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March 26, 2014

Dr. Matt Mountain, Director
Space Telescope Science Institute
3700 San Martin Drive
Baltimore, MD 21218

Re: JSTAC recommendations regarding Early Release Science and Community Fields

Dear Director Mountain:

Over the last several years the JSTAC has been discussing a number of ways in which the scientific productivity of JWST could be maximized during its lifetime. While important for any scientific facility, such maximization of the science return is particularly important for JWST because of its cost and its five-year required life. The JSTAC recognizes the responsibility that we have as representatives of the science community to NASA and its partners, ESA and CSA, to policymakers, and to those funding our missions to offer advice on making JWST as scientifically successful as possible.

The JSTAC realized soon after its inception in 2009 that there were several approaches that could significantly improve the scientific return from JWST. These were identified in a letter (http://www.stsci.edu/jwst/advisory-committee/JSTAC-legacy.pdf) dated June 21, 2010 to the Director where we highlighted the value of (i) a First Look Program, which is now being discussed as Early Release Science (ERS) observations, (ii) open access to data from Large/Treasury/Legacy programs, as has become the norm for the Great Observatories, and (iii) open access to Community Fields, i.e., areas that have had a major investment of observation time on Hubble and other NASA Great Observatory. A common theme for these recommendations was that open access (zero proprietary time) to data plays a key role in optimizing the scientific return.

The discussion in JSTAC that started in 2009-2010 regarding maximizing the science return through open access to data was in abeyance for a period because of the issues surrounding JWST in 2010 that led to the ICRP report, the steps taken to respond to that report by NASA, and the concerns raised in Congress in 2011 that led to a serious discussion regarding whether to continue at all with JWST. The JSTAC has now come back to this central aspect of its charge with renewed discussion of those early recommendations and other aspects related to maximizing the science return.

The JSTAC has revisited these aspects in particular in its last two meetings, in May 2013 and November 2013, and has clarified its recommendations. The recommendations regarding (1) Community Fields and (2) First Look/ERS observations are discussed here. The question of the length of the normal proprietary time/exclusive access period that was extensively discussed at these last two JSTAC meetings, and with the GTOs in July 2013, is addressed in another letter.

(1) Open Access Community Fields: In its June 21, 2010 letter the JSTAC said:

"The Great Observatories space missions have established a number of fields whose multi-wavelength, multi-mission datasets represent an enormous investment of public resources and have extraordinary value for a wide range of science programs. These Great Observatory

datasets have typically been non-proprietary and so are accessible quickly by the international research community, thereby enhancing their scientific impact. The value of these fields has been further reinforced by spectroscopic and imaging observations from a range of international telescope facilities, and observations by other space missions, leading to coverage across much of the spectrum. The numbers of such fields are not large. …… Given the value of such fields for research across a broad range of science areas, the JSTAC endorses the concept of "community fields". The JSTAC further recommends that any JWST data obtained on these fields have zero proprietary periods…."

The full statement regarding such fields can be seen in the June 21, 2010 letter.

Following a discussion in the May 2013 meeting the JSTAC recognized that it lacked the information to consider this question. What was needed were summaries of which fields had been the focus of very large amounts of time on the Great Observatories. Some of this feedback occurred during discussions and presentations regarding the three Great Observatories observing programs. For HST, the list of "most-observed-fields" was provided by STScI in June 2013 and was used in a presentation to the JWST SWG in July 2013 (http://www.stsci.edu/jwst/advisory-committee/SWG_072213-JSTAC.pdf). The ten most-visited areas are listed in an appendix to this letter, along with some additional background regarding the two most observed regions, HUDF/GOODS-S/CDF-S and HDF-N/GOODS-N/CDF-N. The in-progress Frontier Fields program is also discussed in the SWG presentation (since the Frontier Fields have also been considered in the community field context).

