

## MINUTES OF THE KEPLER USERS PANEL

28-29 March 2011

Building N244, NASA Ames Research Center, Moffett Field CA

Prepared by: Alex Brown, Chair

Members Present: Patricia Boyd, Alex Brown, David Ciardi, Bernie McNamara, Richard Mushotzky (by telecon), Joshua Pepper, Lucianne Walkowicz, Nick Gautier (by telecon) [Executive Secretary].

Members Absent: None

Others: Jessie Dotson, Mike Haas, Steve Howell, Doug Hudgins, Martin Still, Charlie Sobeck, Jeff Van Cleve.

### **Mission Status: Spacecraft Health – Mike Haas**

Mike described the spacecraft performance, where several recent (December through March) safings have pushed the data completeness down to 91.8%. This is just below the planned 92% completeness. These safings were all due to different causes but there is a general feeling that the trigger criteria are currently set too fine. Changes to the trigger levels are being investigated that should reduce the likelihood of future safings.

The CCD detectors are performing well with no signs of degradation. Clear, repeatable seasonal variations are present in the photometric time series primarily due to focus and thermal drifts.

### **Archive Status – Martin Still**

The archived data products consist of three sets of targets files (light curves, target pixel files, and monthly full-frame images), calibration files (currently being redesigned), and quarterly products (e.g., biases, overscans, etc.).

Target pixel files are now standardly available in addition to the light curves as part of each data release. The existing data at MAST have been uniformly processed using SOC 6.0 software but this will change from Q8 due to the use of new software version. The KUP was asked how this data incompatibility should be addressed.

Martin discussed the continuing development of Kepler documentation (such as the Kepler Instrument Handbook, Kepler Data Processing Handbook and Kepler Archive Manual). The KUP discussed ways to provide better/briefer Data Release Notes and the feasibility of producing Change Notes as rearchiving of data occurs.

Options for better communicating the potential of archived and new Kepler data to the wider astronomical community were discussed. Long formal presentations about Kepler data (such as at the 2011 January AAS meeting in Seattle) seem to be having little effect.

### **Possible Mission Extension – Doug Hudgins**

Mike Haas detailed the current limitations on the Mission's prime planet search work caused by the inherent variability (CDPP) of even the most photometrically quiet stars.

Doug Hudgins outlined the possible options for mission extension to reattain the prime mission goals. How this might interact with the 2012 Senior Review was discussed. These issues should be far clearer by the next KUP meeting.

### **Public Data Release Policy – Martin Still**

Under the current data release plan only Q0/1/2 data will be available to the outside user community for May 2011 ADP proposals and no additional quarters of data will have been released by the 2012 ADP deadline. The current plan is to release Q3/4 in June 2012. This situation looks bad from the outside perspective and does not enhance the broader image of the Kepler Mission.

The KUP feels that this matter will become an every more negative aspect in the outside view of the Kepler Mission when seeking additional NASA resources and that this issue needs to be addressed as part of any attempts to extend the Mission.

### **GO Program Status – Martin Still**

Martin outlined the status the GO program with the Cycle 3 proposal review having just been completed. The proposal pressure for Cycle 3 showed a decrease compared with Cycle 2 despite strong efforts by the GO Office to generate more interest in GO observations.

The KUP discussed the potential barriers that prevent potential GOs developing proposals and particularly the unusual situation where GO's are often proposing to observe targets on the Science Team list that will be observed anyway. It is evident that constructing Kepler GO proposals is a nontrivial endeavor that numerous potential GOs probably decide is not worth the effort.

Martin described the variety of available methods to access Kepler data other than the GO program, such Director's Discretionary targets, the Participating Scientist Program, the KASC, and the ADP, each of which has its advantages and disadvantages.

He highlighted a diverse set of "astrophysics" results already found with Kepler and noted that there are already 114 Kepler "astrophysics" papers in the literature.

