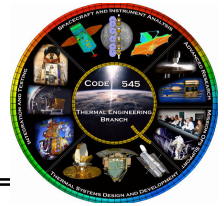

Summary of Thermal Utility Programs Available at Goddard Space Flight Center

Presented by Hume Peabody
Hume.L.Peabody@nasa.gov
(301) 286-9141

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San Jose State University in cooperation with NASA-AMES

Thermal Utility Programs

- Geometry Input
  - Geo_Info: *output various TSS surface properties (area, nodes, etc)*
  - Ren_Optics: *output TSS optics properties and make updates to both optics and geometry files*
  - TSS_Conv: *conversion between selected ASCII based geometry formats*
- Geometry Output
  - Radk_Func: *collection of Radk and HeatRate post processing functions*
- Thermal Model Input
  - TMM_Conv: *conversion between selected ASCII based thermal model formats*
- Thermal Model Output
  - Backload: *calculate backloads for selected nodes from temperature and radk output*
  - ThermPlot: *general post-processing program for thermal output*
  - Generate_T-XYZ: *find closest FEM node to geometry centroid and maps temperature for STOP analyses*

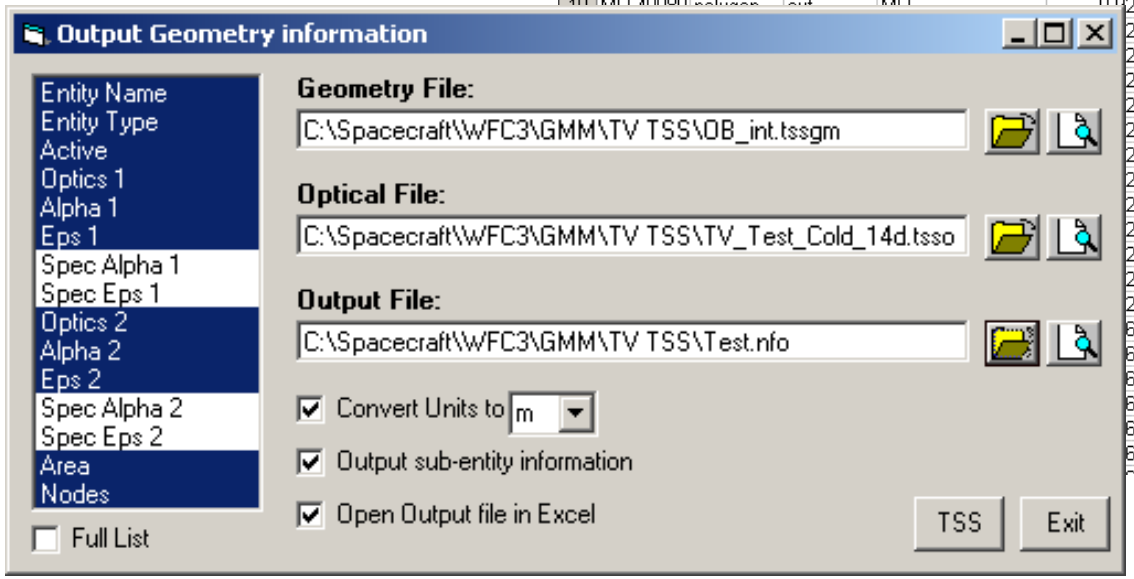
Disclaimer

- All programs developed to address specific need
  - *Not developed to be robust and error free (i.e. not developed to be commercial software)*
  - *Have been developed and used successfully for years*
- Tools may be provided as is
  - *No support, expressed or implied, is included*
  - *Identified bugs will be corrected, but may not be considered high priority*
  - *No documentation exists (ThermPlot excepted)*

Geo_Info

output various TSS surface properties (area, nodes, etc)

