIREX AQ we had the DC-8 and the ER-2 and looked at both large wildfires and their impacts as well as smaller agricultural burning. So that's one example of the kinds of things that when we're doing, really looking at the fires and literally going into the plumes.

Another example within the interdisciplinary call that we had in ROSES 2022 one of the five large topics was on environmental impacts of wildfires. Those proposals are in the review process right now. Similarly, you could get those responsible for other parts of the program to talk about fires in there. The climate change connection is so central to everything that we do. We're looking at not just the present but the future and as I said with fires it's the conditions, it's the fires themselves, it's their immediate impacts, and then it's their longer-term and larger scale impacts. Especially in the R&A side that's been what fires put into the atmosphere and how it gets transported and weather and eventually hooks up with air quality as well as some particular things like when fires get large enough can they create pyrocumulonimbus clouds and what the environmental impacts of those clouds are in terms of transporting things high up into the troposphere and potentially into the stratosphere. Mike do you want to talk about Fire Sense?

Mike Seabloom: In 2021, under Karen's leadership the division established the Fire Sense project which connected the technology aspect which is what ESTO is doing with the R&A work that Jack just described and Applied Sciences as well. Our plan is to develop new capabilities for Earth Observation from airborne and from space-borne platforms that will be a benefit to wildland fire managers. We intend to demonstrate these new capabilities within five years through a series of field campaigns that will end with a Capstone Mission we're expecting in 2027 or 2028. We have a ROSES element A.59 which is Fire Technology development for the pre-active and post-fire environments. We're developing not only instruments for airborne platforms but also for small satellites and also information technologies to support Wildland fire management. So there's a lot going on in this area and we're very excited with this with this new project.

Wendy Mihm: All right. Thanks guys. Next question is about GeoCARB. If NASA is delivered a well-calibrated, well-characterized GeoCARB instrument is there a plan in place that could allow for that to become a flight of opportunity? It's going to be a while before the next U.S. dedicated greenhouse gas system comes online and we never know how long OCO-2 or OCO-3 might survive.

Karen St. Germain: Thanks for that. The GeoCARB project was canceled because of a very serious programmatic and technical concerns, but as you know the team is continuing to work throughout the end of the normal contract. So, at some point later this year, when they've done all they can do, we'll take delivery of the hardware and the documentation. As we committed to when we made that decision, we'll evaluate what we've got at that point and the options for what can be done productively with that hardware. That's still the plan. We'll see what comes forward we'll assess options at that point and make decisions. That's the plan on that.

Let me speak more broadly to our commitment to greenhouse gases in general. As many of you on the on the line will know, the environment around greenhouse gas observation has changed pretty dramatically in the last few years. There are, of course, our NASA assets OCO-2 and 3, we also have the most recent developments using EMIT to measure, in particular methane plumes, but also carbon dioxide plumes. And then, of course, we have significant investments by our international partners to

measure greenhouse gases as well as philanthropic and commercial capabilities coming online. I would say that we broadened our strategy associated with greenhouse gases to include also one of our first Explorer missions which will focus on greenhouse gases. So I would say that we've broadened the portfolio approach to observing greenhouse gases and one of the things that's hard about that is bringing all those observations together in a usable way. Each instrument on orbit measures things somewhat differently and, of course, all of those satellite observations, which are measuring column concentrations or fluxes, are different from the bottom-up inventories of greenhouse gases that our regulatory agencies use. To respond to that need for coherent information coming from all of those sources, we're also investing in standing up the Greenhouse Gas Center. That coherence, establishing the methodologies, the science and the methodologies toward getting coherent greenhouse gas understanding and actionable information, is the first order of business with that Greenhouse Gas Center. So we've broadened the portfolio of observations we'll be bringing in, we are investing in the science of assimilating those observations and we are also planning for future NASA observing systems as well. It's a broader approach in general. We are still very much committed to providing actionable, understandable and scientifically sound greenhouse gas information. Let me stop there

Wendy Mihm: All right. Thanks Karen. This is popping up in a couple different locations so I wanted to address it directly one more time. People are asking about the availability of the chart deck, We will post a PDF of the chart deck on the Community Forum website shortly after the call. So the answer is yes, you will be able to access that there.

