

OLTARIS User Guide

Introduction

On-Line Tool for the Assessment of Radiation in Space (OLTARIS) is a World Wide Web based tool that assesses the effects of space radiation to humans and electronics in items such as spacecraft, habitats, rovers, and spacesuits. This document explains how to input data, perform assessments, and examine results using the web-based user interface.

The OLTARIS architecture is divided into two main parts, the website, in which users interact through a browser, and the execution environment, where the computations are performed. The website is built primarily with standard open source components. The core is Ruby on Rails with a MySQL database running on an Apache web server. The only licensed, server-side component is an Adobe Flash plugin which allows the users to plot and examine results using a standard, free plug-in.

The execution environment is primarily FORTRAN executables tied together with some Perl and Ruby scripts running on a computational cluster. Data is passed between the web server and the cluster using XML files. Jobs are managed with the open-source Sun Grid Engine (SGE).

OLTARIS requires a browser (Internet Explorer 6, Netscape Navigator 9, and Mozilla Firefox have been tested) with JavaScript and Adobe Flash support. The login system requires that the browser's settings are set to allow cookies. It is sufficient to only enable "session" cookies and the cookies will only exist in the browser's memory until the user closes the browser or logs off OLTARIS.

Registration

User Accounts

Users need to register on OLTARIS and get approval before they can enter the website. This is required because some of the content falls under the purview of the International Traffic in Arms Regulations (ITAR), but it also allows for regulating and maintaining limited computer resources by permitting only those with a real need and knowledge to access the site. Once the user account has been activated by the site administrator, the user can login and start using the tools.

Home Page

The home page is at (<https://oltaris.nasa.gov/>). The home page is used for logging on to OLTARIS. The home page also contains links for registering for a user account, changing the user's password, and viewing documentation. Beneath the login form and links is posted general

information about system requirements, general use, current capabilities and a list of known issues.

Site Administrator

The NASA Official link that is located in the footer of each OLTARIS web page is an email link to the site administrator.

Registering for an account

The register link on the OLTARIS home page brings up a form for requesting an OLTARIS user-account. The form provides the information that the site administrator needs to determine that a person qualifies for an account. The form is also the mechanism through which the user specifies a user name and password for the account. The user receives an auto-reply to confirm receipt of the application. The site administrator reviews and verifies the registration and gets the necessary security approvals. If approved, the user receives an email from the site administrator announcing that the account is activated. If declined, the user receives an email requesting further information.

Logging on to OLTARIS

The user logs on to OLTARIS from the home page by entering a user name and a password.

Changing a Password

The Change password link is on the home page. The user is prompted to enter a current user name, a current password, and a new password.

Resetting Forgotten Passwords

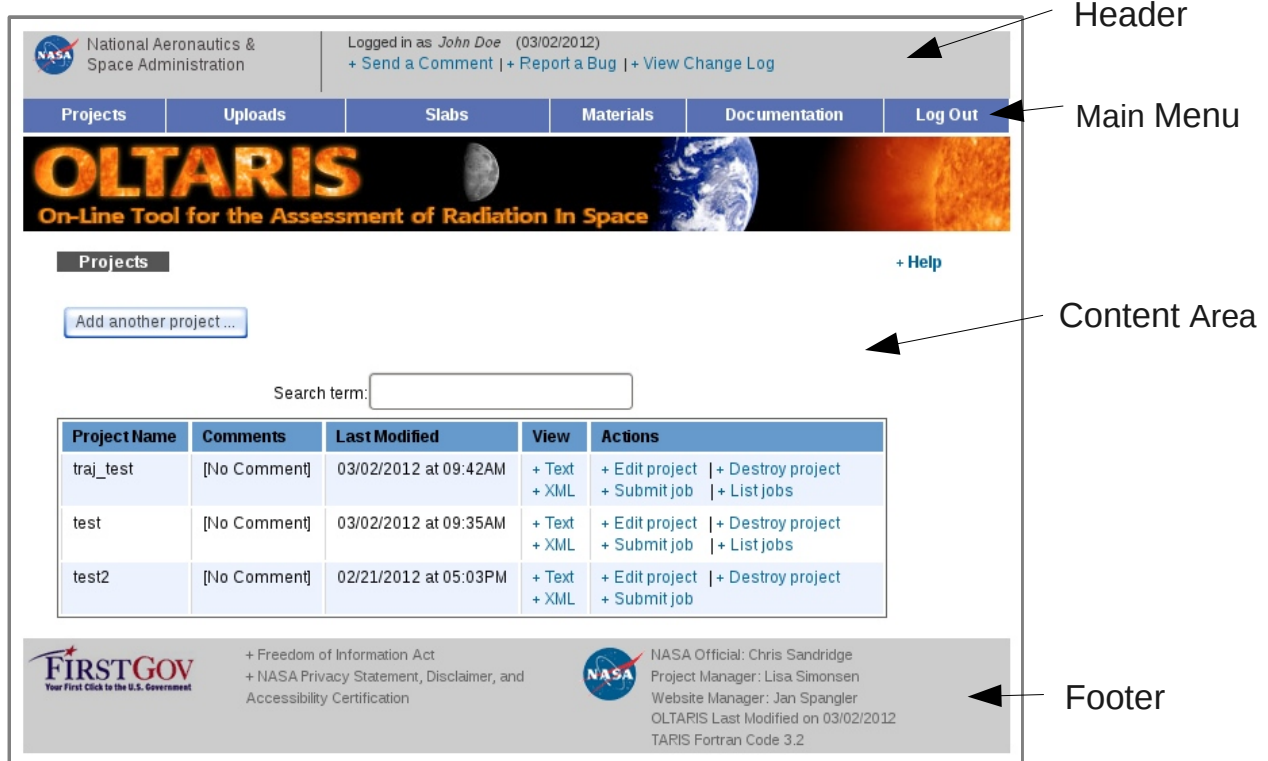
The Forgot my password link is on the home page. The user is prompted to enter his or her user name. Upon submission of the form, a randomly-generated password is sent to the e-mail address that the user provided during registration.

Forgotten User Name

The user must contact the site administrator directly to retrieve a forgotten user name.

General Usage

Screen Layout



Header Area

At the top of the page header is the name of the user that is logged in and the current date. Below that are 3 links:

Send a Comment	Email link for contacting the site administrator.
Report A Bug	Email link for reporting issues that the user feels is a bug in the product.
View Change Log	Brings up a log or record of changes made to the website, including records such as bug fixes, new features, etc.

Main Menu

Selections from the main menu send the user to different modules (i.e., main sections) of the OLTARIS website.

Content Area

This area provides screens in which users can create and interact with their data. Every screen has one or more help links, indicated with a '+ Help' along the right margin. Selection of a help

link brings up a window that contains pertinent usage information. Some areas also have a Reference link that brings up more detailed information about the models and gives the users lists of publications pertaining to the specific model. Error messages and warnings are usually displayed at the top of the content area.

Footer

The footer contains email links to the NASA Official (see section on site administrator), the Project Manager, and the Website Manager. The footer also displays the date that the OLTARIS website was last modified and the release number of the TARIS FORTRAN Code running on the computational cluster.

Data

Data Types

There are 5 main categories of user data:

Data Type	Description
Projects	Projects are the top-level containers for radiation analyses. Each project includes a definition of the radiation environment, a selection of a thickness distribution or slab, and a selection of desired responses.
Jobs	A job is an instantiation of a project that is packaged for processing. Jobs are created whenever a project is submitted for processing. Multiple jobs can be associated with the same project.
Uploads	An upload can be a space vehicle thickness distributions or a point-by-point trajectory.
Slabs	User-defined slab geometries.
Materials	User-defined materials.

Data is presented to the user in lists. For example, as shown in Figure 2, selection of Projects from the main menu would cause all of the user's projects to be displayed as entries in a list:

The screenshot shows a web interface for 'Projects'. At the top left is a 'Projects' header with a '+ Help' link on the right. Below the header is a button labeled 'Add another project ...'. A search bar with the text 'Search term:' is positioned above a table. The table has five columns: 'Project Name', 'Comments', 'Last Modified', 'View', and 'Actions'. It contains two rows of project data.

