

JEFF-3.3T~~4~~3 Processed Covariances: Uncertainty Propagation Analysis and Comparison

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OECD/NEA

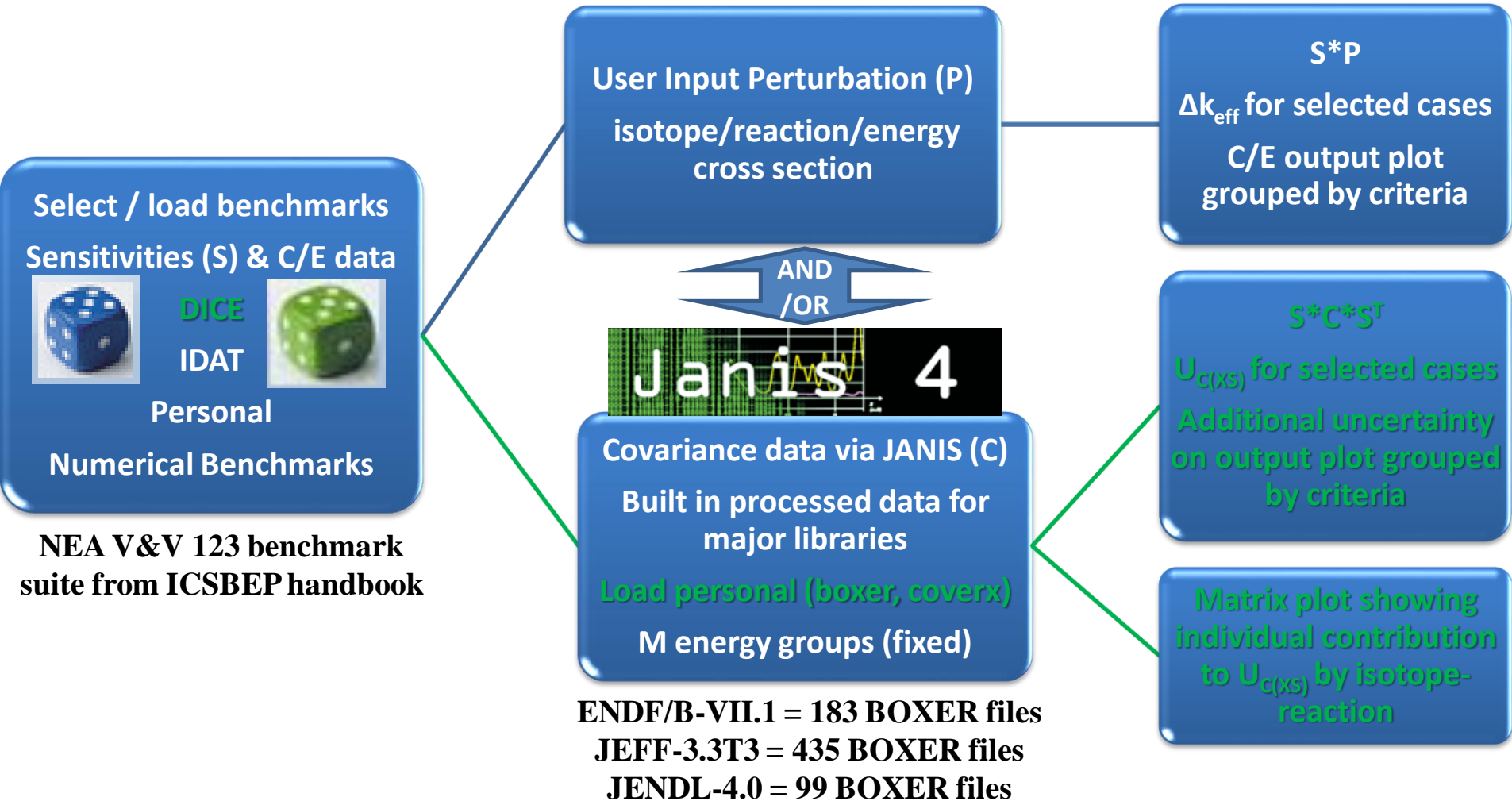
**JEFF Covariance Meeting
~~27 April 2016~~ 26 April 2017**

