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THE CASSINI DATA INGESTION SYSTEM AT MSSL

LKG 02/11/10

This document contains a description of the Cassini data ingestion system at MSSL. An overview is also given by processing_chains.ppt.

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NB: Throughout this document, any commands given should be typed into the console as they appear between the < > brackets.

DATA CAPTURE

Data Processing Prior to MSSL Involvement

Initially data is received from Cassini by the Deep Space Network and sent to JPL. From there it is split and distributed to the various instrument groups involved. CAPS data is sent to SwRI and processed to a set of level 1 data products, which are bundled into daily TAR files and put on an FTP site at SwRI. MAG data is sent to Imperial College London, and put onto two websites.

History

The Cassini spacecraft has been producing data since 1999. During this period its onboard software has been upgraded to produce new telemetry formats, and actuator problems have necessitated extra ground processing. Consequently the data handling system has changed in several ways since the inception of the project.

The first big change was to the data formatting, to allow of its inclusion in the Planetary Data System. This involved a switch away from CDF files as the main data file type to binary flat files. MSSL followed these changes and consequently developed a multi-format directory structure to cope. This format, known as U2 at SwRI and 'unified' at MSSL was used for all data from 21st March 2006 to end June 2010, and earlier data was reprocessed to this format.

The next big change incorporated upgrades to several CAPS instruments, and a recalibration of the ELS. It also fixed problems with actuator position. Data from the entire mission was processed at SwRI, and the higher level data products reproduced at MSSL. This format is known as U3 at both SwRI and MSSL. All earlier CAPS data and related software has been archived. MAG data was not affected.

Only the U3 format, the one actually in use, will be discussed for the rest of this document.

Data and Code Organisation at MSSL

All Cassini data is held on the MSSL SAN. Raw CAPS data is put into /disk/cassini4/cassini/nobackup, which has subdirectories for raw file type and year, eg 'ELS2004'. Data once processed goes into /disk/cassini4/cassini/prodata, which has subdirectories for each product type, each of which has further subdirectories split by year.

Raw MAG data is put into /disk/cassini2/unified/nobackup/rawdata, under which are directories for data type eg /caps, /mag. The raw unified CAPS data is still archived there, gzipped. Only the MAG directories are now of interest. Each of these has a further set of directories beneath, one for each year and data product type of the mission. Data once processed goes into

/disk/cassini3/cassini/prodata, with subdirectory tiers for data type and year. Specific examples will be given in section 2. Raw data that can be easily recopied from its source is stored but NOT backed up at MSSL.

CAPS ingestion and processing code suites each have their own directory under /disk/cassini4/cassini/reprocessing.

CAPS ingestion is in /ffread

Penetrating radiation subtraction is in /penrad

Potential file creation is in /autopot

Moments creation is in /moments

MCP charge history is in /mcpcharge

Gain test evaluation is in /gaintests

Pitch angle derivation is in /pitchangles

IMS SNG moments ingestion from ascii files on the MAPS website is in /sngmoments

Summary (or browse) plots of Cassini data are made with code in /summaryplots

MAG ingestion suites each have their own directory under /disk/cassini2/unified.

MAGDA MAG ingestion is in /fullresmagread

MAPS MAG ingestion is in /magread

CAPS INGESTION

Downloading from SwRI

The files are located on a password-protected FTP site at SwRI. Login to mssltv and go to the /unsafe/lkg directory. Open a connection to SwRI by typing
< lftp -u CAPS ftp.swri.edu >
You will be asked for a password – this is available on request from LKG at MSSL, or email the SwRI Cassini Ops Manager Judy Furman, jfurman@swri.edu.
Next, change to the flight module directory by typing < cd FM >. The filenaming convention is YYYYDDD.tar.gz, so eg 1st March 2006 will have filename 2006060.tar.gz. To pull back this file type < get 2006060.tar.gz >. Wait while it downloads. To get several files in one go, use mget, eg <mget 200606[0-7].tar.gz> will get all files from 2006060 to 2006067 inc. When you have finished, type < exit > to end the session.

Unpacking

This is a two stage process. Files must be unpacked from the tar file and then rearranged into the filing system on the MSSL storage area network.
Unpacking of individual files is done with a Perl script called unpack_u3_caps which is found in the /unsafe/lkg directory. Call the script with the YYYYDDD of the file. Eg, for the example above type < ./unpack_u3_caps 2006060 >. The script will take a couple of minutes and send messages to the screen to tell you what it's doing. This will complete the unpacking.
If the day you are unpacking is near an encounter, and you wish IBS data, then use the unpack_u3_caps_plus_ibs script in the same way as the one above.
If you wish to run many files together then edit the shell script run_unpacking.tcsh to call the appropriate perl script for each day that you want. You must choose the appropriate unpacking script for each day. Run it with < ./run_unpacking.tcsh >. When you have finished, type < exit > to end the session.