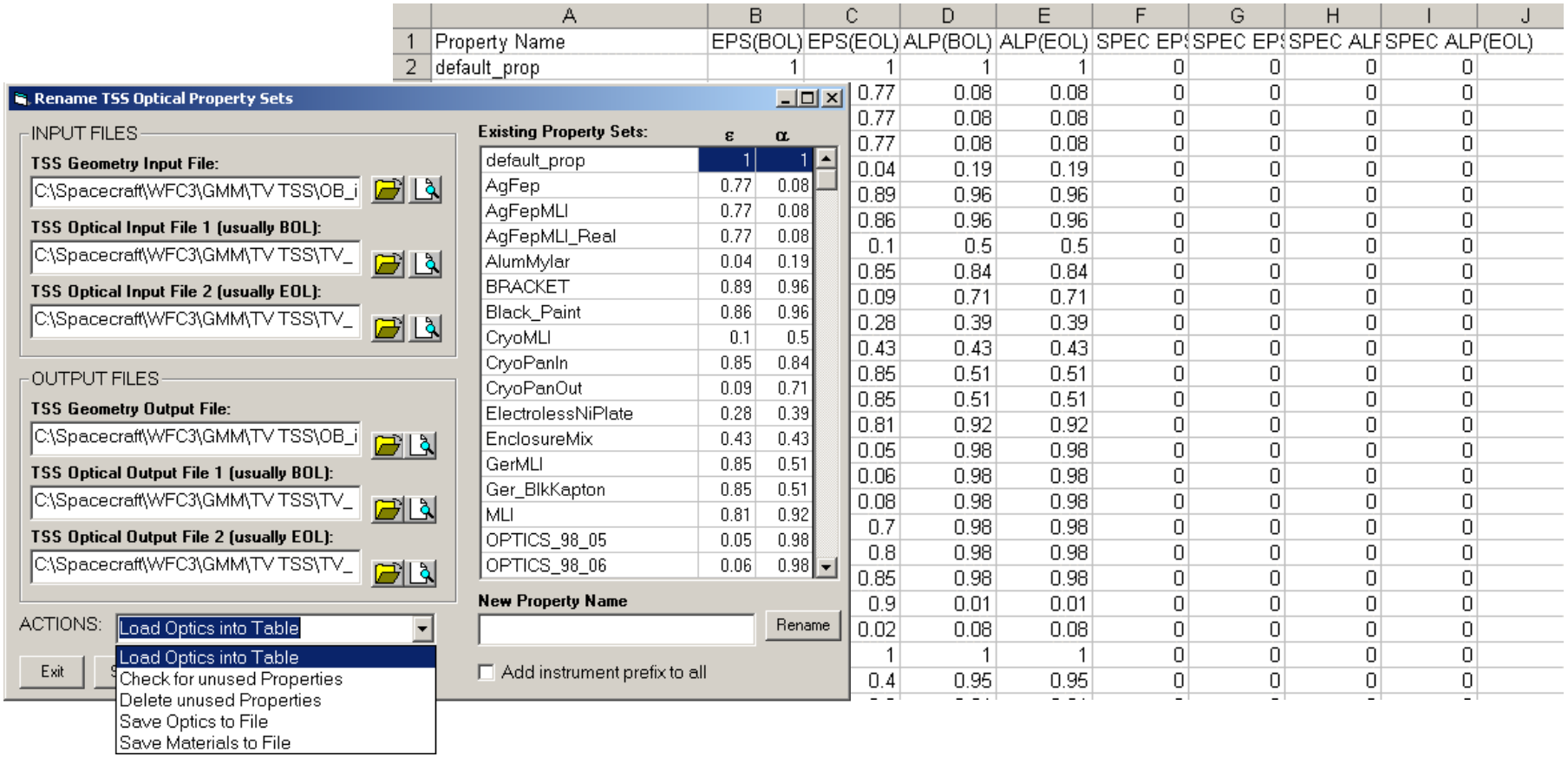
	A	B	C	D	E	F	G	H	I	J	K
1	Ent_name	Ent_type	Active	Optics (Out)	Alpha1	Eps1	Optics (In)	Alpha2	Eps2	Area	Nodes
2	MLI.40010	polygon	out	MLI	0.92	0.81	MLI	0.92	0.81	1.050E-02 m^2	40011
3	MLI.40011	polygon	out	Perfect_Black	1	1	Perfect_Black	1	1	4.950E-03 m^2	4999
4	MLI.40020	polygon	out	MLI	0.92	0.81	MLI	0.92	0.81	1.050E-02 m^2	40011
5	MLI.40030	polygon	out	MLI	0.92	0.81	MLI	0.92	0.81	6.386E-03 m^2	40011
6	MLI.40040	polygon	out	MLI	0.92	0.81	MLI	0.92	0.81	6.386E-03 m^2	40011
7	MLI.40050	polygon	out	MLI	0.92	0.81	MLI	0.92	0.81	6.260E-03 m^2	40011
8	MLI.40060	polygon	out	MLI	0.92	0.81	MLI	0.92	0.81	6.260E-03 m^2	40011
9	MLI.40070	polygon	out	MLI	0.92	0.81	MLI	0.92	0.81	7.834E-03 m^2	40011
						0.81	MLI	0.92	0.81	7.834E-03 m^2	40011
						0.81	MLI	0.92	0.81	1.553E-02 m^2	40011
						0.81	MLI	0.92	0.81	1.553E-02 m^2	40011
						0.81	MLI	0.92	0.81	2.075E-01 m^2	40111
						0.81	MLI	0.92	0.81	1.599E-01 m^2	40121
						0.81	MLI	0.92	0.81	3.372E-01 m^2	40131
						0.81	MLI	0.92	0.81	5.329E-01 m^2	40141
						0.81	MLI	0.92	0.81	3.372E-01 m^2	40151
						0.81	MLI	0.92	0.81	5.329E-01 m^2	40161
						0.81	MLI	0.92	0.81	2.887E-01 m^2	40171
						0.81	MLI	0.92	0.81	2.557E-01 m^2	40181
						0.81	MLI	0.92	0.81	2.887E-01 m^2	40191
						0.81	MLI	0.92	0.81	2.557E-01 m^2	40201
						0.89	al_irridite	0.29	0.08	6.161E-03 m^2	30010
						0.89	al_irridite	0.29	0.08	3.791E-03 m^2	30020
						0.89	al_irridite	0.29	0.08	5.895E-03 m^2	30030
						0.89	al_irridite	0.29	0.08	7.060E-03 m^2	30040
						0.89	al_irridite	0.29	0.08	7.060E-03 m^2	30050
						0.89	al_irridite	0.29	0.08	4.952E-03 m^2	30060