Procedure Overview

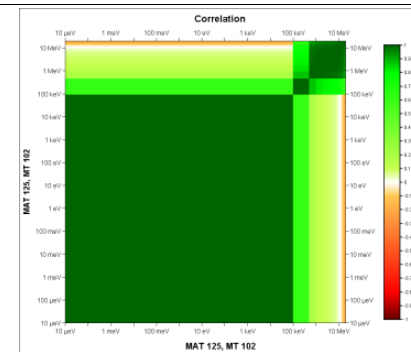
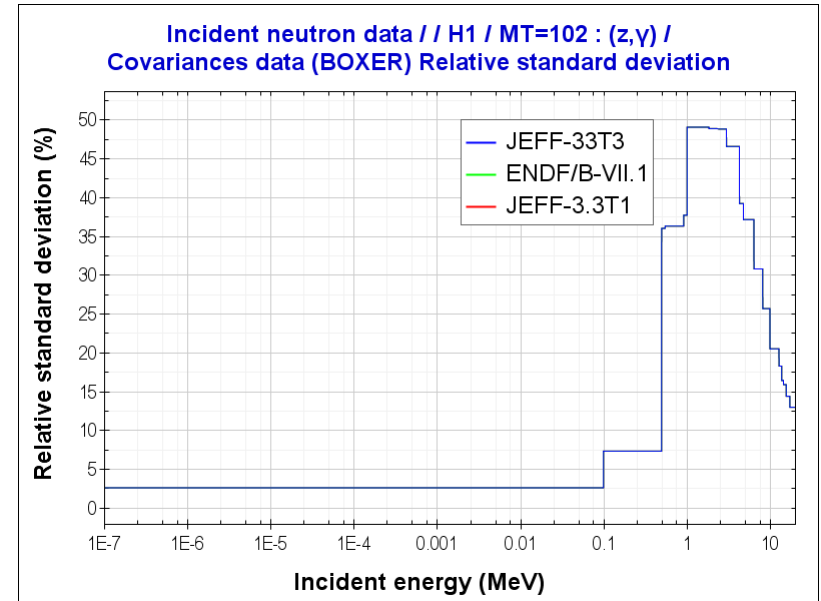
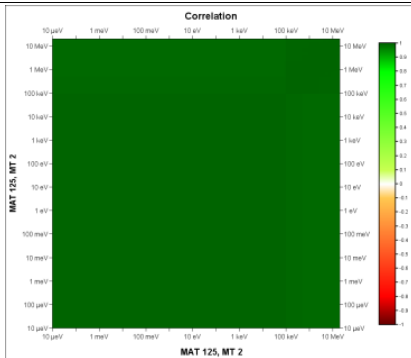
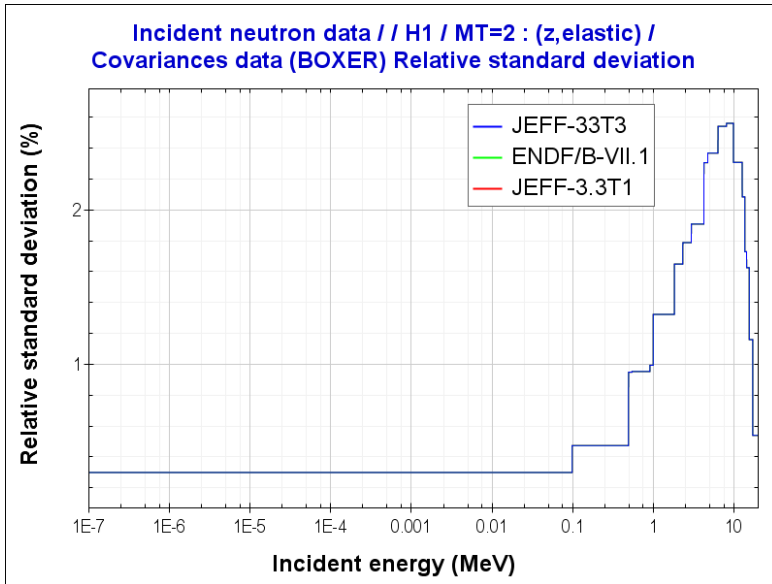
- Tests of ^1H , ^{16}O , ^{233}U , ^{235}U , ^{238}U , ^{239}Pu & ^{241}Pu
- Used the MCNP V&V suite of 123 cases
 - Missing sensitivities for ~10 cases
 - For some, we have multiple models and sensitivities
 - MT101 sensitivity in lieu of MT102 in some cases (limitation to fix!)
 - Therefore 146 calculations performed per library
- JEFF-3.3T1, JEFF-3.3T3, ENDF/B-VII.1 and JENDL-4.0
 - njoy processed BOXER format files (MF32 and 33 only)
 - SCALE 238 group structure (constant flux weight)
- Comparison of nuclear data uncertainty propagated from covariance files using standard linear ‘sandwich’ equation
- NDaST tool public version <http://www.oecd-nea.org/ndast/>