### **GO Office Goals – Martin Still**

The GO office is working towards producing a suite of Python tools (PyKEP) that will allow users to perform a range of data analysis including extracting pixel-level lightcurves, co-trending artifact removal, and combining multiple quarters of data.

### **PDC-MAP Co-trending Software – Jeff Van Cleve**

Jeff described work on developing a better pipeline for removing instrumental trends and artifacts using co-trending information provided by empirical source data, rather than instrumental

engineering data, and a Bayesian characterization of the systematic trends. This software is called PDC-MAP and has great potential to provide significant improvement in the data reliability for both the Science Team and the general user.

The GO Office is intending to produce a general purpose tool (known as C-SAR) that would provide a method for the general user to utilize the co-trending capabilities of PDC-MAP.

## **Discussion and Recommendations by the KUP**

### **1. Kepler Archive, Data Products, On-line Tools, and GO Support**

The KUP made the following recommendations relating to data products:

- The KUP views development of PDC-MAP as absolutely vital for the success of the Kepler Mission, both for its prime science and for general astrophysical investigations. We strongly support the development of PDC-MAP.
- The creation and implementation of C-SAR requires greater resources than the current 0.5 FTE and we recommend allocation of greater resources to ensure the timely development of this vital tool. The aim should be to have a fully functional tool available to the community by mid-2012. i
- *[The two items above are our highest priority recommendations].*
- The Q0-Q7 data should be translated to the new data format and the existing data replaced in the archive. However, a temporary situation where both formats would reside in the archive should not be a great concern.
- Provision of Quarterly “Active pixel maps” for each target should be considered; this would simplify understanding which CCD pixels were active for each target as a function of season without having to download the larger target pixel files with all their temporal data.
- Current limitations on the number of targets that GOs can study is proving restrictive in some situations. The Mission should explore options whereby GOs could study large samples of EXOP targets statistically for non-planetary science.

### **2. Better Documentation and Communication with the Wider Community**

The KUP made the following recommendations relating to better and simpler access to information regarding the Kepler Mission and Kepler data suited to the needs of the astronomical community:

- The name of the “Kepler Guest Observer Office” should be changed to something akin to the “Kepler Science Center” to better reflect the range of services and broad user community that it should be assisting. The current name implies that it is there to only serve GOs, rather than the broader range of potential users of Kepler data.

- Conducting “Community Data Workshops” in a variety of formats and forums is desirable but will probably be ineffective without the availability of “hands-on” tools to demonstrate to potential Kepler data users. A mixed approach at AAS meeting will probably work best with some scheduled formal presentations but also more one-on-one discussions at the Kepler booth.
- Addition of a “Google Page Search” on the GO webpage would facilitate the finding of relevant information.

### **3. Timing of Kepler Data Releases**

The KUP continues to have serious concerns regarding the current data release policies and their consequences:

- The Mission should aim for a steadier sequence of data releases that more closely resemble the typical 1 year proprietary period of other satellites.
- Consequently the KUP recommends that the data from Q3/4/5 be released in roughly Fall 2011 so that a far larger data sample is available for 2012 ADP proposals.
- At our last meeting the KUP recommended that plans should be made for KSAS to migrate to public access. There appears to have been no progress regarding this and we hope to receive more information concerning this matter at our next meeting.

### **4. Preparation for a Kepler Extended Mission**

Preparations for the Mission Extension process should be started as soon as possible.

- Kepler should continue to operate a GO program in the Extended Mission phase.
- Whatever the nature of Kepler’s extended mission a detailed Data Release Plan will be needed and it is likely to be reviewed very intensely. Formulation of such a plan should be a matter of urgency.
- The case for maintaining the current mission noise level goals must be constructed with very explicit explanation for the necessity of maintaining that level and with the assumption that it will be reviewed by a very skeptical audience.

#### **Future Meetings:**

Tentatively we plan to hold our next meeting in roughly 6 months time but no date was fixed.