After further discussion in its November 2013 meeting the JSTAC reached a consensus that the concept of Community Fields had merit, as had been outlined in our 2010 letter, but that at this time it was really just one field that stood out clearly as a field for which consideration should be given for open access through the community field concept. What distinguished this field was both the very large amount of time that had been committed by all three Great Observatories and the broad legacy character of the datasets. That field is the HUDF/GOODS-S/CDF-S region that has had about 3000 orbits (6 Ms) of HST ACS and WFC3 data, 4 Ms of Chandra data and 6 Ms of Spitzer data. Accordingly:

The JSTAC recommends that STScI identify the HUDF/GOODS-S/CDF-S region as an open access "community" field such that GO data acquired on that region normally have zero proprietary/exclusive access period.

The JSTAC recognizes that agreements limit the extension of the community fields concept to include GTO observations. The uniquely open nature of the investment made in the HUDF/GOODS-S/CDF-S has been widely recognized by the astronomy community, as exemplified by the open access accorded to essentially all data taken in this region. In this spirit, the JSTAC plans to discuss this aspect with the GTOs and to request that the GTOs voluntarily cooperate in adhering to the principle of open access to GTO data obtained in the HUDF/GOODS-S/CDF-S. The JSTAC requests that STScI similarly encourage the GTOs.

(2) Open Access First-Look/Early Release Science (ERS) program: In its June 21, 2010 letter the JSTAC said:

"The JSTAC recommends that the Institute develop a "First-Look" program, similar to that carried out by Spitzer in its first year, to obtain images and spectra that would be used to demonstrate key modes of the JWST instruments. The goal of this program is to enable the community to understand the performance of JWST prior to the submission of the first post-launch Cycle 2 proposals that will be submitted just months after the end of commissioning. To meet this goal, science data need to be released as soon as commissioning activities allow. The

data from this "First-Look" program would complement the Early Release Observations (ERO) and the Science Verification (SV) datasets. The First-Look data should have no proprietary period. The JSTAC recommends that the First-Look data be released both in raw form and with any initial calibrations as soon as possible; the key aspect is speed. ……"

The full statement regarding such programs can be seen in the June 21, 2010 letter.

For clarification, the First Look/ERS program should not be confused with NASA's Early Release Observations (ERO) program that is a public media activity to demonstrate early mission success. The ERO data will be useful for science, but their primary purpose is a media demonstration that the mission is operational and on track to begin its science program.

The JSTAC discussed the Early Release Science program at its May 2013 meeting and reiterated its broad support for an ERS program, but asked for more discussion at its November meeting. The key rationale for the open access ERS program is to again maximize the science output of JWST during its lifetime.