Okay. The next question, I'm going to pivot to the cloud computing question. There are many users interested in cloud computing capabilities for the use of AI, ML, deep learning etc. on large data sets. Is NASA working with other departments and organizations to make interoperability data/tool access and cloud computing possible for data set users, visualizations and analytics? And for that Joel just popped up on camera. Take it away

Joel Scott: Thank you for that question it very much aligns with what NASA is looking towards and thinking in terms of Open Source science as Julie mentioned earlier in this talk. So yes, when you start to mention things about interoperability, data and tool access, cloud computing, these are all things that NASA is looking to. We are working in a concerted way within the Earth Science Data Systems Program to form agreements that will allow more interoperability of our data sets and of our visualization tools and we'll do this is openly and publicly as possible. It's a fantastic question. Thank you

Wendy Mihm: All right. We're having another question come up. This one I believe, is about AOS. Please stand by one moment just grabbing the question. What is the mission life for AOS I? and how will this support the AOS P measurements? They seem to be quite different mission lifetimes. Karen that one is for you

Karen St. Germain: Their design lives are two and three years respectively for Storm and Sky. Storm being the incline, Sky being the polar. With three and five year consumables and those consumables are very conservative estimates because they assume that they're carrying consumables to compensate for orbital insertion issues as well. We do actually expect to have significant overlap in these missions and while we are in Phase A right now, the team is also looking at any adjustments to improve the alignment of those, balancing of course against getting to launch as quickly as we can. We do think we'll have considerable overlap between those two and we're looking to increase that.

Wendy Mihm: Okay. Another clarification question on GeoCARB. Who is the 'we' when we're referring to we will analyze the potential usability of the GeoCARB instrument? and will that happen in some kind of internal funding stream?

Karen St. Germain: We'll stand up a NASA team to do that analysis and it'll be technical and programmatic.

Wendy Mihm: We don't see any additional questions in the queue and we're coming up on five minutes to the hour. Last minute opportunity to drop anything in. We'll wait just a minute longer to see if we have anything else roll in. Going once, going twice...

Wait, we did see one come in. Okay all right a couple more. Stand by we're sorting through these as they come in. Can you again explain the reason to cut the budgets of the currently operating missions by 20 to 30 percent? Is this to support the designated missions?

Karen St. Germain: I'll take this one. I would give you a more general answer. We've got a considerable amount of budget pressure that's associated with a wide variety of things. We talked about starting up the Earth System Observatory Missions at the same time we're starting up Landsat and pressure associated with that. But also we're still recovering from the loss of buying power with regard to Covid and inflation having to change the phasing of how we fund our new development programs and fund more up front because long lead items are taking much longer than they have historically. We have a whole variety of pressures on the one hand and on the other hand, of course, the list of missions that are operating continues to grow. So what we're doing here is trying to drive down the cost of operating missions so that we have room to build the new missions. So that's what that challenge is about. It's really to try to rebalance the portfolio in terms of new investments versus ongoing existing missions. That's the short answer there

With regard to just the operating missions themselves, one of our objectives here is to maximize the science that we can from those operating missions. If we don't ask every single one of the operating missions to try to become more efficient in their operations, what that will end up meaning is we'll go to Senior Review and some missions will get the full amount of money they want and other missions we simply wouldn't be able to continue at all. By asking the operating missions to take the challenge of driving down their operating costs the idea is to try to maximize the amount of science we can do with the resources we have for operating missions.

Wendy Mihm: Excellent. Thank you. It is now the top of the hour I wanted to thank everyone for attending and all the great questions in the Q&A section. I want to thank our panelists. I also wanted to make one note to address a question that we saw up front we pulled up from up top which was with regard to the ESO Day Q and A's. We are working those and we'll get them to you as soon as possible. Again, thank you attendees, thank you panelists. Great session and we look forward to seeing you next time

Bye now. Thanks everyone thanks for joining us.