Nuclear Data Sensitivity Tool (NDaST)

Flowchart

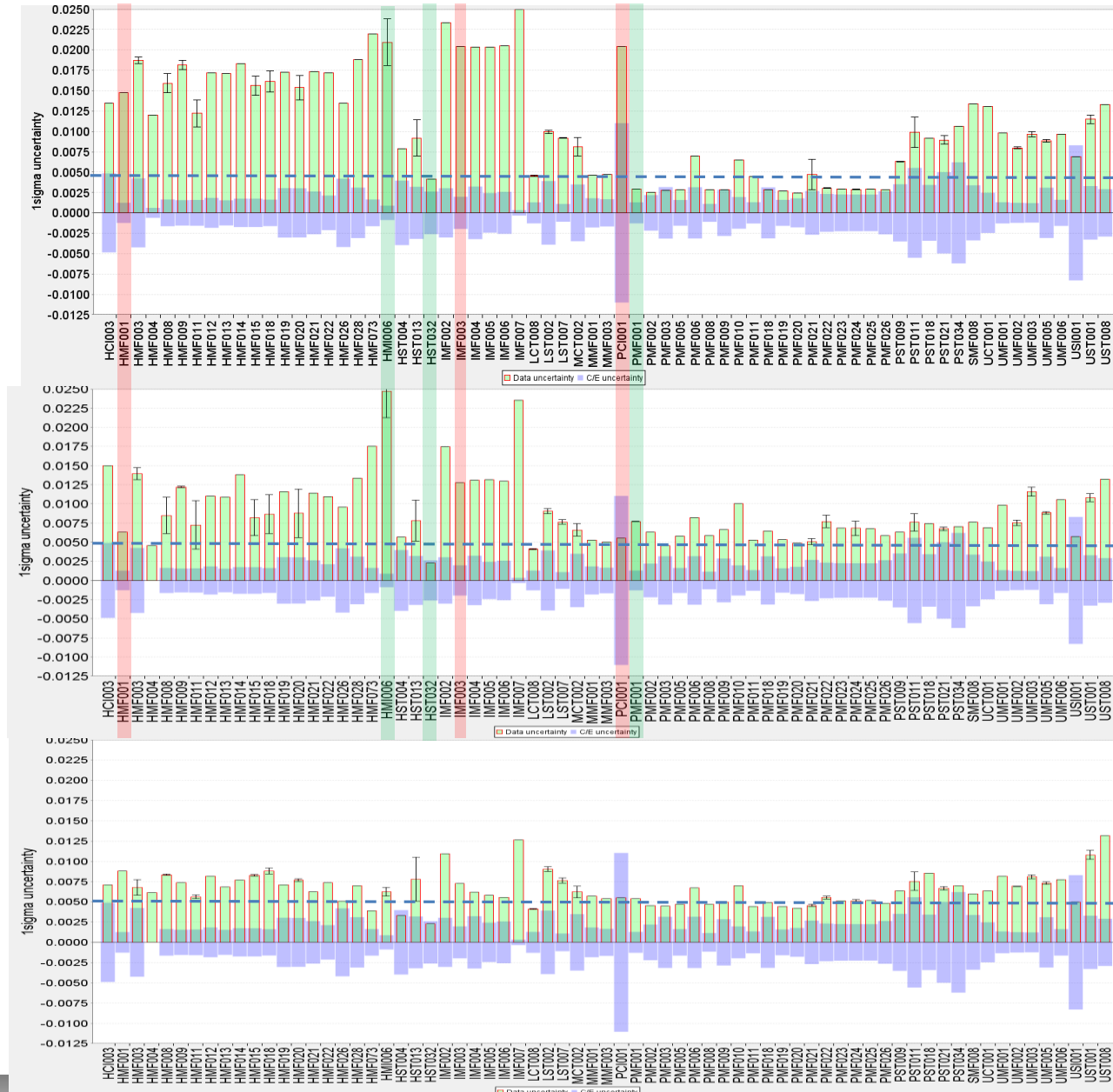


Hydrogen-1 Comparison



- Identical file, therefore the effect on the total uncertainty for moderated cases can be isolated to the fissile nuclides