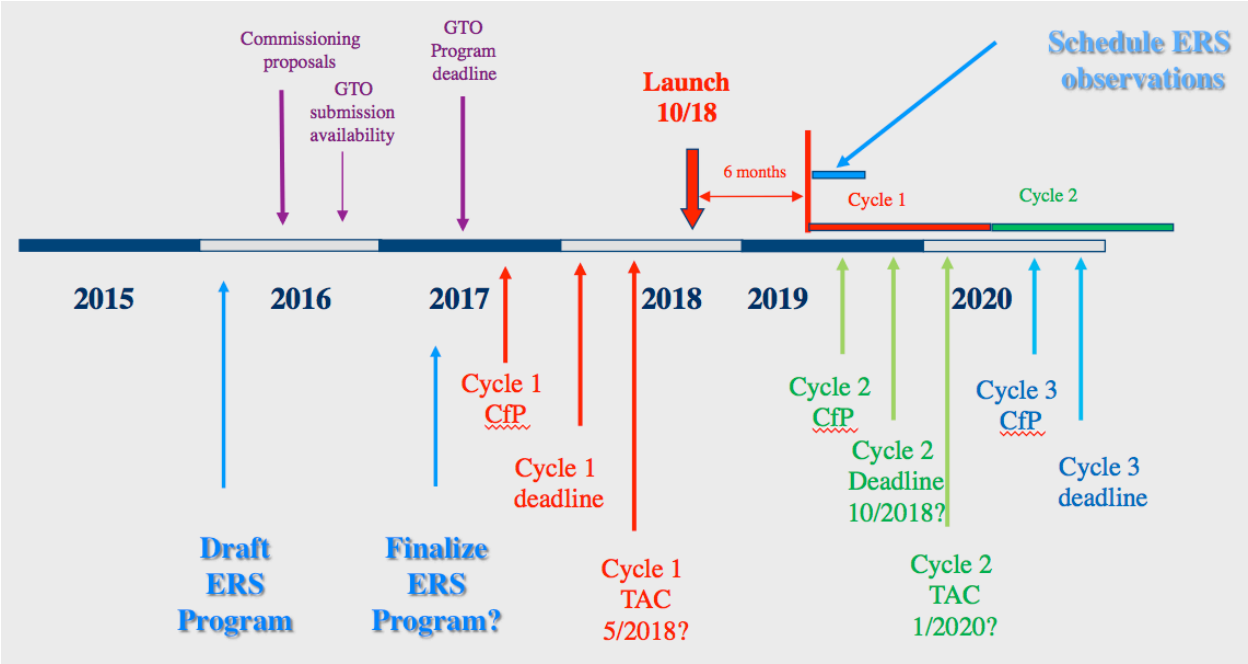
The discussion at the November 2013 JSTAC meeting centered around the primary goals of an ERS program that are: (i) educate the community as to the scientific capabilities of JWST's key instruments and modes; (ii) ensure rapid data availability so that the community can generate proposals for Cycle 2 that take maximal advantage of JWST's new and uniquely powerful capabilities (since the Cycle 2 deadline is part way through Cycle 1); and (iii) involve the community in the planning of the ERS program. To achieve these goals, the program should (i) provide a wide range of scientifically-interesting datasets that will enhance the science proposals for Cycle 2, (ii) exercise a wide range of the expected–to–be most used modes for a range of science topics, (iii) be carried out very early in the first cycle and (iv) begin the planning process in an early, open way with proposals from community members.

The ERS program will also allow STScI to enhance its data processing pipelines and data analysis routines, and do so through interactions with the community using the open and widely accessible ERS datasets. The early availability and open access of the ERS dataset will result in large numbers of scientists gaining immediate experience with JWST and so providing rapid feedback that can be used to improve not just the data processing aspects but also understanding of instrument characteristics, both of which will prove invaluable in enhancing the quality of the Cycle 2 programs. The great value of the ERS program will surely accrue from having hundreds, if not thousands, of eyes on the data at an early stage!

The Spitzer mission faced concerns similar to those of JWST regarding bringing the community up to speed. Spitzer had a two and half year mission lifetime requirement and offered orders of magnitude increases in sensitivity. The potentially short lifetime and completely new sensitivity landscape was addressed in two ways: Legacy Programs and the First Look Survey. The Legacy programs were designed as large, coherent science programs that, in addition to their proposed science goals, would provide the community a lasting science legacy if the mission only met the 2.5-yr Level 1 requirement. Six Legacy programs totaling 3160 hours that covered a range of scientific goals and instrument capabilities were selected in advance of launch through a TAC process in response to a call for proposals. All Legacy data had zero proprietary period which resulted in ~50% of the time executed in the first cycle being available immediately. The First Look Survey (FLS) was a ~100 hours Director's Discretionary Time program that was executed at the start of nominal Spitzer operations. The data was also non-proprietary and the program details were formulated with input from the community, but the program was executed by the Spitzer Science Center. The goal of the program was to provide data immediately to the extragalactic, galactic, and solar system communities that characterized the sky at Spitzer's new sensitivity levels.

For JWST the goals regarding familiarization of the community with regard to the science and instrumental capabilities are similar. The JSTAC understands that the ERS is being discussed as coming from the Director's Discretionary time (about 600 hours on JWST). An open access ERS program as recommended by the JSTAC would be larger than the Spitzer FLS, though much smaller than the Spitzer Legacy program, and so would not be unique to JWST.