- *Area Unit Conversion*
- *Sub-entity output*
  - *Nodal sub areas, activity, properties*

Ren_Optics

output TSS optics properties and make updates to both optics and geometry files

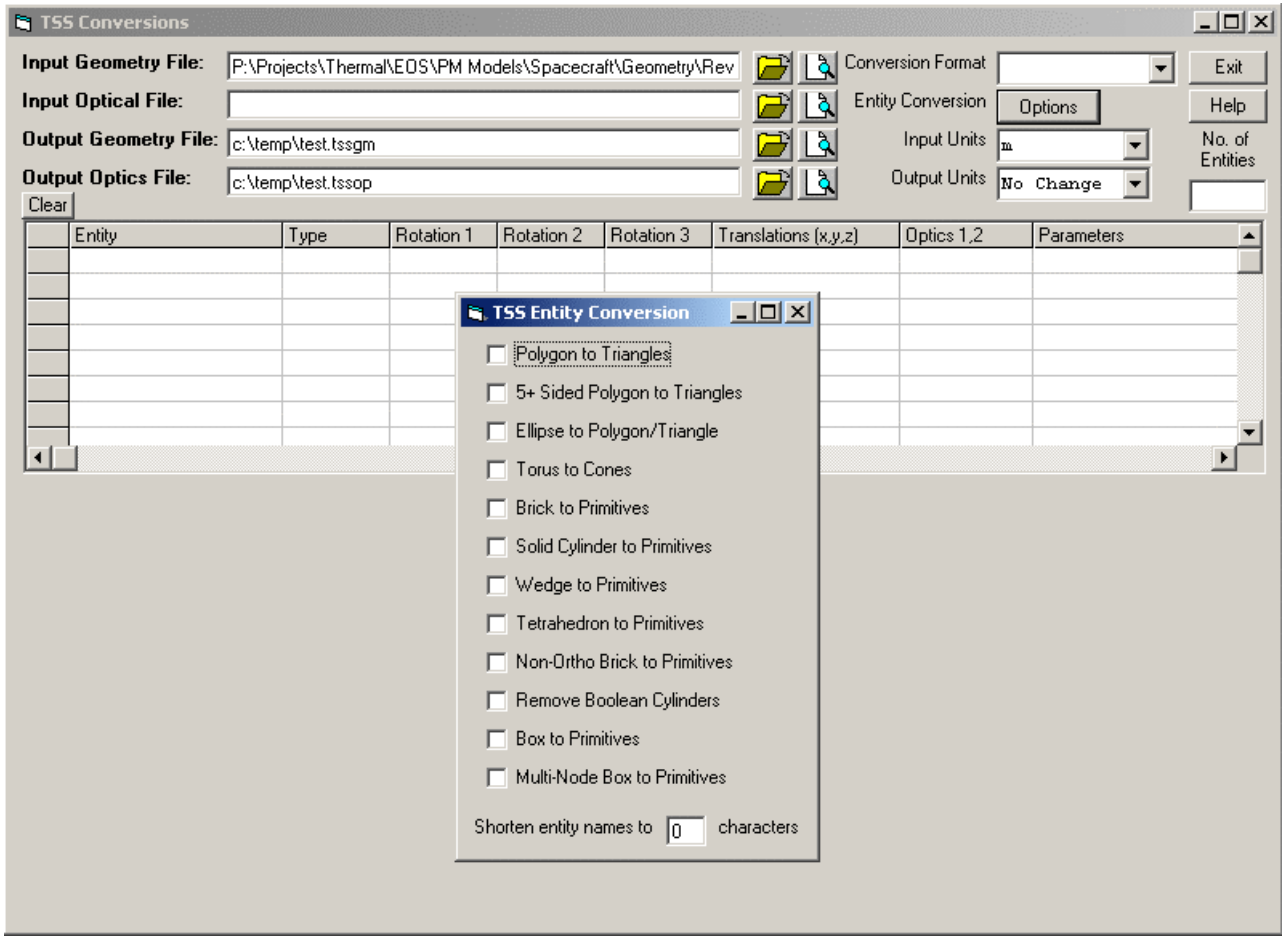


	A	B	C	D	E	F	G	H	I	J
1	Property Name	EPS(BOL)	EPS(EOL)	ALP(BOL)	ALP(EOL)	SPEC EP	SPEC EP	SPEC ALF	SPEC ALP(EOL)	
2	default_prop	1	1	1	1	0	0	0	0	
			0.77	0.08	0.08	0	0	0	0	
			0.77	0.08	0.08	0	0	0	0	
			0.77	0.08	0.08	0	0	0	0	
			0.04	0.19	0.19	0	0	0	0	
			0.89	0.96	0.96	0	0	0	0	
			0.86	0.96	0.96	0	0	0	0	
			0.1	0.5	0.5	0	0	0	0	
			0.85	0.84	0.84	0	0	0	0	
			0.09	0.71	0.71	0	0	0	0	
			0.28	0.39	0.39	0	0	0	0	
			0.43	0.43	0.43	0	0	0	0	
			0.85	0.51	0.51	0	0	0	0	
			0.85	0.51	0.51	0	0	0	0	
			0.81	0.92	0.92	0	0	0	0	
			0.05	0.98	0.98	0	0	0	0	
			0.06	0.98	0.98	0	0	0	0	
			0.08	0.98	0.98	0	0	0	0	
			0.7	0.98	0.98	0	0	0	0	
			0.8	0.98	0.98	0	0	0	0	
			0.85	0.98	0.98	0	0	0	0	
			0.9	0.01	0.01	0	0	0	0	
			0.02	0.08	0.08	0	0	0	0	
			1	1	1	0	0	0	0	
			0.4	0.95	0.95	0	0	0	0	

- *Rename specific properties*
- *Add prefix (to avoid duplicates)*
- *Check for, or remove, unused*
- *Make property tables*
  - *Optics (TSS, Desktop)*
  - *Materials (Desktop)*