Project Name	Comments	Last Modified	View	Actions
myproject2	[No Comment]	01/16/2010 at 08:31PM	+ Text + XML	+ Edit project + Destroy project + Submit job
myproject	[No Comment]	01/15/2010 at 12:40PM	+ Text + XML	+ Edit project + Destroy project + Submit job

Figure 2 Projects List

The user can list any category of data through selection of the corresponding item from the main menu. The only exception is the Jobs List which is linked to from within the Projects Module.

Data Lists

Data lists all have a similar format:

Column	Description
Name and Comments	The name and comments fields allow the user to categorize projects as they wish. Hovering the mouse over the text and left-clicking lets the user edit the name or comments inline.
Last Modified	The date and time at which any attribute of the data object was last modified.
View	Selection of the Text link displays a user friendly summary of the project. Selection the XML link displays the XML description of the project. The View column only appears in the Projects list.
Actions	This column contains links for updating the state of the data object such as edit, delete, etc.

Lists are ordered by the last modified date. Lists with many entries are paginated (i.e., the list is split over several pages) such that there are no more than 15 entries per page. Next and Previous links at the top of a paginated list cycle the user through the different pages. The search box which appears above the data list is used to filter which objects are displayed in the list. Only those objects that contain the search term in either the name or comments field will appear in the list.

User-defined Data vs. System-owned Data

Most lists contain both user-defined data and system owned data. User-defined and system-owned materials are listed under separate headings. For example, as shown in Figure 3, the user's thickness distributions are under the heading "User-defined Thickness Distributions" and the system-owned thickness distributions are under the heading "OLTARIS Thickness Distributions." User-defined data are data objects that are created by the user and can be edited and deleted. System-owned data cannot be updated or deleted by the user. However, the user can reference system-owned data when creating a project.

Thickness Distribution Name	Comments	Last Modified	
User-defined Thickness Distributions			
mu_material1	my first material	08/11/2009 at 10:05AM	+ View + Destroy
my_material2	my second material	08/11/2009 at 10:05AM	+ View + Destroy
OLTARIS Thickness Distributions			
STS_dloc2	Space Shuttle Dosimetry Location 2, 968 rays	06/29/2009 at 02:59PM	+ View
STS_dlocPB2	Space Shuttle Dosimetry Location in payload bay, 512 rays	06/29/2009 at 02:59PM	+ View
aluminum_poly_tissue_sphere	2 g/cm ² Aluminum, 1 g/cm ² poly, 3 g/cm ² tissue, 968 rays	09/29/2008 at 08:32AM	+ View
aluminum_sphere	2 g/cm ² Aluminum, 968 rays	09/29/2008 at 08:32AM	+ View
aluminum_tissue_sphere	2 g/cm ² Aluminum, 3 g/cm ² tissue, 968 rays	09/29/2008 at 08:32AM	+ View

Figure 3 Thickness Distribution List contains both user-defined and system-owned data objects.

Creating New Data Objects

New data objects are created by clicking on the button that appears above the data list. For example, as shown in Figure 2, selection of the Add Another Project ... button redirects the user to a form for defining the different aspects of a radiation analysis. Submission of the form returns the user to the list. The newly created object appears as the first item in the data list.

Editing Data Objects

Selection of the edit link redirects the user to a form that can be used to edit the data object.

Delete Data Objects

Selection of the destroy link deletes a data object. For most data objects, the user is asked to confirm the delete.

OLTARIS Modules

This section describes the major modules of the OLTARIS website. Modules are entered by selecting items from the main menu.

Projects

Each project is the complete encapsulation of a radiation analysis; it includes the definition of the radiation environment, the selection of a thickness distribution or slab, and a selection of desired responses. The Projects Module allows the user to create new projects, edit existing projects,

submit new jobs to the compute cluster, and access the results of previous jobs. A job is an instantiation of a project that is packaged for processing. When a new project is created, the user is stepped through a series of pages that allows them to define the different aspects of the problem. Once the project is saved, the user is returned to the Projects List and can submit a job to the compute cluster.

Once a job is submitted, the user can check on the status of the job from the Jobs List for the project. Also, when a job is complete, an email will be sent to the user from the grid scheduler (SGE). Once the job is complete, the user can view the results by selecting the Show Results link for the completed job in the Jobs List.

Project List

The user interface for the Projects List is as described in the General Usage section of this document. There are 4 links in the Actions column:

Link	Description
Edit Project	Redirects the user to a form for editing the project.
Destroy Project	Deletes the project.
Submit Job	Once a project is fully defined, it is ready to be submitted to the computational grid for processing. The Submit Job link redirects the user to a form that lets the user enter a name for identifying the job within OLTARIS and comments. Submission of the form sends the job to the grid scheduler and then redirects the user to the Projects List. A message box appears at the top of the Content Area. The message informs the user whether OLTARIS was successful in submitting the job to the grid scheduler.
List Jobs	Redirects the user to the Jobs List. This list will contain all the jobs that have been submitted for that particular project. If no jobs have been submitted, the List Jobs link is not displayed.

The button above the Projects List redirects the user to the form for creating a new project. The forms that are used for creating and editing projects have identical formats.

Form for Creating and Editing Projects

Name and Comments

At the top of the form are input areas for entering a project name and comments:

Project Name:

Comments:

The Project Name must have between 4 and 30 characters, and it cannot contain white-space or any special characters. Entry of comments is optional.

Environment Definition

This section of the Project Form is for defining the project's external environment. If no environment has been selected, the user will be presented the following display of buttons:

Environment Definition [+ Reference](#)
[+ Help](#)

Use buttons to define an external environment for your project. Clicking on a button temporarily links you to a separate form for specifying features of the selected environment.

GCR, Free Space 1 AU

SPE, Free Space 1 AU

Earth Orbit/ Trajectories

GCR, Lunar Surface

SPE, Lunar Surface

Europa

Each button links to a form that is specific to the type of environment selected. These environments are currently available in OLTARIS:

Environment	Description
GCR, Free Space 1 AU	Free space galactic cosmic ray environment at 1 AU
SPE, Free Space 1 AU	Free space solar particle event environment at 1 AU
Earth Orbit / Trajectories	GCR environment with altitude and inclination dependent cutoff, trapped protons, and albedo neutrons.
GCR, Lunar Surface	Free space galactic cosmic ray environment at 1 AU for each ray emanating from free space to the target point. For each ray emanating from the lunar surface to the target point, the external environment is assumed to be zero. The lunar neutron albedo component is not included at this time. The orientation of the vehicle or habitat with respect to the lunar surface is defined by specifying a material type four thickness in the XML thickness file for each ray emanating from the lunar surface to the target point. Note that this environment requires the selection of a thickness distribution. Currently lunar environment cannot be processed for slabs.
SPE, Lunar Surface	Free space solar particle event environment at 1 AU for each ray emanating from free space to the target point. For each ray emanating from the lunar surface to the target point, the external environment is assumed to be zero. The lunar neutron albedo component is not included at this time. The orientation of the vehicle or habitat with respect to the lunar surface is defined by specifying a material type four thickness in the XML thickness file for each ray emanating from the lunar surface to the target point. Note that this environment requires the selection of a thickness distribution. Currently lunar environment cannot be processed for slabs.
Europa	Design reference environment for the joint NASA/ESA mission to Europa.

Form for GCR-type Environments

The form for entering a GCR-type environment looks like this:

Free Space Environment at 1 AU with Galactic Cosmic Ray (GCR) Effects

[+ Reference](#)
[+ Help](#)

Comments:

Mission Definition

Select Historical Solar Min/Max Enter Date Enter Solar Modulation Parameter
Select a solar maximum or a solar minimum event and enter a duration in number of days.