ELS and SNG Ingestion

The ingestion suite is called FFREAD (standing for Flat File READ). You will need to go to its directory, which is /disk/cassini4/cassini/reprocessing/ffread. Then you can edit a plain text file called infiles with any editor. This file should contain a list of the days you wish to process. It can take any number of files and will run ingestion code on all of them sequentially. The list should give the YYYYDDD number of each day, one per line. Then you run the ingestion by going into IDL

(with < idl >) and typing < ffread_u3, 'infiles' >. It will take about 8 minutes per day ingested, and send many messages to screen.

After it has finished, check the log for each day, which will be automatically saved in /disk/cassini4/cassini/prodata/logfiles/YYYY, to make sure that no errors or warnings have been made. If a crash is noticed, contact MSSL Ops staff. Warnings should be relayed to the scientists who will use the data.

If all has gone well, you will find that new files have appeared in the prodata directories. For our example day above, the new files would be;
/disk/cassini4/cassini/prodata/els/2006/els_01-mar-2006.dat
/disk/cassini4/cassini/prodata/sng/2006/sng_01-mar-2006.dat
/disk/cassini4/cassini/prodata/hsk/2006/hsk_01-mar-2006.dat
/disk/cassini4/cassini/prodata/elsres/2006/elsres_01-mar-2006.dat
/disk/cassini4/cassini/prodata/sngres/2006/sngres_01-mar-2006.dat
/disk/cassini4/cassini/prodata/oneminave/2006/els_1min_01-mar-2006.dat

IBS Ingestion

To make an IBS dataset suitable for use by the FULLRESDISPLAY suite, run the makeibsday routine, which is in the same directory as ffread, above. Go into IDL with < idl > and eg for our example day, type < makeibsday_u3, 2006060 >. For this example the new file made will be /disk/cassini4/cassini/prodata/ibsres/2006/ibsres_01-mar-2006.dat.

This will only work if the raw data has previously been unpacked with the unpack_u3_caps_plus_ibs script, see section on unpacking above.

Penetrating Radiation Subtraction

This will only be necessary near Saturn periapsis and Titan encounters. The fullresdisplay suite can use the elsres_ , sngres_ and, if available, ibsres_ files produced thus far to plot spectrograms. If penetrating radiation is seen on a spectrogram, then the subtraction code can be run. All that must be noted are the starting and finishing times between which penetrating radiation must be subtracted. If this period covers more than one day then the code must be run twice, from the start to midnight ending the first day, and from midnight starting the second day to the finish.

Code for ELS, SNG and IBS data must be run separately. In each case, start in IDL, in the /disk/cassini4/cassini/reprocessing/penraddirectory. Call the routines, giving each the date with eg < elspenrad, '01-mar-2006'> , < sngpenrad, '01-mar-2006' > and <ibspenrad, '01-mar-2006'>. Each will give on-screen instructions as to how to continue. The penetrating radiation curves and radiation-subtracted data will be added to the initial files, and can be checked with fullresdisplay.

If the result is unsatisfactory, the added data can be removed. Again in IDL, run < delelspenrad, '01-mar-2006' > , < delsngpenrad, '01-mar-2006' > or < delibspenrad, '01-mar-2006'>

to clean the files, and then start again.

Potential File Creation

The first step is to run the automated potential finder. Go to /disk/cassini4/cassini/reprocessing/autopot and start IDL. Eg for 1st March 2006, type <autopot, '01-mar-2006' >. After about a minute a plot will appear on screen, consisting of three spectrogram panels. The bottom panel shows where the potential has been placed using the solar wind algorithm. The middle panel shows where it has been placed using the magnetosphere algorithm. The top panel shows an attempt to combine the lower two. A widget will also appear, asking which of these three potentials should be saved. If none are usable, there is also a 'None' option, which will not save any data. Otherwise, the chosen potential will be saved to eg /disk/cassini4/cassini/prodata/potential/2006/pot_anode5_01-mar-2006.dat.