TSS_Conv

conversion between selected ASCII based geometry formats

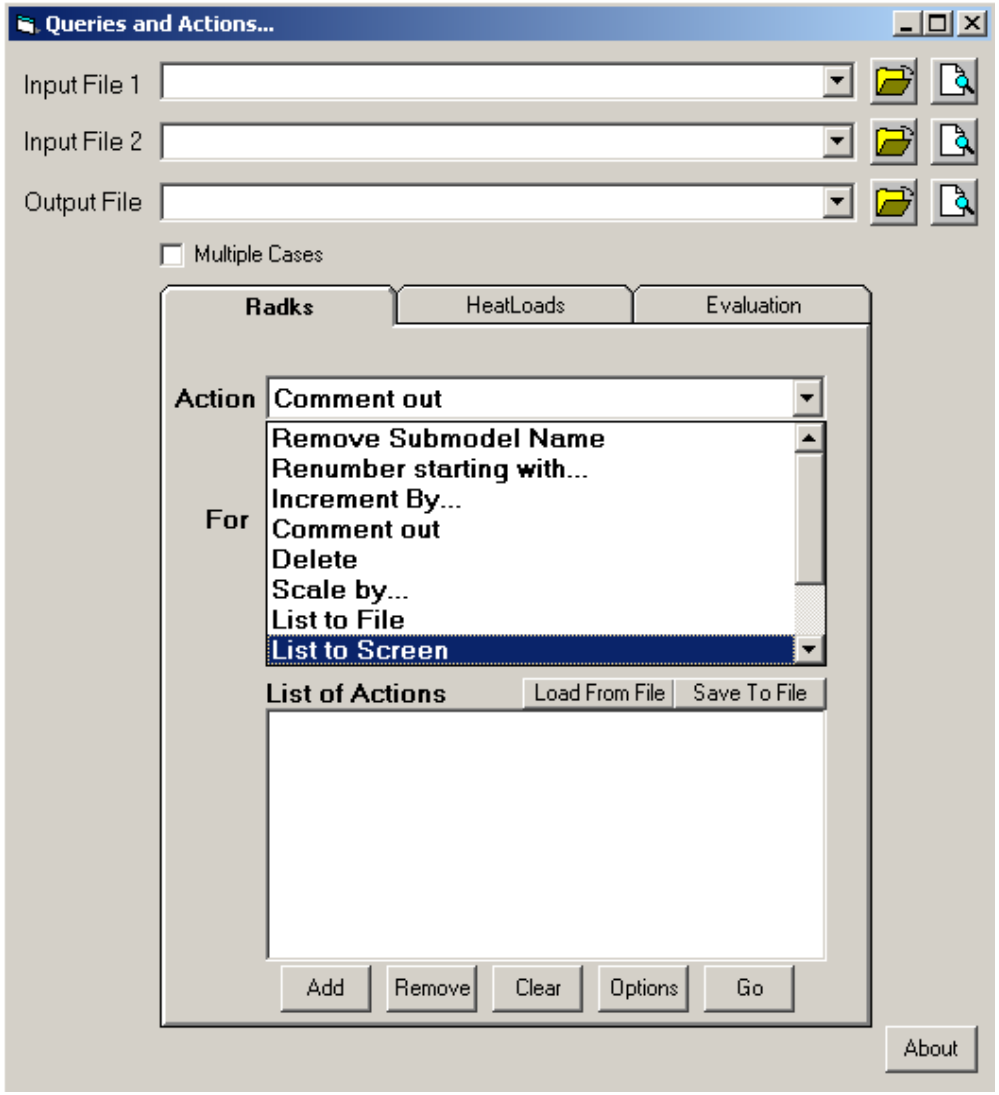


- *Available conversions*
  - *TSS to ESARAD*
  - *TSS to Thermica*
  - *Esarad to TSS*
  - *Thermica to TSS*
  - *Esarad to Thermica*
  - *TSS to NEVADA*
  - *TMG to TSS*
- *Unit conversion*
- *Special cases*