<input type="radio"/> 1956 Solar Min	<input type="radio"/> 1977 Solar Min (DSNE)	<input type="radio"/> 1997 Solar Min
<input type="radio"/> 1959 Solar Max	<input type="radio"/> 1982 Solar Max	<input type="radio"/> 2000 Solar Max
<input type="radio"/> 1965 Solar Min	<input type="radio"/> 1987 Solar Min	<input type="radio"/> 2007 Solar Min (predicted)
<input type="radio"/> 1970 Solar Max	<input type="radio"/> 1991 Solar Max	

Duration in Days:

Save External Flux for this Environment

Save External Differential Flux for Space Environment? Yes No

The GCR form has 3 main options:

- If the “Select Historical Solar Min/Max” radio button is selected, the user chooses a historical solar minimum or solar maximum and enters the mission duration in days to define the mission length.
- If the “Enter Date” radio button is selected, the user enters a start and end date for the mission. The "Duration in Days" field will either display the length of the mission if start and end dates are given, or it can be used to specify the length of a mission if only a start date is given.
- If the “Enter Solar Modulation Parameter” radio button is selected, the user enters a solar modulation (ϕ) and a duration in days .

In all 3 cases, mission duration can be entered in fractions of a day. For example, 2.5 would specify 2 days and 12 hours.

At the bottom of the form, the user indicates whether or not to save the environment for plotting and analysis. After the form is completed, selection of the Save button causes the environment

definition to be saved to a database and returns the user to the Project Form. The Cancel button also returns the user to the Project Form but without saving the environment definition. If the environment definition is saved, the project form is updated to show a summary of the environment definition:

Environment Definition

[+ Reference](#)
[+ Help](#)

Type: Free Space

Comments: *No Comments*

Event 1956 Solar Min (mission duration = 10.0 days)

Edit Environment

Change Environment Type

Selection of the “Edit Environment” button re-displays the GCR-form so that the details of the environment can be edited. Selection of the “Change Environment Type” button will prompt the user to re-set the environment to another type such as SPE, EO or Europa.

Form for SPE-type Environments

Historical and User-Defined SPE

Historical SPE

User Defined SPE

Use the check boxes to select one or more events, and numeric input fields to enter a multiplication factor. The multiplication factor multiplies the external flare fluence by the factor specified. If more than one event is selected, they are combined.

<input type="checkbox"/> September 1859 (Carrington - September 1989 hard fit)	<input type="text" value="1.0"/>	<input type="checkbox"/> August 1972 (LaRC)	<input type="text" value="1.0"/>
<input type="checkbox"/> September 1859 (Carrington - March 1991 soft fit)	<input type="text" value="1.0"/>	<input type="checkbox"/> August 1972 (King)	<input type="text" value="1.0"/>
<input type="checkbox"/> February 1956 (Webber)	<input type="text" value="1.0"/>	<input type="checkbox"/> August 1989	<input type="text" value="1.0"/>
<input type="checkbox"/> February 1956 (LaRC)	<input type="text" value="1.0"/>	<input type="checkbox"/> September 1989	<input type="text" value="1.0"/>
<input type="checkbox"/> November 1960	<input type="text" value="1.0"/>	<input type="checkbox"/> October 1989	<input type="text" value="1.0"/>

There are two main options for defining a SPE-type environment:

- If the “Historical SPE” radio button is selected, the user chooses any combination of events to include in the total SPE environment. Multiplication factors can also be entered to reduce or increase the spectrum of a particular event. If more than one SPE is selected, the spectra are summed.
- If the “User Defined SPE” radio button is selected, the user is provided a second set of radio buttons for selecting one of several curve fits for defining the SPE: Weibull,

Exponential in Energy, Exponential in Rigidity or Band Function. Once a curve fit is selected, the equation will be displayed and the user is provided input fields for entering appropriate parameters as indicated in the equation.

Form For Earth Orbit/Trajectories

Circular Orbit or User Trajectory
 Circular Orbit User Trajectory

Start and End Dates
Start Date: 2011 December 2
End Date: 2011 December 2
Duration in Days: 0.0

Orbital Parameters
Altitude km (minimum altitude is 200 km)
Inclination degrees (range is 0.0 .. 90.0)

Components to Include in Environment
Use check boxes to select one or more components.
 Galactic Cosmic Ray (GCR) Trapped Proton Neutron Albedo

Do you want to apply "The Constellation Program Design Specification for Natural Environments (DSNE)?"
DSNE: Yes No

The “Earth Orbit/ Trajectories” forms provides two main options for defining a environment:

- If the “Circular Orbit” radio button is selected, the user enters a start and an end date for the mission, the altitude in kilometers, and the inclination in degrees. The user can instead choose to use the DSNE environment (Constellation Program Design Specification for Natural Environments) which when set to yes will fix the dates, altitude, and inclination. When DSNE is selected, the mission duration is the only editable attribute.
- If the “User Trajectory” radio button is selected, the user chooses a trajectory from a pull-down menu that is populated with available trajectories and enters a start-date.

For both the “Circular Orbit” and “User Trajectory” environments, the boundary condition consists of three components: GCR, omnidirectional trapped protons, and atmospheric albedo neutrons. The user can select any combination of the three components.

Form for Europa

Mission

Use buttons below to select the mission scenario.

105 Days at Europa Jovian Tour Flux at 5Rj Flux at 9Rj

Components to Include in Environment

Trapped electron and proton fluxes at 5Rj and 9Rj are peak fluxes. Trapped heavy ions are only available for 5Rj and 9Rj and are averaged fluxes.

Trapped Electrons Trapped Protons Trapped Heavy Ions (averaged)

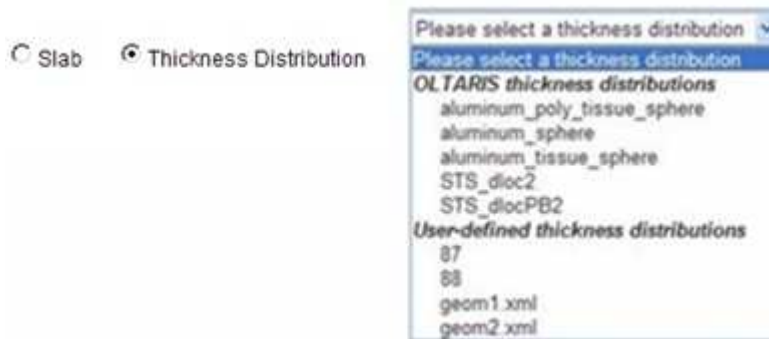
This form is used to select components of the design reference environment for the Europa/Jovian mission. Radio buttons are provided for selecting which mission segment to use. The boundary condition consists of three components: trapped electrons, omnidirectional trapped protons, and trapped heavy ions. The user can select any combination of the three components. If a component isn't available for the selected mission segment, the check box will be grayed out.

Selection of a Thickness Distribution or Slab

The “Geometry” section of the Project Form is used to select a slab or a thickness distribution for the project geometry:

Slab Thickness Distribution

Selection of a radio button will populate a drop-down menu with the available choices:



The type of geometry that is selected determines which type of transport will be used during the radiation analysis. Slab geometries are near limitless combinations of materials and layers in any order to which the external environment, or boundary condition, is transported from face to face using a straight ahead transport with bi-directional or backscattered neutrons. The advantage of slabs is that they are fast calculations and any material defined by the user can be used. The disadvantage is that not all of the responses (listed in the next section) are available. If a slab geometry is selected, the selection boxes for the non-supported responses are grayed out.

Thickness distributions are handled two ways, either by interpolation-based responses or ray-by-ray response. The interpolation-based response is limited to 3 materials (2 + tissue if effective dose equivalent is required). In this case straight ahead transport is performed (*without* bi-directional neutrons) on a spatial grid for each material type in every combination but always in the same order. This array of fluxes is then used to compute different response vs. depth tables, which are then used to compute the response along each ray by interpolation.

Ray-by-ray transport can support thickness distributions with as many as 100 materials in any order along each ray. In this case, straight ahead transport with bi-directional neutrons is performed along each ray and integrated with all the other rays to compute flux at a point. This flux is then used to compute the desired response. These jobs can take much longer to run, especially if effective dose equivalent is selected. Not all responses are supported for ray-by-ray analysis. If you select one that isn't allowed, you will get an error when you try to submit the job.