The potential as produced by the automated system may need alteration. The IDL routine for this, in the same directory as above, is called updatepot.pro, and is called in IDL by typing eg <updatepot, '01-mar-2006'>. A spectrogram will come up on screen. Left-click where you wish to begin, and from then on every left click will define a new potential level extending back to the previous click. When you have finished, right-click to exit. If you're not happy with what you have marked, you can have another go. If you are happy, you'll be shown the day with the new potential and the updates will be saved in the file. At the beginning of the procedure, the code made a copy of the file in it's un-updated form. You will now be asked by a widget whether to delete this file. If you keep it, you will find it named eg /disk/cassini4/cassini/prodata/potential/2006/pot_anode5_01-mar-2006.dat.holding, and can rename it to whatever you choose.

Moments

Once a standard potential file has been produced, standard 3D moments can be made with the suite in /disk/cassini4/cassini/reprocessing/moments. If penetrating-radiation-subtracted data is available, moments will be made with that too. Similarly to ffread, first edit the file called datefile to be a list of the dates you want moments for, in the format eg 01-mar-2006. Then run the code in IDL using < run_moments, 'datefile' >
This will run for several minutes and put moments files into the relevant directories, eg /disk/cassini4/cassini/prodata/moments/2006/moms3d_01-mar-2006.dat
disk/cassini3/cassini/prodata/actave_moments/2006/actave_moms3d_01-mar-2006.dat
/disk/cassini3/cassini/prodata/acycle_moments/2006/moms3d_acycle_01-mar-2006.dat

Pitch Angles

Pitch angles are produced automatically using the code in /disk/cassini4/cassini/reprocessing/pitchangles. They cannot be run until the ELS and 1s MAG SC data (see section on MAG ingestion below) are present. They also use the SPICE kernels (see section on SPICE kernels below), which are not available immediately – if no kernel is present then a predicted one can be obtained, see Dr G Lewis for details. To run the processing, go to the directory given above. Edit the file called infiles to be a list of the dates you want files for, in the format eg 01-mar-2006. Then run the code in IDL using
 < run_pitchangles, 'infiles' >
or in the special case of the Earth flyby data, 17th to 19th August 1999
<run_EFB_pitchangles, 'infiles' >

This will put the pitch angle data files into the relevant directory eg /disk/cassini4/cassini/prodata/pa/2006/pa_01-mar-2006.dat

One-minute Average Files for the Leicester Group

Occasionally the team at Leicester request a batch of one-minute-averaged ELS files. These should be produced automatically during ingestion but can also be created with the oneminave_single.pro routine. Go to directory /disk/cassini4/cassini/reprocessing/ffread. Run the code in IDL using eg <oneminave_single,'01-mar-2006'>

This will put the averaged file into the relevant directory, eg /disk/cassini4/cassini/prodata/oneminave/2006/els_1min_01-mar-2006.dat

To transfer the file to Leicester it is best to gzip it and put it on a personal webpage at MSSL.

Encounter Altitude Files

When an encounter occurs, the altitude of Cassini above the moon encountered should be calculated for the day before the encounter, the day itself and the day after. At the moment only encounters with Titan, Enceladus, Rhea, Tethys, Hyperion and Dione can be processed. If another moon is needed ask a computing person to add that moon's radius to the main routine. To make the encounter altitude file for a given day go to directory /disk/cassini4/cassini/reprocessing/icy_moon_alt. Run the code in IDL using eg

<icy_moon_alt, '09-aug-2009', 'titan'>

This will put the altitude file into the relevant directory, eg /disk/cassini4/cassini/prodata/encounter_alt/encounter_alt_09-mar-2009.dat

MAG INGESTION

Please note that although the descriptions below look very confusing, things will become much clearer once you log on to mssltv and look at the directory structure there.

From MAGDA

If possible, always use MAGDA data, as this is at the highest resolution.

First, open a web browser such as firefox, and go to https://cass18.cassini.sp.ph.ic.ac.uk:8080/MAGDA/ You will need a username and password, these are available from LKG at MSSL on request.

Select the day(s) of data that you want. Normally for each day you'll want consolidated data at 1s resolution for the FGM in four different co-ordinate systems, SC, RTN, KRTP and KSM . The easiest way to do this is to enter eg "1s fgm sc rtn krtp ksm 2006060" into the search box, then select all the entries that appear. Download the zip files to any suitable spot, eg /disk/cassini2/scratch/temp_data, and note the names assigned to them. Unzip them with the Linux command < unzip filename >. Copy the .ffd files to the appropriate /rawdata directory eg /disk/cassini2/unified/nobackup/rawdata/mag/2006/ and remove anything else, including the zip file. Eg <rm acoates_29716.zip >, <rm *.ffh >, <rm magda_terms.pdf >.