  - *Solids to primitives*
  - *Torus breakdown*
  - *Polygons to triangles*
  - *Shorten entity names*

Note: presented at 2002 TFAWS as "Use of TSS as a Neutral Format for Geometry Model Conversions: An Alternative to STEP-TAS"

Radk_Func

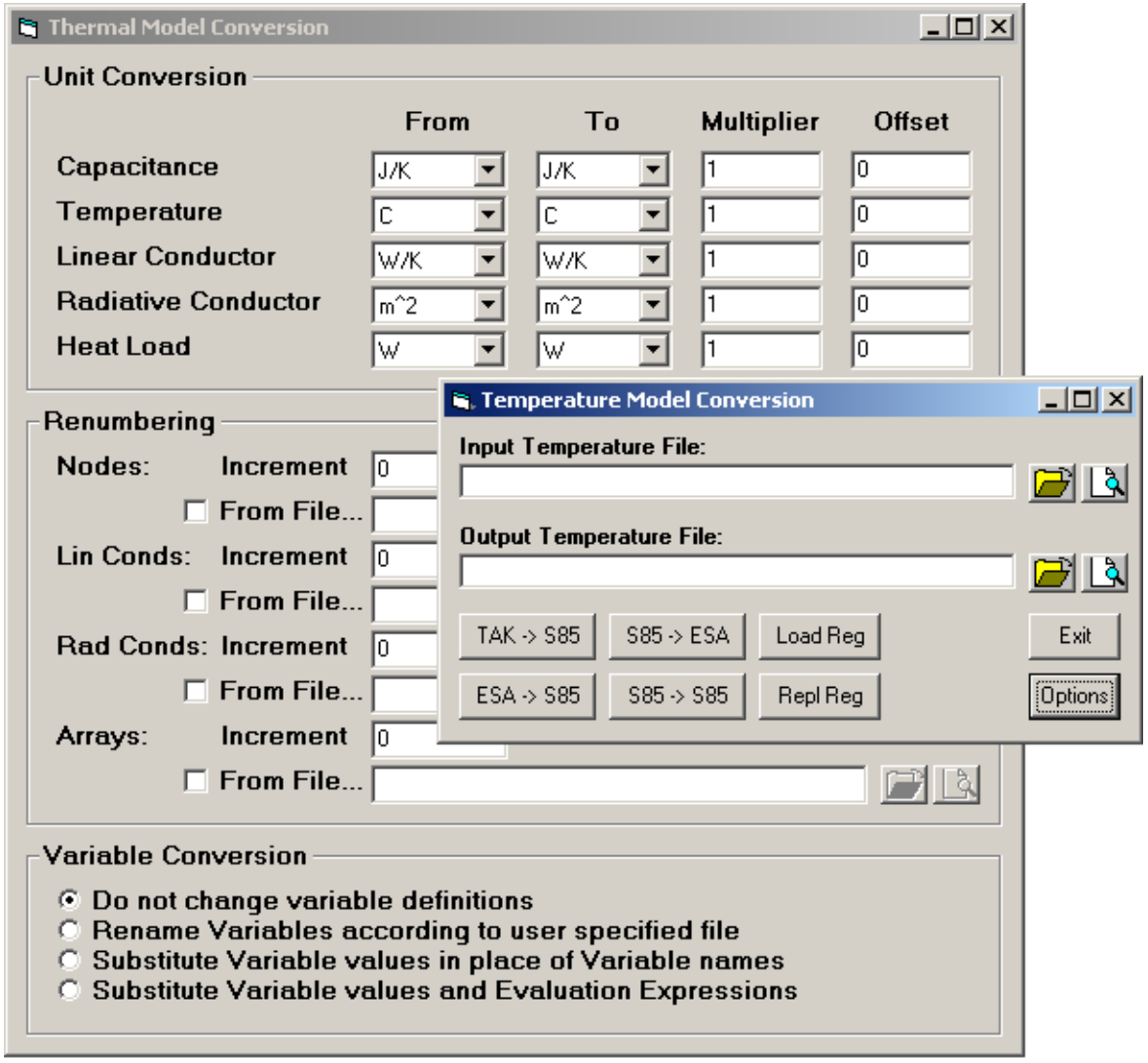
collection of Radk and HeatRate post processing functions