All Results by Evaluation ID

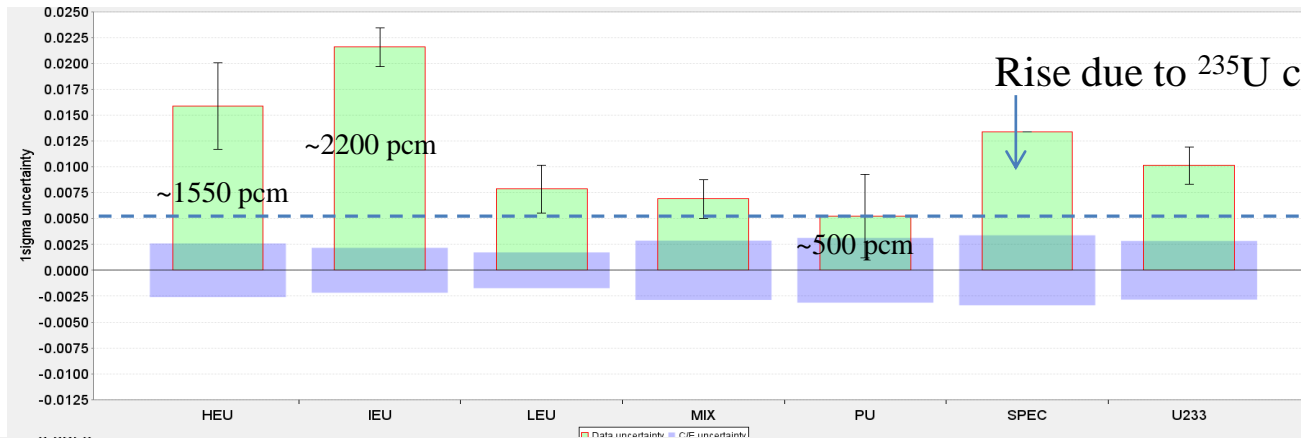


JEFF-3.3T3
Mean = 1100 pcm

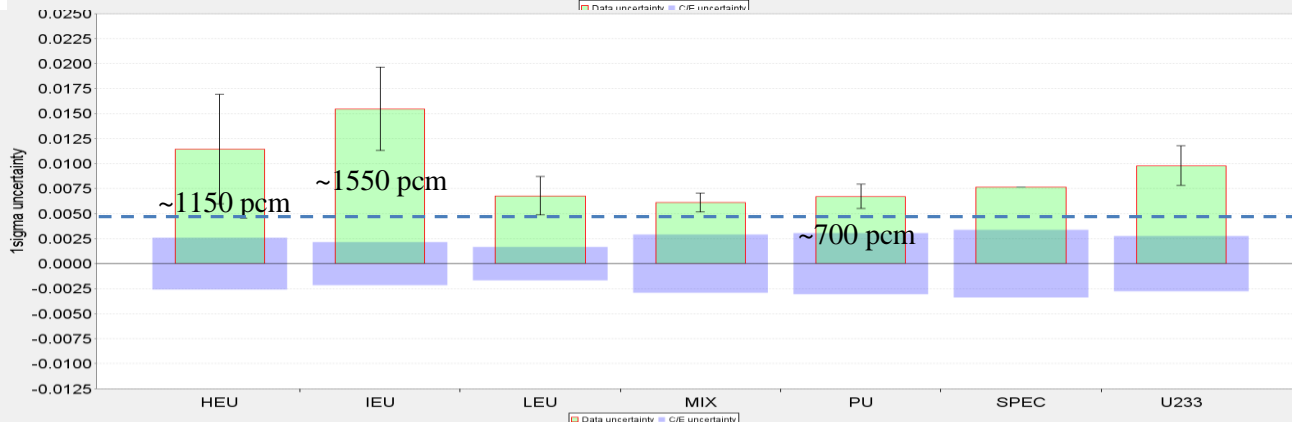
JEFF-3.3T1