Now, in the /disk/cassini2/unified/fullresmagread directory there are four routines, one for each co-ordinate system, and four files in which to list the files you want to ingest. So eg for the 1st March 2006 in spacecraft coordinates, the filenames in the sc_infiles file should be of the format 06060_mrdcd_sdfgmc__sc_1s.ffd.

Then each routine can be called in IDL with eg < fullresmagreadsc, 'sc_infiles' >. The output files will be put into eg in the above case, /disk/cassini3/cassini/prodata/mag_sc_1s/2006/ mag_sc_1s_01-mar-2006.dat

There is also a combined command to run the ingestion on all four co-ordinate systems. Fill in the four 'infiles' files with the files to be ingested, as above, then in IDL use < runall >.

From MAPS

First, open a web browser such as firefox, and go to http://mapsview.engin.umich.edu/. You will need a username and password. These are available from LKG at MSSL on request, or alternatively, you can register under your own name on the site. Select the day(s) that you want, and download the data in your choice of co-ordinate system, to any suitable spot, eg /disk/cassini2/scratch/temp_data, and note the names assigned to them. Unzip them with the Linux command < unzip filename >.

This will give you a couple of PDF files you don't want. Remove them with < rm CASSINI_Rules_of_the_Road.pdf > and < rm MAPS_Rules_of_the_Road.pdf >. It will also have created another couple of directories. You want to move the data out of these new directories and into the standard ones. Use eg for 1st March 2006 in spacecraft co-ordinates < mv MAG/SC/*.* /disk/cassini2/unified/nobackup/rawdata/mag/2006/ >. Then get rid of the new directories with < rm -R MAG/ >. Quite often you'll get the header file from 30th May 2004 as a free gift. Quietly remove it with < rm MAG__SC___2004151_0.HDR >.

Then, similarly to the MAGDA processing, go to /disk/cassini2/unified/magread. Edit the 'infiles' file to list the files to be processed. These will be of the format eg MAG__SC___2006060_0.TAB. Then each routine can be called in IDL with eg < magreadsc, 'infiles' >. The output files will be put into eg in the above case, /disk/cassini3/cassini/prodata/mag_sc_1min/2006/mag_sc_1min_01-mar-2006.dat

UPDATING SPICE KERNELS

The SPICE kernels are the data files used by the SPICE system to calculate spacecraft time, position, etc. They are updated regularly, and new ones should be checked for each week. To check for and retrieve updates go to directory /disk/cassini2/spice/get_spice and run the code in IDL with
< get_spice_kernels, 0 >

A lot of text will come up on screen. As the code looks for the correct kernels, it will move through the /disk/cassini2/spice/kernels directory structure. The current directory is printed to the screen. It is useful to go to each directory to see what is there then when you are asked if you wish to download a new kernel, you can say yes ie <y> or no <n> depending on whether you want to supersede what is already there. Once the text has finished scrolling the updates are finished.
In the /disk/cassini2/spice/kernels there is some code called 'how_to_load_kernels.pro'. This will show you how to load the spice kernels you require.

MCP CHARGE HISTORY

There are two sets of charge history. The unscaled dataset contains the daily charge that actually went through the ELS anodes. The scaled dataset contains the charge in the outside environment. All code updates both simultaneously.

Updating Charge History

This is done with the code suite in /disk/cassini4/cassini/reprocessing/mcpcharge. Similarly to ffread, edit the file called infiles to be a list of the dates you want to update the charge history for, in the format eg 01-mar-2006. Then run the code in IDL using < insertmcpdata, 'infiles' >

This will run quickly, and update two pre-existing files called mcpreservoir_unscaled.dat and mcpreservoir_scaled.dat, which are both stored in /disk/cassini4/cassini/calibfiles. It also saves copies of the pre-existing reservoir files. These copies are overwritten every time data is inserted into the files, as otherwise we'd be inundated with old versions.

Updating Instrument Operating Conditions

There are several circumstances which necessitate passing extra information to the charge history suite. All code and data files are stored in /disk/cassini4/cassini/reprocessing/mcpcharge.