- *Collection of utilities to post process RADK output*
  - *Renumber*
  - *Comment*
  - *Delete*
  - *Scale*
  - *Sum*
- *Can act on*
  - *All conductors*
  - *Conductors connected to*
  - *Conductor between*
- *Multiple sequential actions may be defined*
- *Some support for heatloads but not as mature*

TMM_Conv

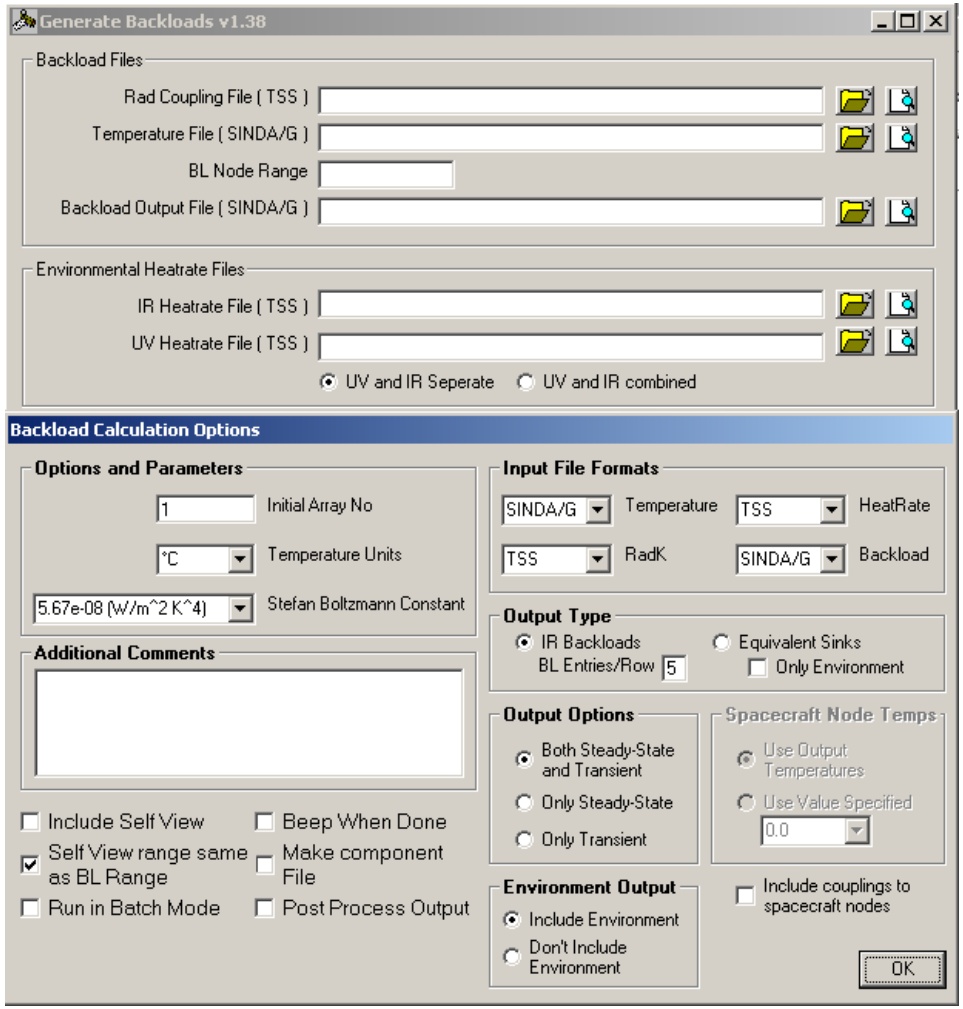
conversion between selected ASCII based thermal model formats