The planning for the ERS program was outlined in a *nominal* timeline developed for JSTAC by STScI that indicated that a selection of science, targets and modes would involve the community and be carried out over the next two years. The ERS program would be iterated with the GTOs as their program is being developed on a similar timescale, and then finalized as the GTO program matures and the GTO selections are finalized.



While the details of the activities and the detailed timing remain to be established and discussed with the JSTAC, the JSTAC again endorsed the concept of an open access ERS program and endorsed that further planning be carried out. Accordingly:

The JSTAC recommends that STScI work with the community to plan for implementation of an Early Release Science (ERS) program that will provide non-proprietary, open access data to the community on a wide range of science programs and modes that (i) demonstrate the scientific capabilities of JWST, (ii) quantify the observational capabilities and (iii) position the astronomy community to submit Cycle 2 proposals that are based on real-world experience with JWST, thereby allowing the community to exploit the full potential of JWST very early in its 5-year life.

As the ERS program is being planned and implemented we agree with STScI that iteration will be needed with the GTOs so as to ensure that the GTO and ERS programs do not duplicate targets. The JSTAC encourages STScI to work with the GTOs so that the community involvement in the selection of targets, science objectives and modes is carried out efficiently and is completed when needed before the Cycle 1 Call for Proposals.

As indicated above, this letter is a companion to one that deals with the third topic of our earlier recommendations: that is, with the recommendations regarding the length of the proprietary

(exclusive access) period since that plays such a major role in maximizing the science return from JWST.

The JSTAC appreciated the considerable effort undertaken by STScI to educate us in the nuances of science planning for a mission, and the complexities of the planning process. We would like to thank all those involved. JSTAC is happy to work with STScI to clarify our recommendations regarding community fields and the ERS program, and to respond to any questions that may arise during implementation.

Sincerely yours, on behalf of the Committee,

Garth Illingworth
University of California, Santa Cruz
Chair, JSTAC

JSTAC members:

Roberto Abraham	University of Toronto
Neta Bahcall	Princeton University
Stefi Baum	Rochester Institute of Technology
Roger Brissenden	Smithsonian Astrophysical Observatory
Timothy Heckman	Johns Hopkins University
Malcolm Longair	Cavendish Laboratory, University of Cambridge
Christopher McKee	University of California, Berkeley
Bradley Peterson	Ohio State University
Joseph Rothenberg	JHR Consulting
Sara Seager	Massachusetts Institute of Technology
Lisa Storrie-Lombardi	Spitzer Science Center, Caltech
Monica Tosi	INAF – Osservatorio Astronomico di Bologna

JSTAC Ex-officio observers from the Agencies:
(whose contributions to this letter were limited to factual input)

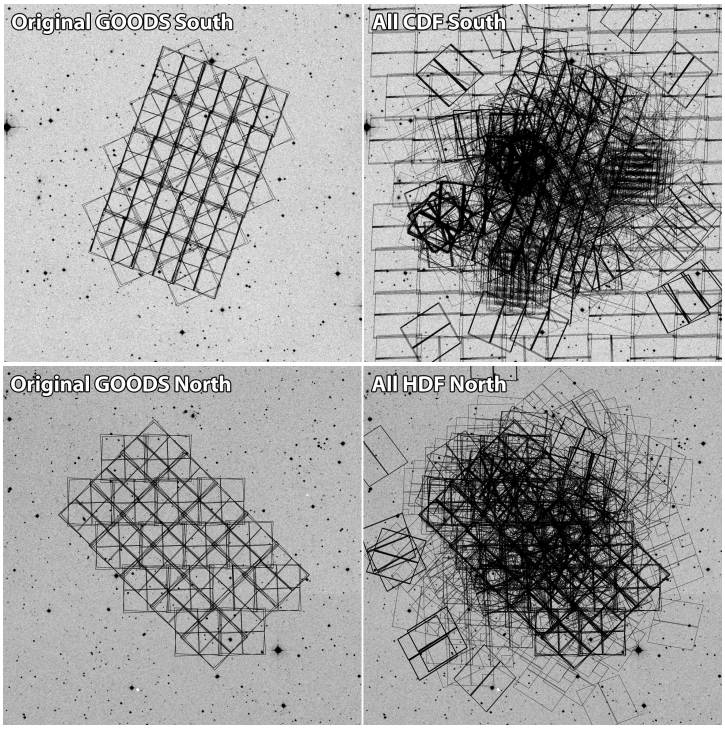
Hashima Hasan	NASA HQ
John Mather	NASA GSFC
Mark McCaughrean	ESA
Alain Ouellet / Jean Dupuis	CSA
Eric Smith	NASA HQ