Selection of Responses

This section of the Project Form is for selecting the response functions to be evaluated and returned to the user:

<input type="checkbox"/> Differential Flux/Fluence:	Differential Flux/Fluence after Transport (Function of Depth, Energy and Isotope)
<input type="checkbox"/> Dose:	Dose in <input type="text" value="Tissue"/>
<input type="checkbox"/> Dose Equivalent:	Uses ICRP 60 quality factor
<input type="checkbox"/> Effective Dose Equivalent	Whole body quantity, uses anatomical model and ICRP 60 quality factor, also computes Avg. Dose Equivalent to BFO, skin, and lens. Use the drop down list below to select the anatomical model: <input type="text" value="Select Anatomical Model"/> + Reference
<input type="checkbox"/> TLD-100:	TLD = Thermo-Luminescent Dosimeter
<input type="checkbox"/> TEPC:	TEPC = Tissue Equivalent Proportional Counter
<input type="checkbox"/> LET:	LET in <input type="text" value="Tissue"/>

Any combination of response functions can be chosen if the project's geometry is a thickness distribution. If the project's geometry is a slab, the user's choices are limited to Differential Flux/Fluence, Dose and Dose Equivalent. Here is a brief description of each of the responses:

Response	Description
Differential Flux/Fluence	This response is the output of the transport calculation. If the geometry is a thickness distribution, an array of flux/fluence vs. depth (a spatial grid for each material), energy, and isotope is generated. In the case of a slab, the results are only for the spatial grid of the defined slab.
Dose	This response generates dose in tissue vs. depth (a spatial grid for each material) and dose at a point in the case of a thickness distribution.
Dose Equivalent	This response generates dose equivalent vs. depth (a spatial grid for each material) and dose equivalent at a point in the case of a thickness distribution. This calculation uses the ICRP (International Commission on Radiological Protection) 60 quality factor.
Effective Dose Equivalent	This response requires the choice of one of the available anatomical models - the Computerized Anatomical Female (CAF), Computerized Anatomical Man (CAM), Male Adult voXel model (MAX), or Female Adult voXel model (FAX) The body models are added to the user supplied thickness distributions. The thickness distribution must include either one or five raytraces. If one point is defined, all the body points are added to the one vehicle point. If 5 points are given, it is assumed that they are defined properly for a 5-zone calculation. In this case, the body points are summed to the closest vehicle point. This calculation uses the ICRP 60 quality factors and tissue weighting factors. This calculation also gives the effective dose equivalent averaged to each of the body organs, including averaged skin, Blood Forming Organs (BFO), and lens.
Thermo-Luminescent Dosimeter (TLD)	This response is calculated at all interpolation grid points and is called the TLD-100 Table or TLD-100 versus Depth Table. This table can be interpolated over a set of thickness files to obtain a TLD-100 value at a point inside a vehicle and/or human. This is a standard TLD-100 that is commonly flown on Shuttle and International Space Station (ISS). Used for validation.
Tissue Equivalent Proportional Counter (TEPC)	This response computes a value at a point defined in the thickness distribution. This is another instrument response like those carried on Shuttle and ISS. Used for validation.
Linear Energy Transfer (LET)	This response computes both differential and integral flux/fluence vs. LET and depth (a spatial grid for each material) or at a point for the vehicle thickness distribution. A drop-down menu lets the user specify whether LET-related calculations use tissue or silicon as the target material.

Submitting the Project Form

Three buttons are at the bottom of the Project Form:



The button labeled Create project (or Update project if the user is editing an existing project) is used to save a project to the database. If any errors occur during the save, one or more error messages will be displayed at the top of the Content Area. The user is prompted to correct the entries in the Project Form that are in error. If the save is successful, the user is redirected back to the Projects List. The Cancel button also redirects the user to the Projects List but without saving anything. The Reset form button sets the form so that it is the way it was before anything was typed in.

Submitting a Job for Processing

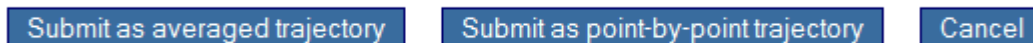
Once the project is saved, the user is returned to the Projects List where selection of the Submit job link will submit a job to the compute cluster. A project can include multiple jobs so that if the user wants to change particular elements of the project, say select a different environment or response, the user can do so and create an additional job that can be submitted under that same project.

This is the form for submitting a job:

A form titled "Form for Submitting a Job" is shown. It has a dark header bar with the title in white. Below the header, there is a "Job Name:" label followed by a text input field containing "job_2". Below that is a "Comments:" label followed by a larger text area. At the bottom of the form are two blue buttons: "Submit" and "Cancel".

Input areas are provided for entering a job name and comments. Selection of the submit button will create a job based on the project's parameters and submit it to the compute cluster.

The submit options may vary if the project's environment is based on a user-defined trajectory:



In this case, if the project is submitted as an **Averaged Trajectory** then the external environment (boundary condition) is computed at each trajectory point and integrated to obtain an average environment. The average environment is then run as a single job to provide total response quantities (and averaged per-day rates) for the entire trajectory.

If instead the project is submitted as a **Point-by-Point Trajectory** then the external environment is computed at *each* trajectory point and run as a separate job. The results are then combined and returned as a function of time along the trajectory. These submissions can take much longer to run since there are as many jobs as there are time steps in the trajectory. The results files can also get quite large if desired responses include spectral data, such as boundary condition flux, flux after transport, or LET. It is best to start with a smaller number of points in the trajectory to get a feel for run time and the resulting data size. The status of this run cannot be checked; an email will be sent when the post-processing is complete.

Submit options may also vary depending on the type of geometry in the project:



Thickness distributions with 3 material types or less (2 types + tissue for projects selecting effective dose response) can be submitted as an **interpolation-based job** or a **ray-by-ray job**. Interpolation-based jobs compute response vs. depth in each material and then interpolate on each thickness to compute total responses. Ray-by-Ray jobs perform a complete transport (including backward neutron transport) along each ray to compute the flux/fluence at the vehicle location and then compute the responses (dose, dose equivalent, effective dose, and TLD are currently supported) using the flux/fluence at a point. Ray-by-ray jobs can take much longer to run (especially for effective dose), but can support many different materials, in any order (like slabs), along each ray in the thickness distribution. Interpolation-based jobs reorder and group like materials together. Thickness distributions with more than 3 material types cannot be sent as interpolation-based jobs.

Jobs List

Selection of a List Job link from the Projects List redirects the user to a list of all the jobs that have been submitted for a particular project.

Jobs For Project europa_freespace + Help

[Return to Project List](#) Select Units for Results: mGy, g/cm² Rad, mils

Job Name	Grid Engine Id	Comments	Job Submitted	Actions
job_3	3770	No Comments	12/10/2010 at 05:46PM	+ Destroy Finished - Show Results
job_2	3769	No Comments	12/10/2010 at 05:45PM	+ Destroy Finished - Show Results
job_1	3768	No Comments	12/10/2010 at 03:48PM	+ Destroy Finished - Show Results

Above the Jobs List is a button for redirecting the user back to the Projects List and, in some cases, radio buttons for selecting which units of radiation to use when displaying results. The radio buttons are only provided when the job is associated with a design reference environment for the Europa mission. The user interface for the Jobs List is the same as is described in the General Usage section of this document. Listed below are attributes and links that are specific to the Jobs List:

Attribute or Link	Description
Grid Engine Id	This is the unique identifier that is assigned by the grid scheduler when the job is submitted. When the job completes, the email that is sent to the user uses this id to identify the job.
Job Submitted	This is the date and time that the job was submitted.
Destroy	Selection of this link deletes the job and its results. Deletion of a pending or active job does not remove it from the SGE queue.
Status	This link is for monitoring a job while it is running. The status of the job is displayed at the top of the content area in a box outlined in red. The status information includes the CPU time used by the batch job and the batch job state. When the job is complete, this link will turn to Finished after the page has been refreshed.
Show Results	This link redirects the user to the Results Page

Results Page

The format of the Results Page will vary depending on the project's environment definition and response selection. The following example shows the Results Page that was generated for a GCR project:

Mission Totals

Mission Duration = 0.01 Days

Data	Value	
Dose	7.044E-03 mGy	+ Sphere Viewer

Mission Rates

Data	Per Day	Per Year
Dose	7.044E-01 mGy/day	2.571E+02 mGy/year

Table Data

Data		
Dose (mGy) vs. Depth (g/cm2)	+ Plot	+ Download
Flux (heavy ion particles/(AMeV-cm2)) vs. Energy (AMeV) vs. Isotope at Point 1	+ Plot	+ Download
Flux (heavy ion particles/(AMeV-cm2)) vs. Energy (AMeV) vs. Isotope vs. Depth (g/cm2)	+ Plot	+ Download

Project Summary

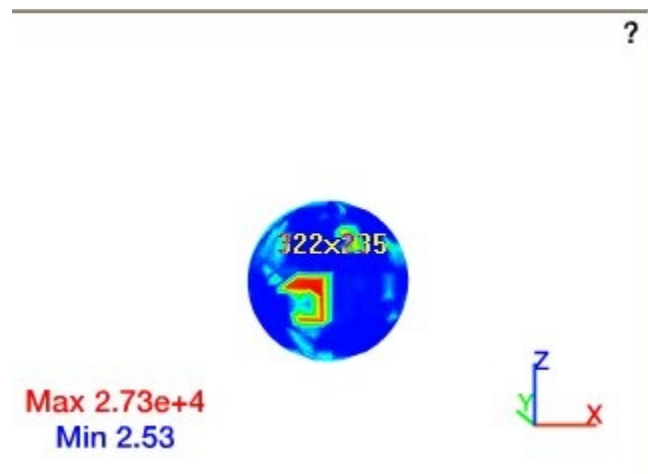
Project Name: myproject
Project Description: [No Comment]
Environment Type: GCR,
Environment Description: no description
GCR Event: 1956 Solar Min (duration =0.01 days)
Save Environment Flux? No
Requested Response Functions: Flux, Dose
Thickness Distribution Name: aluminum_sphere (968 rays)
Thickness Distribution Description: 2 g/cm² Aluminum, 968 rays
Job Name: job_1
Job Comments: No Comments
Grid Engine ID: 2014
TARIS FORTRAN version: 2.4

The Results Page lists some of the results directly in tables. There are also links for plot data such as dose versus depth curves and flux/fluence data. The plot screen has a button for copying the plotted data to the user's clipboard so that it can then be pasted into various local applications on the client. The user also has the option to download the data to his or her desktop computer in the form of an ASCII compatible file.

The Point Data Section of the Results Page

Point data is displayed for the entire mission duration. If effective dose is computed, the results are broken down to list the organ averaged dose equivalent to each organ and then the whole

body effective dose equivalent as a separate quantity. Most point data can be better interpreted by viewing the directional contributions on a sphere. Selection of the Sphere Viewer link opens a pop-up window that contains the directional contributions shown as colors on a sphere. The axes displayed are related to the vehicle thickness distribution used in the calculation. The sphere can be rotated and the color fringes can be altered. Clicking on the '?' displays a help screen for the viewer.

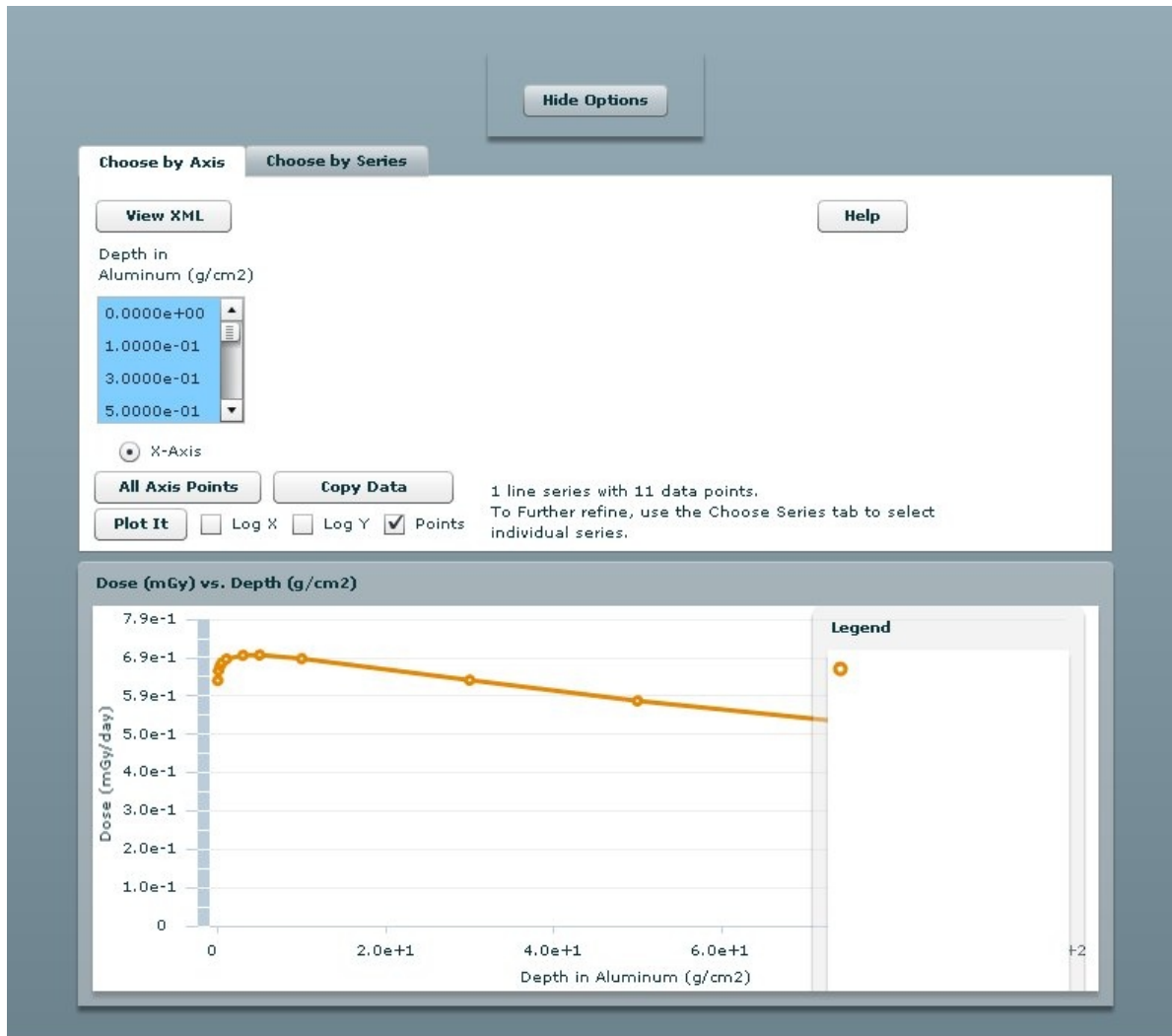


Point data for the entire mission duration is under the heading “Mission Totals”. If the project’s environment is EO, there are potentially extra tables where the data is broken down by component: one table of values for EO and GCR effects only and another table of values for Trapped Proton and Neutron Albedo Effects only.

If the project’s environment is a GCR or an EO with a GCR component then there will also be a “Mission Rates” heading. The table under “Mission Rates” contains the point data re-formulated as daily and per annum rates. Rates for EO projects are also broken down by component.

The Table Data Section of the Results Page

This section of the Results Page is for downloading or viewing table/array results. Selection of the Download link saves the data in an ASCII file which is downloaded to the client computer. Multidimensional array data in the file will be in column-major order. The Plot link invokes an Adobe Flash plug-in that has been customized for viewing OLTARIS data. Selection of the Help button in the Plot Window displays usage information. In addition to numerous plotting options, there is a Copy Data button that lets the user copy the data used for the current plot to the user’s system clipboard. This allows the user to paste it into Excel, Matlab, Sigmaplot, etc.



Project Summary

The Project Summary captures a project’s attributes at the time the project was submitted to the SGE. If the project has been edited since then, the attributes in the project summary may differ from the project’s current attributes. The intention of showing the summary is to document the inputs that yielded the results shown on the current Results Page.