- *Thermal Model Conversion*
  - *TAK2000 to SINDA*
  - *SINDA to ESATAN*
  - *ESATAN to SINDA*
- *Unit conversion*
  - *C, T, GL, GR, Q*
- *Renumbering*
  - *Nodes*
  - *Lin,Rad Conds*
  - *Arrays*
- *Variables*
  - *Convert names (shorten)*
  - *Replace with values*
  - *Replace with values and evaluate*

Backloads

calculate backloads for selected nodes from temperature and radk output

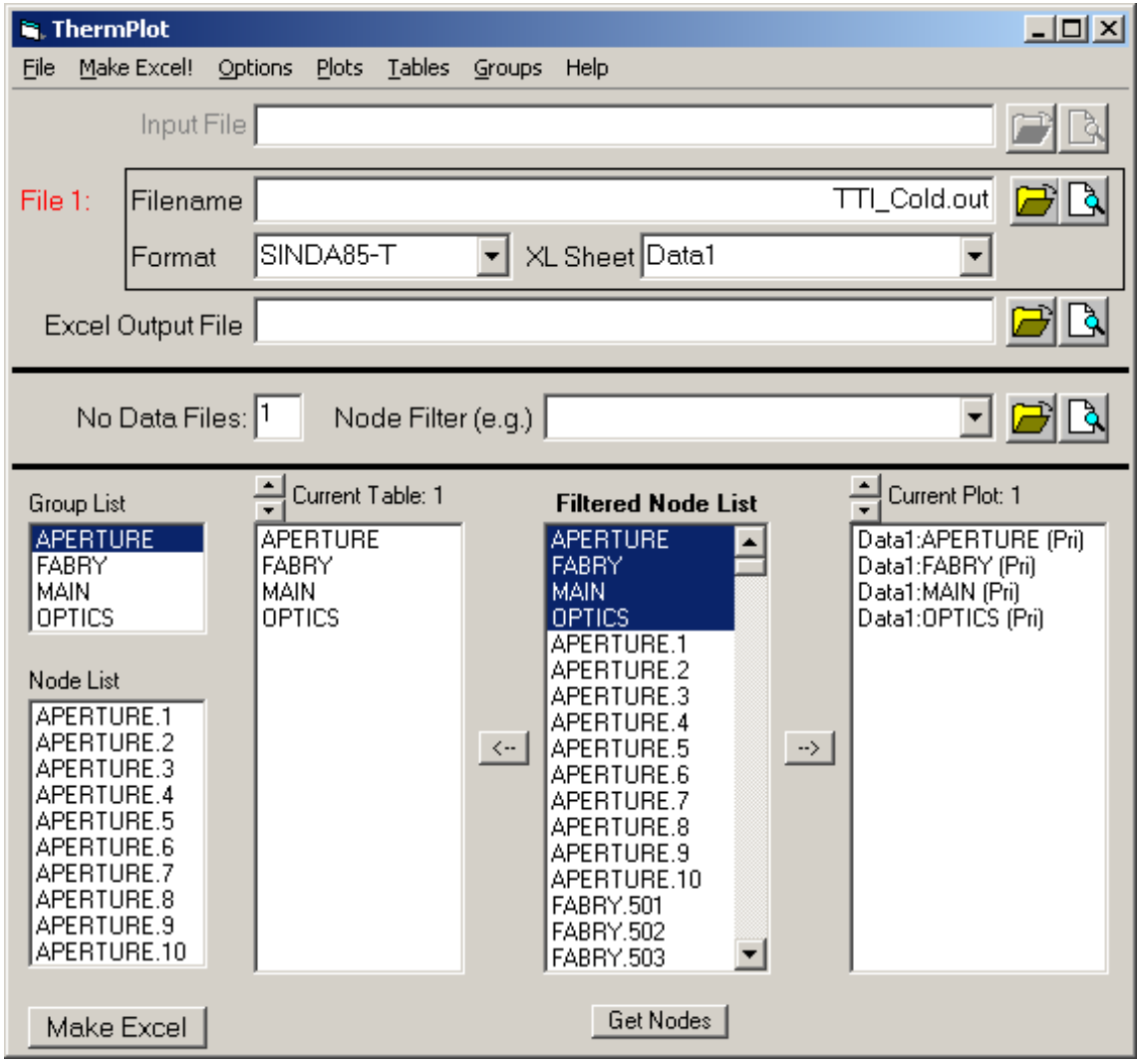


- *Backloads present a method for representing complex thermal environment for a surface/node as a simple heat load*
- *Requires Radk and Temperature Output*
- *May include env fluxes*
  - *Recommend separate IR & UV*
- *Numerous formats supported*
- *Output SS, TR or both*
- *Define conduction interfaces*
- *Include or exclude effects of other nodes in BL range (self view)*
- *Component file for validation*

