

**Subject: [NGAO]-Solar System Notes on March 15, 2006 telecon**

Dear all,

I summarized in red ink the tasks remaining for each of us. Please, read this colorful email and let me know your comments. We made some significant progress for the simulation, but there is still some work to be done in this area (B3 and B2) + the text of the proposal...

Next telecon is scheduled on Monday March 27 at 2pm PST. we should aim to have most of the materials needed for the presentation for the working group on Monday and start divided the task for the document (2-4 pages per science cases). It is very important that everybody attend this telecon.

Regards,

Franck M.

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Notes from on the Solar System Telecon

attendees: J. Emery, M. Adamkovics, K. Noll, F. Marchis

Absent: A Bouchez

We went through the slides prepared by F. Marchis showing the first set of simulations based on NFAO (no blurring) PSF, discuss the other science cases and review the xls table containing the instrument requirement per science cases

Link to the slides: <http://astron.berkeley.edu/~fmarchis/document/KNGAO/Presentation/>

J. Emery, A. Bouchez & F. Marchis will attend the CfAO working group.

**Action items not related with any science cases:**

**Keith:** will send us a short email with his thoughts and comments about science requirements (see email sent on March 1, 2006 by Franck)

**Antonin:** Will send us a short email with his thoughts and comments about science requirements (see email sent on March 1, 2006 by Franck)

**SCIENCE CASES:**

**A. ----- Multiple Asteroidal Systems -----**

**- A.1 Sylvia multiple system is in progress (Franck)**

the orbital element of the moons are set. Movie & first images are available

<http://astron.berkeley.edu/~fmarchis/document/KNGAO/SylviaProject/>

The images considering also NFAO-no tip-tilt are NOW available, comparison between NIRC2, NGAO R & V and HST is progress

**action item Franck:** finalized the estimate of the orbital parameters and the precision (in progress)

**- A.2 2003EL61 and its 2 moons (Antonin)**

Peter W. suggested to use NFAO with 8 mas blurring to simulate a 17-18 mag target.

Email from Antonin (sent on March 14):

"I'm writing up the initial results of the EL61 simulations, and will distribute that to our group in a couple of days (by this Friday). I decided to broaden the scope a little, and ask the question of how successful a survey of multiplicity of KBOs with KPAO would go, if they all had similar satellites to EL61. I think this is a more interesting question than discussing the rather unique case of the second-brightest KBO only. I would be glad if you could mention this development to the group."

**action item for Antonin:** Send Franck the slides/table/materials for workshop presentation (this weekend?)

### **- A.3 Size and Shape of Asteroids (assigned to Josh & Keith)**

I requested to have the SR and FWHM of NFAO PSF together in a table to simplify this task. Peter, We need to better know the relation between residual blurring <-> magnitude.

something like

$mv < 16$  - no blurring

$16 < mv < 18$  - 8 mas

$18 < mv < 19$  - 15 mas

$mv > 19$  - 25 mas

Progress email from Josh Emery

"Quick summary of asteroid imaging science case before I head off to the afternoon sessions:

I computed best-case brightnesses and angular sizes for asteroids in the Main Belt, Trojan swarms, Centaur region, Kuiper Belt by assuming they would be viewed at perihelion and opposition. I assumed no blurring at  $V < 15$  (is this right, or will there be blurring at that brightness?) and that we needed to get 3 pixels on the object to call it "resolved". Using these assumptions, I found that about 450 Main Belt asteroids would be resolvable in the visible (only 16 at K-band), 5 Trojans (0 at K-band), 1 Centaur, and 3 KBOs (the big ones - UB313, EL61, and FY9). This includes unnumbered as well as numbered objects.

I'll send a more detailed (and prettier) summary next week sometime."

**Comments from Franck:** did you use IRAS radiometric measurements as a database or H estimate (which albedo?)

**action item for Josh & Keith:** Send Franck the slides/table/materials for workshop presentation. (this weekend?)

### **\* A.4 Spectroscopy of moonlets (assigned to Josh & Franck)**

we need to generate images and have a better idea about the stability of PSF.