Uploads → Thickness Distributions

The Thickness Distributions Module presents a list of the user’s current thickness distributions and allows the user to upload new ones. Once a thickness distribution is uploaded, it can be selected for a project from the Projects Module. Thickness distributions are uploaded to the site in the form of an XML file. A document describing the format of the file and sample files can be downloaded from the Thickness Distributions page. The user can also download a phantom CAD object that represents a human geometry. This can be positioned and oriented in the user’s CAD

software to help select the proper target points in their vehicle geometry for computation of effective dose responses.

Overview

Ray tracing process

Thickness distributions are computed using a process called ray tracing. Ray tracing uses a directionally distributed set of rays emanating from the same point to determine how much material is surrounding that point in each ray direction. The point source of the rays is commonly called a Target Point. The intersections of the rays and the various components of the vehicle CAD model are used to determine the along-ray thicknesses of the components, which are stored along with their associated material types.

Supported materials for interpolation-based transport

Interpolation-based transport generally supports three materials - aluminum, polyethylene, and tissue – in the vehicle raytrace. For example, one ray could intersect a human being, which would be a thickness of tissue, followed by some shielding material, which could be polyethylene, and then the vehicle structural components, which could be a thickness of aluminum. The user can substitute their own materials by re-defining the material type ids in the XML file. Rays typically intersect multiple objects, so there can be many separate material thicknesses along each ray. OLTARIS sorts and combines these thicknesses so that the outermost layer of shielding is composed of all the collected aluminum thicknesses along that ray, the next layer of shielding represents the total thickness of polyethylene along that ray and the innermost layer represents the total amount of tissue along that ray.

Supported ray distributions

Any angular distribution of rays may be used, as long as they are distributed evenly enough that each ray can be considered to represent an equal solid angle of shielding surrounding its target point. However, to compute an effective whole-body dose equivalent using OLTARIS, the user will need to use one of the many ray distributions that are available for download from the Thickness Distributions page. Those currently available include distributions with 42, 492, 512, 968, 1002, 4002, 9002, or 10,000 rays.

Phantom orientation

If the user needs to take into account a specific body phantom orientation with respect to their vehicle, OLTARIS provides a process that makes this possible. To calculate an effective dose, OLTARIS combines uploaded vehicle thickness distributions with pre-computed body phantom thickness distributions. The process used to combine these distributions provides the ability to analyze a specific body orientation relative to a vehicle shielding model and the ability to capture the local variation of radiation intensity inside the vehicle. This local variation could be due to variations in the amount of shielding surrounding different regions of the vehicle interior and might, for example, yield a situation in which the phantom's head was more lightly shielded than its feet.

In order to accurately represent the user's desired phantom orientation within a vehicle model, the user will need to download one of two specially developed CAD models from the OLTARIS web site. These CAD models are proxies for the male and female body phantoms that are available for use in OLTARIS. The user will need to load this model into their CAD soft ware, as

a new component in their shielding model. The models have been made available in an IGES (Initial Graphics Exchange Specification) file format to gain broad compatibility with the widest possible array of CAD software. Each body phantom proxy CAD model includes eight reference points.

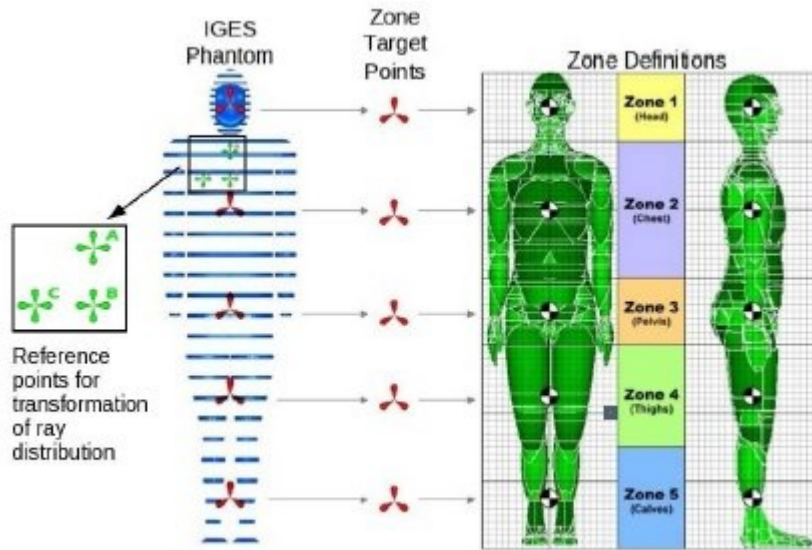


Figure 4 Body Phantom Zone Points

The three points used to establish the phantom orientation have been colored green and labeled “A”, “B”, and “C” (see Figure 4). Once oriented, the records the (x, y, z) coordinates of these three points, taking care to use the same reference coordinate system that will be used for ray tracing. The coordinates of these three points can be entered into a form on the OLTARIS website to generate a custom ray distribution, rotated to take the phantom orientation into account. The form used to create these ray distributions is accessed from the Thickness Distributions page. The user should use this ray distribution to ray trace vehicle thickness distributions that correspond to that phantom orientation.

The other five reference points included with each IGES phantom proxy are colored red and are used to capture the effects of shielding variation within the vehicle interior. These five points correspond to five body zones, as shown in Figure 4. To use this feature, the user will need to perform five separate vehicle ray traces and calculate five separate vehicle thickness distributions, each centered on one of the red zone target points. The effective whole-body dose equivalent calculation within OLTARIS uses tissue thickness distributions based upon hundreds of target points that are distributed throughout the body phantom in specific tissues. OLTARIS will add the vehicle thickness distribution closest to each of the zone’s tissue thickness distributions to get the total shielding around each body point. The user does not have to use the five target points, as one target point can be used in which all of the body points are added to the single vehicle thickness distribution. However, a single target point will be less accurate than the five target point case, as the local variations in the vehicle shielding may be significant.

Web Site Specifics

Thickness Distributions List

User defined and OLTARIS-supplied thickness distributions are listed. These are the thickness distribution files that are supplied by OLTARIS:

File Name	Description
aluminum_poly_tissue_sphere	Three concentric spheres: 2 g/cm ² aluminum, 1 g/cm ² polyethylene, 3 g/cm ² tissue
aluminum_tissue_sphere	Two concentric spheres: 2 g/cm ² aluminum, 3 g/cm ² tissue
aluminum_sphere	2 g/cm ² aluminum sphere
STS_dloc2	All aluminum: Space Shuttle raytrace from Dosimetry Location 2
STS_dlocPB2	All aluminum: Space Shuttle raytrace from Dosimetry Location 8 in payload bay

The user interface for the Thickness Distributions List is the same as described in the General Usage section of this document.

A note about the view link: Selection of the view link redirects the browser to display a thickness distribution in raw XML. These xml files tend to be large and can be slow to load. Also, the browser's back button must be used to return to the Thickness Distributions List.

Links for Creating Thickness Distributions

Link	Description
Human Phantom Overview	This link downloads a pdf or PowerPoint file that contains a description of the overall process of adding a human phantom into an uploaded space vehicle shielding distribution, to enable the calculation of whole body effective dose.
Download Thickness Metafile Description	This link downloads a pdf file that contains a description of the XML format required for uploading thickness distributions to OLTARIS.
Download Example Thickness Metafiles	This link downloads a zip file containing example thickness distributions in XML format. These files can be used as a model for the user's own thickness files.
Download Phantom Geometries	This link downloads an IGES representation of the phantom that can be oriented in the user's vehicle. After the phantom has been oriented, the user will have to return to the Thickness Distributions Module and download a rotated ray distribution.
Download Un-rotated Ray Distribution	This link redirects to a form for downloading one of the eight available ray distributions. The images link on the form displays pictures of the available downloads. The ray distribution files are selected from a drop-down menu.