Appendix: Community Fields

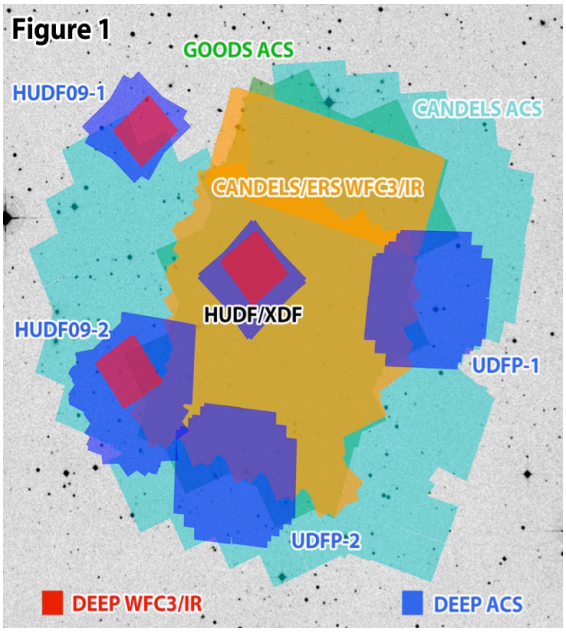
Some background regarding the most-studied HST fields was presented to the JWST SWG in July 2013 (http://www.stsci.edu/jwst/advisory-committee/SWG_072213-JSTAC.pdf). This background is helpful for recognizing why the JSTAC felt that the HUDF/GOODS-S/CDF-S region stood out from all others. More detail can be found in the presentation.

UDF	14457	
HDF North	9222	
47 Tuc	5766	
OmegaCen	4330	
SHER-25	4323	(N3603 - Carina Nebula)
PAR	2274	also Carina Nebula
NGC 6397	1841	
WASP12	1677	
Trapezium	1658	
SN1987A	1528	

Following a request by JSTAC, STScI did a search for the 50 most visited regions of the sky by Hubble. The small table groups the ten most visited areas and numbers of exposures. The UDF (HUDF/GOODS-S/CDF-S) and HDF–North (HDF-N/GOODS-N/CDF-N) regions are the most observed, along with several galactic clusters. Just the ACS data is shown below for these two fields.



There are currently about 3000 orbits of ACS and WFC3 data on the HUDF/GOODS-S/CDF-S and about 1400 orbits on the HDF-N/GOODS-N/CDF-N. Over the life of HST including all instruments ~6470 orbits, or ~18030 exposures, have been put on the HUDF/GOODS-S/CDF-S and ~4300 orbits, or ~13550 exposures, on the HDF-N/GOODS-N/CDF-N).



The other Great Observatories and ground-based telescopes have focused on these areas also. For the HUDF/GOODS-S/CDF-S region, Hubble's 6 Ms (ACS and WFC3 data) is matched by 6 Ms from Spitzer and 4 Ms from Chandra. This extensive dataset from all the Great Observatories resulted in the JSTAC recommending that the HUDF/GOODS-S/CDF-S region be considered as a "community field" with open access (zero proprietary period).