Note: application of backload usage presented at 2004 TFAWS as "Use of the Interface-Backload Method for Solving LISA and other Large, Divided Thermal Problems"

ThermPlot

general post-processing program for thermal output

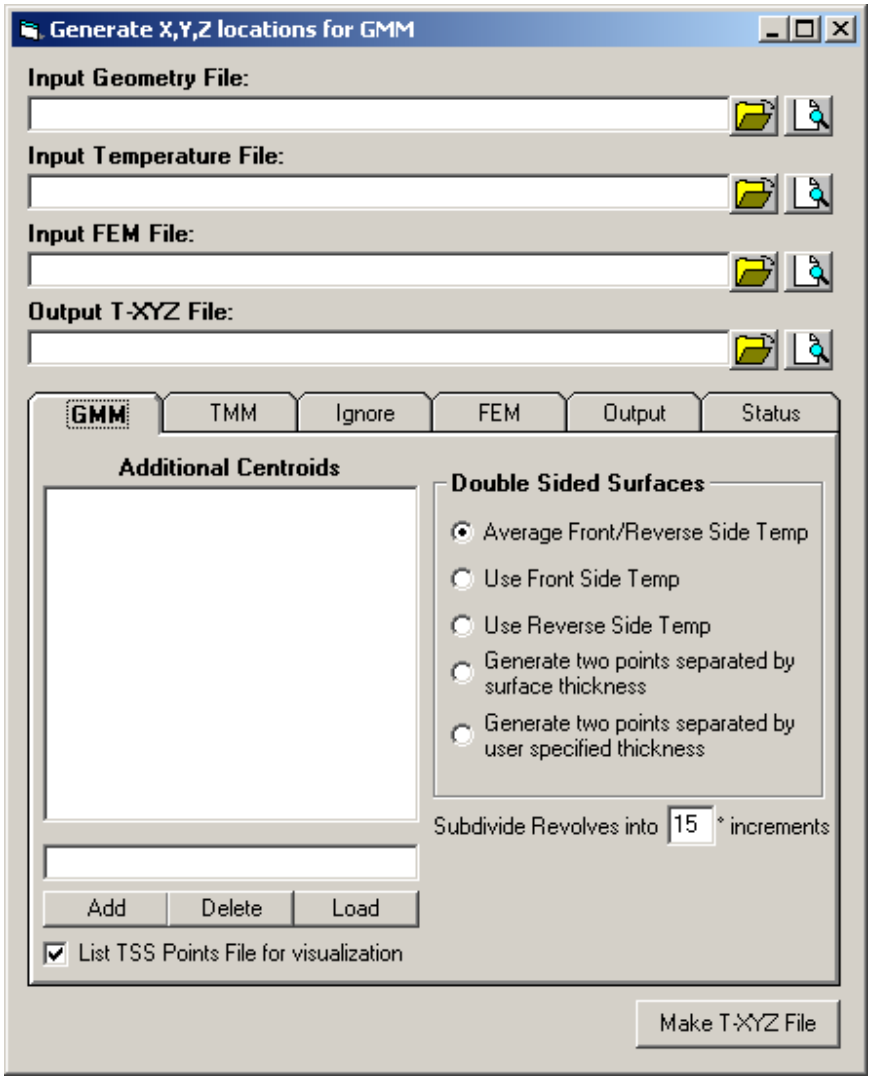


- *Generalized Post Processing Program*
  - *Data*
  - *Tables*
  - *Plots*
  - *Groups*
  - *HeatMaps*
- *Documentation Included*
- *No further updates planned*

Note: presented at 2001 TFAWS as "Use of ThermPlot Software for Quick Evaluation of Thermal Model Results"

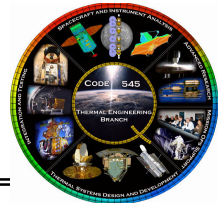
Generate_TXYZ

find closest FEM node to geometry centroid and maps temperature for STOP analyses



- *Finds closest FEM node to TMM node for STOP mapping*
- *GMM*
  - *Revolves subdivided into segments to locate "centroid" near to surface*
  - *Options for double sided surfaces*
  - *Additional (non-geometric) centroids may be added*
- *TMM*
  - *Timestep selection*
  - *Dereference GMM node to TMM node (MLI mapping)*
- *FEM*
  - *Units and Coordinate System offsets*
  - *TMM node to FEM node override*
- *Output*
  - *Sorting*
  - *Multiple associations (>1 GMM nodes map to 1 FEM node)*

Summary



- The described tools have not been developed to commercial levels
  - *But they do expand the capabilities of existing tools*
- Some of the features may be outdated, or have been reproduced or improved with later releases of various thermal codes
  - *However, some of the capabilities remain unique (particularly the model conversion capabilities)*
- The utilities are available to interested parties, but the source code remains under GSFC control