Scientific justification: What kind of absorption features can we expect for asteroid surfaces (C,S, M, V taxonomic types) in the NIR, and in visible. Do we need the short wavelength visible range (<0.7 microns). What is the most adequate spectral resolution?

Progress in scientific justification can be made.

**action item for Josh & Franck:** Prepare scientific Justification.

## B. ----- Titan and other Giant Planet satellites -----

### - B.1. Titan surface and atmosphere (assigned to **Mate & Franck**)

Titan image are generated & convolved to simulate different instruments and wavelength of observations.

You can see the images on

Based on simulated consideration the SSI albedo map in visible + low altitude haze and convolved using NFAO-no tip-tilt blurring PSF (Mate & Franck)

see for instance preliminary result (no noise added yet)

\* comparison Keck NGS, Keck XAOPI (PSF from Bruce), Keck NFAO

[http://astron.berkeley.edu/~fmarchis/document/KNGAO/Titan/simu\\_titanH\\_OA.jpg](http://astron.berkeley.edu/~fmarchis/document/KNGAO/Titan/simu_titanH_OA.jpg)

\* Titan surface observed in several wavelength (at  $\lambda < 0.75$   $\mu\text{m}$  the surface cannot be seen)

[http://astron.berkeley.edu/~fmarchis/document/KNGAO/Titan/simu\\_titan\\_NGAO.jpg](http://astron.berkeley.edu/~fmarchis/document/KNGAO/Titan/simu_titan_NGAO.jpg)

\* comparison HST/ACS-HRC vs KNGAO in R band

[http://astron.berkeley.edu/~fmarchis/document/KNGAO/Titan/simu\\_titan\\_compHST.jpg](http://astron.berkeley.edu/~fmarchis/document/KNGAO/Titan/simu_titan_compHST.jpg)

Discussion during March 15 telecon:

**Question:** What kind of surface changes?

Josh pointed out that 2 bright spots were detected on the surface of Titan (LPSC conference, reference?), no idea about their composition, not correlated with albedo feature

**Question:** surface can be seen at  $< 0.9$   $\mu\text{m}$ ?

Mate confirmed that the surface of Titan can be detected at 0.6  $\mu\text{m}$  reference (Richardson 2004)

[http://adsabs.harvard.edu/cgi-bin/nph-](http://adsabs.harvard.edu/cgi-bin/nph-bib_query?bibcode=2004Icar..170..113R&db_key=AST&data_type=HTML&format=&high=4417293d3125795)

[bib\\_query?bibcode=2004Icar..170..113R&db\\_key=AST&data\\_type=HTML&format=&high=4417293d3125795](http://adsabs.harvard.edu/cgi-bin/nph-bib_query?bibcode=2004Icar..170..113R&db_key=AST&data_type=HTML&format=&high=4417293d3125795)

**Question:** Titan up to 5  $\mu\text{m}$ ?

Do we have any good justification to request superNIRC2 up to 5  $\mu\text{m}$  for Titan?

**action item for Mate:** Prepare a new map of Titan including a surface change (with a short explanation). Send to Franck this weekend? It will better illustrate the gain in angular resolution (comparison with HST for instance).

### - B.2 Io image in sunlit is also ready (**Franck**)

preliminary result (no noise)

\* Io observed in visible and NIR with KNGAO

[http://astron.berkeley.edu/~fmarchis/document/KNGAO/Io/simu\\_io\\_NGAO.jpg](http://astron.berkeley.edu/~fmarchis/document/KNGAO/Io/simu_io_NGAO.jpg)

\* comparison with HST in R band

[http://astron.berkeley.edu/~fmarchis/document/KNGAO/Io/simu\\_io\\_compHST.jpg](http://astron.berkeley.edu/~fmarchis/document/KNGAO/Io/simu_io_compHST.jpg)

**Question:** Off-axis PSF. We will wait the Working group meeting to see what the other groups did.

**action item for Franck:** Prepare Io in eclipse observation.

### B.3 Observations of smaller Giant Planet satellites (assigned to **Josh & Mate**)

No progress made yet.

inputs are welcome....

**action item for Josh and Mate:** Let us know your plans ....