If the ELS is turned off for a period then no charge will go through the ELS and we can't estimate what charge will be in the environment. Consequently these days are zero-filled and marked as off. For example, if the ELS was switched off at mid-day on 01-mar-2006 and switched back on at mid-day 03-mar-2006 then the command to run in IDL is <insertmcpoff, '01-mar-2006', '03-mar-2006' >. This will update the two reservoir files.

If the ELS MCPs are run at a level too low to register signal for a period longer than a whole day (from midnight to midnight) then those days must be zero-filled and marked as 'on but with no signal'.   For example, if the ELS MCPs were turned down at mid-day on 01-mar-2006 and up again at mid-day 03-mar-2006 then only the middle day would have no data at all. The command to run in IDL is <insertmcpzerofill, '02-mar-2006', '02-mar-2006' >. This will update the two reservoir files.

If we know that the ELS was operating for a certain period, but the data for that period is missing, then we can fill the gap with an average of the data to either side. For example, if the three days from 01-mar-2006 to 03-mar-2006 inclusive have been lost then the command to run in IDL is <insertmcpfill, '01-mar-2006', '03-mar-2006' >. This will update the two reservoir files.

CALIBRATION FROM GAIN TESTS

This should not be attempted by anyone who has not had the calibrations tutorial from LKG.

Checking Gain Tests

Scale factors compensate for the degradation of the ELS instrument with time. They are folded in with the geometric factors and change throughout the mission. They were painstakingly calculated in mid-2006 and predicted values based on that calibration were in use up to mid-2010. At that time it was obvious that the rate of degradation was slowing, so a recalibration was made. This recalibration is the one used in all U3 data. Every time a gain test is run the threshold values found for each anode should be checked against previous thresholds to make sure the calibration is still valid. This cannot be fully automated as the MCP levels reported in the housekeeping are not given to high enough resolution.

When a gain test is run, this is the process to follow to add it to the scale factor calibration set:
1) Use fullresdisplay to look at the data for the relevant day. Pick out the time range covered by the second part of the test. If possible check that the spacecraft attitude, the magnetic field and the general plasma environment were stable during this period. Also make sure that the telemetry mode didn't change and that the actuator was parked. If any of these quantities change during the test, then it should be regarded with suspicion.
2) Restore the elsres_ file for the day directly into IDL and find the first and last A cycles covered by the time range above. Suppose the test ran from 12:15 to 12:30. Use
    < range=WHERE(secofday ge 44100 and endsec le 45000) >
    < print, acycle(range,0) >
    The first and last numbers printed will be the A cycle numbers you need.
3) Go to the /disk/cassini4/cassini/reprocessing/gaintests directory. Call lookgain, which will unpack the uncorrected data into the highest possible resolution and pick out all the relevant information. It will also return into IDL a zero-filled array for the user to fill with MCP levels.
   The call is eg <lookgain, '01-mar-2006', x, y, data, format, act, mcp, userlevels > where x and y are the first and last A cycles respectively.
   Look at the data returned (an array of time by counts per anode) and decide when each MCP level was running - the count rates should be flat at each level. The mcp array can give you a guide as to the levels involved.

   Here you can decide whether to proceed or not. If the first five 'steps' of the dataset are not flat and obvious, then the test is unusable. Go straight to step 5 and note this in the gainlog. If the test seems usable then proceed. If the test seems completely unusable then still complete steps 5 to 7 below, stating in the gainlog that the test was unusable.

   Fill in the userlevels array with the actual levels eg if you think the MCPs were at level 45 from index (200,*) to index (260,*) in the data array, then use <userlevels(200:260)=45> to register this.

Do not assign a value to any part of the array where the MCP values were mid-change, or the actuator was moving, or the 'stepping' is not flat.

   The code will then save all the data, including the user-specified data, in a file in the same directory, called eg gain_01-mar-2006.dat.

4) Staying in IDL, call makegain to calculate and save the gain curves for this test. You'll need to tell it the MCP operating level for the period around the test, which can be displayed with fullresdisplay. It's the MCP level that is used for most of the day. The call is eg <makegain, '01-mar-2006', data, userlevels, 46, gain, levels> where 46 is the operating level. This stores the test data safely in the same file as was created by lookgain.pro, in step 3 above. If you want, you can use <SURFACE, gain> to look at the curves derived.

5) Add a note to /disk/cassini2/unified/gaintests/gainlog to say how stable the plasma environment/spacecraft/mag field etc were during the test. Initial and date it.

6) Update the /disk/cassini2/ELS_catalogue_u2/gain_test_list.txt, to give the date and times covered by the full gain test – this includes the first half of the test that we don't use.