Download Rotated Ray Distribution	This link redirects to a form that lets the user download a rotated ray-distribution that is oriented so that vehicle can be ray-traced in the same coordinate system as the phantom. The images link on the form displays pictures of the available downloads. The ray distribution files are selected from a drop-down menu. The form also contains fields for entering the x-, y-, z-coordinates in the vehicle coordinate system. These points uniquely determine the position and orientation of the phantom within a vehicle model.
Upload Thickness Metafile	This link uploads an XML thickness distribution from the client to the OLTARIS website. During the upload, OLTARIS will check to validate that the uploaded file is a properly composed thickness file. This action can is also linked to from the button above the Thickness Distribution List.

User Defined Materials and Thickness Distributions

Although the number of materials within a thickness distribution can be no more than three, it is possible to create a thickness distribution that specifies three materials other than the default aluminum, polyethylene, and tissue:

1. Use the “Download Thickness Metafile Description” button to download the “Radiation Shield Thickness Metafile Format” document.
2. Review document sections describing the *Material Table Element* and the *Material Element*. The material table defines how material identification numbers map to material names within the thickness distribution. The Material Table Element contains one or more Material Elements. Each Material Element has two main attributes:
 - *material_id* which is unique to this material in the material table. Each thickness in a thickness distribution will use this id number to associate that thickness with the proper material.
 - *type_id* that identifies the type of material that will be used for transport calculations. Possible values are 1, 2 or 3.

3. Hand edit the thickness distribution, adding up to three elements to the Material Table:

```
<material_type_define id="1" user_material_name="User Material 1">
```

```
<material_type_define id="2" user_material_name=" User Material 2">
```

```
<material_type_define id="3" user_material_name=" User Material 3" />
```

These statements cause the user-defined material named "User Material 1" to be associated with all Material Elements with type-id equal to 1, "User Material 2" to be associated with all Material Elements with type-id equal to 2, and "User Material 3" to be associated with all Material Elements with type-id equal to 3.

4. Be sure that you have created the user-defined materials that are referenced. The following error appears if the user-defined materials named in step 3 are not already created be-

fore uploading the thickness distribution: “Material that is in the material table not found in the database.”

Uploads → Trajectories

List of Trajectories

[Upload a Trajectory ...](#)

Search term:

Name	Comments	Uploaded	Actions
User-defined Trajectories			
LEO DSNE, 500km, 51.6 Incl.	[No Comments]	01/04/2012	+ View + Plot + Destroy
LEO DSNE, 400km, 51.6 Incl.	[No Comments]	10/20/2011	+ View + Plot + Destroy
LEO DSNE, 400km, 55.5 Incl.	[No Comments]	09/13/2011	+ View + Plot + Destroy

File Formats for Uploading Trajectories

[+ Description of file formats that can be used for trajectory upload](#)

The Trajectories Module can be used to upload a trajectory file corresponding to an orbit around Earth. Upon selection of Uploads->Trajectories from the OLTARIS main menu, the user is presented a list of files that have already been uploaded and a button for uploading new trajectory files.

File Formats for Uploading Trajectories

At the bottom of the main page of the Trajectory module is a link for displaying a document that describes the file formats that can be used to upload a trajectory. Each format is described in detail and example files are provided for each format.

Form for Uploading a Trajectory

Select the “Upload a Trajectory ...” button at the top of the main page of the Trajectories Module to bring up the form for uploading a trajectory file. Follow these steps to upload a trajectory:

1. Enter comments relevant to the trajectory in the textbox at the top of the form. Entry of comments is optional.
2. Click on “Browse” and navigate to the saved file on your computer.
3. Click “Open”.
4. Click “Upload Trajectory File”.
5. If the upload is successful, the user is redirected back to the main page of the Trajectories Module. An entry for the newly uploaded trajectory appears at the top of the list of

trajectories. If the upload is unsuccessful, then an error message is displayed at the top of the upload form.

The Trajectory Viewer

The plot link that is associated with each entry in the Trajectory List brings up a tool for visualizing the trajectory against 2D or 3D Google Maps of Earth. The trajectory can also be viewed as three 2D Time Series plots: Latitude vs Time, Longitude vs Time and Altitude vs Time.

How to Use a Trajectory in a Project

Once a trajectory is uploaded, it can be applied to a project by following these steps:

1. Click on the “Add another project ...” button at the top of the Projects main page to redirect the display to the form for creating a new project; and then click on the “Earth Orbit/ Trajectories” button to redirect the display to the form for creating earth orbit environments.
2. Click on the “User Trajectory” button on the Earth Orbit/ Trajectories form. This causes a pull-down menu of uploaded trajectories to be added to the form. Choose a trajectory from the menu. The “Start Date” selector will be updated if the chosen trajectory file specifies a mission start-date. The start date can be changed in the form if desired, that way the same trajectory can be used for different periods in the solar cycle without having to upload another trajectory.
3. Finish filling out the Earth Orbit/ Trajectories form and then click on save button. Note that Neutron Albedo isn't supported and is grayed out..
4. Save the project after you are done filling out the new Project form.
5. Click on the “+Submit Job” link that is associated with the project that was created in the previous step.
6. Submit job by clicking on either the “Submit as averaged trajectory” button or the “Submit as point-by-point trajectory” button.
7. If a job is submitted as an average trajectory, the status of that job can be checked as with any other type of job. If the job is submitted as a point-by-point trajectory, there is no mechanism for checking the status. The user will get an email when the post-processing is complete.

Slabs

Although OLTARIS provides a few predefined materials, the user will in most cases first define the materials he or she wants to use in the Materials Module. Once a material is defined, the user then goes to the Slabs Module and defines a layout of any thickness of material, in any order the

user chooses. This capability is useful for comparing new material or structural concepts. Once a slab is created, it can be selected for a project from the Projects Module.

Slabs List

The user interface for the Slabs List is as described in the General Usage section of this document. There are 3 action links:

Link	Description
Show	This link redirects to a page that displays the slab's composition; i.e., the number of layers, material type of each layer, thickness of each layer and total slab thickness. Slab layers are presented in a sortable list. Layers can be dragged up and down the list to change their order both on the page and in the slab. To drag, the user left clicks on the slab layer and drags the layer to its new destination in the slab.
Edit	This link redirects to the form for editing a slab.
Destroy	This link deletes a slab definition. Note, a slab cannot be deleted if it is referenced by one or more projects. In this case, a warning will be displayed at the top of the Content Area. The warning will identify which projects reference the slab.

The button above the Slab List redirects the browser to the form for creating a new slab. Identical forms are used for creating and editing slabs.

Form for Creating and Editing Slabs

The screenshot shows a web form for creating and editing slabs. The form is titled "Form for Creating and Editing Slabs" and contains the following elements:

- Slab Name:** A text input field containing "aluminum_tissue_slab".
- Comments:** A text area containing "Two layer slab: 2g/cm² aluminum, 3 g/cm² tissue".
- Units of Thickness:** A drop-down menu showing "g/cm2".
- Number of layers in slab:** A text input field showing "2".
- Buttons:** "Add new layer to slab", "Create slab", "Cancel", and "Reset form".
- Layers Table:** A table with columns "Material" and "Thickness".

Material	Thickness
aluminum_li-2195	2.0
Please select a material	0.0
- Total:** A text input field showing "2.0".

Annotations point to various UI elements:

- "Slab units selected from drop-down menu." points to the "Units of Thickness" field.
- "List of slab layers appears in the blue area of form" points to the "Layers" table.
- "Drop-down menu from which user chooses layer's material" points to the "Material" column in the "Layers" table.
- "Button is clicked to append new layer to list of slab layers." points to the "Add new layer to slab" button.
- "Button deletes layer from slab" points to the "remove" buttons in the "Layers" table.
- "Input field for entering layer thickness. Units will be the same as selected from the units drop-down menu." points to the "Thickness" input fields in the "Layers" table.
- "Total slab thickness" points to the "Total" field.

Figure 5 Form for creating and editing slabs.

The Slabs Form is used to define the necessary attributes of a slab including the slab name, number of layers, material type of each layer, thickness of each layer, and units of thickness. Comments are optional. The total thickness of the slab is computed as the thickness of each layer is entered.

A Note on Units: Slab units are selected in the drop down menu. Ultimately, all thickness units are converted to g/cm² for the transport procedure and response function calculations. Plots and output data files with spatial information are also given in g/cm².