7) Update the /disk/cassini2/unified/codebank/showgaintests.pro routine to again give the date and times covered by the full gain test. This will then be used to locate gain tests by other code. Please let all MSSL Cassini group members know that the file has been updated, in case they want to make copies.

Necessary Decisions

        Gain tests can sometimes give anomalous results. Spotting these is un-automatable, and must be done by eye. So look at the results you have just got from your test. First, the shape of the gain profile for this particular test should be a smooth S-curve for each anode. If the reflex point that denotes the threshold is being interfered with then the test will not be valid. Second, are the thresholds gained within statistical likelihood of being on the trend of thresholds since Saturn approach? If they are not, then the test may not be valid.

        In IDL, in the same directory, run trackgaintests.pro with the command eg <trackgaintests,'01-mar-2006>. This will show you the trend line for each anode and where the new test lies on it. It also gives the standard deviation of the gain test threshold from the trend line.

        If you decide that your test is valid, then you can add it to the post-calibration dataset using the add_postcalib_gaintest.pro code in /disk/cassini4/cassini/reprocessing/gaintests. The call is updategain, sdate, part. Sdate is as before, part is the part of the test the thresholds are derived from, 1 for the first part, and 2 for the second.

        If the test is partially valid, or can be 'rescued' by, eg, excluding a couple of high readings, then some manual computing work may be needed. This should be done by ops staff if at all possible.

        If the test looks to be valid, but is off the threshold trend, this must be discussed with a scientist. It would probably be sensible to wait for the next test and see if the trend is regained or not. If a new trend appears, then the calibration code will need updating by ops staff. Inform them politely

and then duck. A cross-check for new trends would be to look at the MCP charge data and see if the trend of that since Saturn approach has altered. The two trends should correlate.

Finally, if the test is invalid, it is worth checking some earlier data. All gain tests come in two parts, and the instructions above are for the second part, where a single energy bin is used, which is the more accurate of the two. However, the first part can be used if all the energy bins containing a reasonable signal level are summed. To do this, still in the /disk/cassini4/cassini/reprocessing/gaintests directory, run the first part display code with <check_first_part, indate, starttime, endtime> where indate is the date as a string, starttime is the second-of-day of the start of the first part of the test and endtime is the second-of-day of the end of the first part of the test. Fullresdisplay can be used to get the times, as above. The code will display the gain curves for all of the lower energy bins, per anode. If these all look like smoothish gain curves then you can proceed. Use investigate_first_part_27sep2010.pro as a template to write one-off code for your test date. Save the gain values in the gain_ file made by lookgain.pro above.

Updating Instrument Operating Conditions

If the ELS is switched off for a period, then MCP degradation ceases and gain will not change over that period. If the ELS operating level is raised then scale factors for extra levels must be calculated. Special code specific to each circumstance must be written to update the file. A template is provided, /disk/cassini4/cassini/reprocessing/mcpcharge/update_on_off_op.pro. Keep a copy of any updating code run in the same directory.
NB: In this case, note that any elsres_ files ingested before the changes were made but dated afterwards may need to be rerun to pick up the correct calibrations.

PUTTING BROWSE PLOTS ON WEBSITE

The MSSL webserver is mssllw. The webpage software is already in place, in /home/planetary/planetary/missions/Cassini/cassiniplots, and there are copies of the code in /disk/cassini4/cassini/reprocessing/summaryplots.

To make plots, go to /disk/cassini4/cassini/reprocessing/summaryplots and edit the file called indates to be a list of the dates you want moments for, in the format eg 01-mar-2006. Then call the processing routine in IDL with eg < run_summaryplots, 'indates' > This will drop a set of PNG files, one per six-hour period, into /disk/cassini4/cassini/prodata/summaryplots/YYYY. These must then be transferred to the appropriate directory on the webserver.

First, login to mssllw as user 'planetary' using < ssh -l planetary www >. You will be asked for planetary's password, which is available from LKG, GRL, NSS or GHJ at MSSL on request. Change directory to the year-appropriate plots directory using eg < cd /home/planetary/planetary/missions/Cassini/cassiniplots/plots06 > and use secure copy to pull the files across, eg < scp "xxx@mssltv:/disk/cassini2/unified/summaryplots/*.png" . > where xxx are your initials. You'll be asked for your own mssltv password, and then the transfer will occur. Once it has finished, go up a directory (ie < cd .. >) and use a text editor to edit the data_blurb.inc file, to update the list of dates we have plots for.