Materials

The user defines a material by entering the material's mass percentage, its molecular mass percentage, or its chemical formula. After the material is defined, the user can submit the material definition to the computational grid so that material cross sections can be computed for later use. The user receives email notification when the processing of the material is complete and the material cross sections are available.

Once a material is defined, the user can go to the Slab Module and assign that material to slab layers. The name of the material will appear in the drop-down menu of materials associated with each layer (see Figure 5) in the Slab Form. Slabs referencing that material can also be selected for a project. It is not until the user submits the project to the grid scheduler (SGE) that OLTARIS checks that the cross-sections have been computed for the material. If no cross-sections are available for one or more materials that are referenced by the project, a warning is displayed that identifies the materials for which no cross-sections have been generated.

User-defined materials can also be used in thickness distributions by using the material name in the material_type_define element of the XML file.

At this time, only naturally occurring isotopes, except for Neon, can be used to define a material. Neon and Boron-10 cannot be used; Boron-11 is assumed to be the naturally occurring isotope for Boron.

OLTARIS only accounts for nuclear and atomic interactions in the transport of charged and neutral particles through bulk matter. Therefore, molecular interactions, bond structures, etc. are neglected and the following molecular formulas are considered equivalent: C₈Co₂(O₈) = C₈CoO₁₆.

Materials List

The user interface for the Material List is as described in the General Usage section of this document. Figure 6 shows a screen capture of part of one user's list:

Materials + Help

Add another material ...

Search term:

Material Name	Comments	Last Modified	Database Available?	Actions
User-defined Materials				
Cobalt_carbonyl	C8CoO16	01/19/2010 at 05:47PM	no	+ Show + Edit + Destroy Generate Database
mymaterial	My favorite material.	01/19/2010 at 05:46PM	no	+ Show + Edit + Destroy Check Job Status
Silicon	[No Comment]	08/07/2009 at 02:38PM	yes	+ Show + Edit + Destroy + Regenerate Database
OLTARIS Materials				
polyethylene	CH2	11/04/2009 at 10:03AM	yes	+ Show
lunar_regolith_a17	can change comment?	10/29/2009 at 10:49AM	yes	+ Show
silicon	[No Comment]	10/16/2009 at 09:14AM	yes	+ Show

Figure 6 Materials List

The fourth column of the Material List is titled “Database Available?” A yes in this column indicates that the cross-sections for this material have been generated and no indicates that they have not been generated.

There are 5 links that appear in the column that is titled “Actions”:

Link	Description
Show	This link redirects to a page that displays a summary of the material composition. The summary displays the material definition, density and density units.
Edit	This link redirects to a form that can be used to edit the material’s composition.
Destroy	This link deletes a material. A material cannot be deleted if it is currently used in a slab definition. The slab would have to be changed or deleted before the material can be deleted.
Generate Database	This link submits a material to the grid scheduler (SGE) so that cross sections can be generated. A message is displayed at the top of the Content Area informing the user that the job was sent and the link will change to Check Job Status. An email is sent from the grid manager to the user when the job is finishes.

Regenerate Database	This link re-submits a material to the computational grid so that the material cross sections can be re-computed. The user needs to re-generate a material's cross section after a material's attributes, other than name and comments, are changed.
Check Job Status	This link shows the status of the grid job that is computing the cross-section database. If the message indicates No Jobs Pending, then the job is no longer running and the "Database Available?" column should indicate yes. If it doesn't, then the database generation failed and the user should submit a bug report. Once the job has completed successfully, this link will change to Regenerate Database.

Form for Creating Materials

The button labeled "Add another material ..." links to the form for creating materials. There are three ways to define a material – Elemental Mass Percentage, Molecular Mass Percentage, and Chemical Formula. The user must select one to start as shown in Figure 7. Density units can be selected in the drop down menu. Ultimately, all density units are converted to g/cm³.

The screenshot shows a web form titled "New Material" with a "+ Help" link in the top right. The form contains the following elements:

- Material Name:** A text input field.
- Comments:** A text area with a scroll bar.
- Density:** A text input field containing "1.0".
- in units of:** A dropdown menu currently showing "g/cm3". An annotation points to this menu with the text "Density units are selected from a drop-down menu."
- Define in Terms Of:** Three radio buttons labeled "Elemental Mass Percentage", "Molecular Mass Percentage", and "Chemical Formula".
- Buttons:** Three buttons at the bottom: "Create material", "Cancel", and "Reset form".

Annotations for the buttons:

- An arrow points to the "Create material" button with the text "Saves material definition before returning user to Material List".
- An arrow points to the "Cancel" button with the text "Returns user to Material List without saving".
- An arrow points to the "Reset form" button with the text "Returns user to this state at Step 1".

Figure 7 Step 1 is to choose the Definition Style

The screen will change depending on the Definition Style that is selected. Figure 8 shows an example screen for Elemental Mass Percentage. The user must know the mass, charge and mass percentage of each element in the material. Only naturally occurring elements can be used at this time. The sum of all percentages must add up to 100.

New Material

Material Name:

Comments:

Density: in units of:

Number of elements in material: 4

Button appends new element to list of Elemental Mass Percentages

List of Elemental Mass Percentages appears in the blue area of form

Elemental Mass Percentage			
Element Mass	Element Charge	Mass Percentage(0 < p <= 100)	
<input type="text" value="1"/>	<input type="text" value="1"/>	<input type="text" value="9.993"/>	<input type="button" value="remove"/>
<input type="text" value="12"/>	<input type="text" value="6"/>	<input type="text" value="14.901"/>	<input type="button" value="remove"/>
<input type="text" value="14"/>	<input type="text" value="7"/>	<input type="text" value="3.5"/>	<input type="button" value="remove"/>
<input type="text" value="15"/>	<input type="text" value="8"/>	<input type="text" value="71.606"/>	<input type="button" value="remove"/>
		Total	100.0

Button deletes elemental mass percentage from material

Sum of all percentages must add up to 100.

Figure 8 Example of screen for Elemental Mass Percentage

Figure 9 shows an example screen for the Molecular Mass Percentage definition style. The user enters the chemical formula and mass percentage of each molecule in the material. Formulas are input by entering the chemical symbols of each constituent element followed by the number of atoms. Formulas are input using plain text. The show formula button lets the user view the formula with atomic number indicated using a subscript. Although not shown in Figure 9, there is a blue box at the bottom of the screen that has some example chemical formulae to help the user figure out the input format.

Material Name:

Comments:

Density: in units of:

Number of elements in material: 2

Material in Terms of Molecular Mass Percentage

Formula	Mass Percentage(0 < p <= 100)	
<input type="text" value="C"/>	<input type="text" value="50.92"/>	<input type="button" value="show formula"/> <input type="button" value="remove"/>
<input type="text" value="C37H42N4O6S"/>	<input type="text" value="49.08"/>	<input type="button" value="show formula"/> <input type="button" value="remove"/>
Total Percentage 100.0		

Sum of all percentages must add up to 100.

Molecular formula: **C₃₇H₄₂N₄O₆S** close

Figure 9 Example screen for Molecular Mass Percentage

Figure 10 shows an example screen for the Chemical Formula definition style. This form operates similarly to the one for Molecular Mass Percentages except that only one formula is entered.

New Material + Help

Material Name:

Comments:

Density: in units of:

Note: Selection of Show Formula button causes the chemical formula that you have entered to be displayed in this

Form for Editing Materials

The form for editing a material definition is same one as is used for creation. The difference is that the user skips the first step because the definition style is fixed after creation. Changing any part of the material definition (except name and comments) invalidates any existing cross-sections for the material. They will need to be re-generated.

Documentation

This module contains links for downloading user documentation and various reports.

Log Out

Logging out from OLTARIS is done explicitly by selection of the Log Out item from the Main Menu. It can also be done implicitly, such as by powering the machine off or closing the web browser window. The OLTARIS login system uses a session-only cookie to authenticate the user. When the user logs out, this session-only cookie is deleted from the user's computer. As a security precaution, one should not rely on implicit means of logging out of OLTARIS, especially not on a public computer; instead one should explicitly log out and wait for the confirmation that this request has taken place.