Mean = 1043 pcm

ENDF/B-VII.1
Mean = 922 pcm

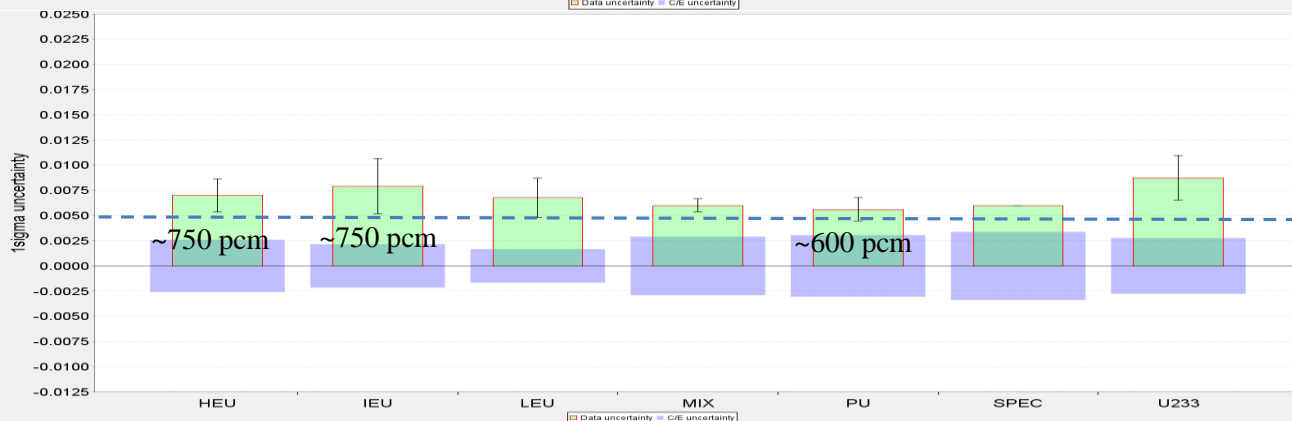
JENDL-4.0
Mean = 668 pcm



JEFF-3.3T3

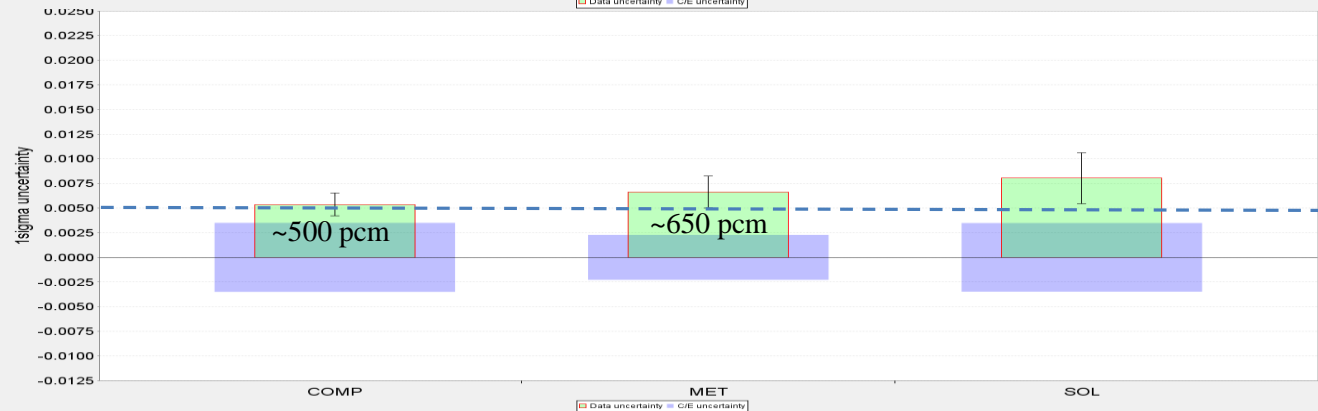
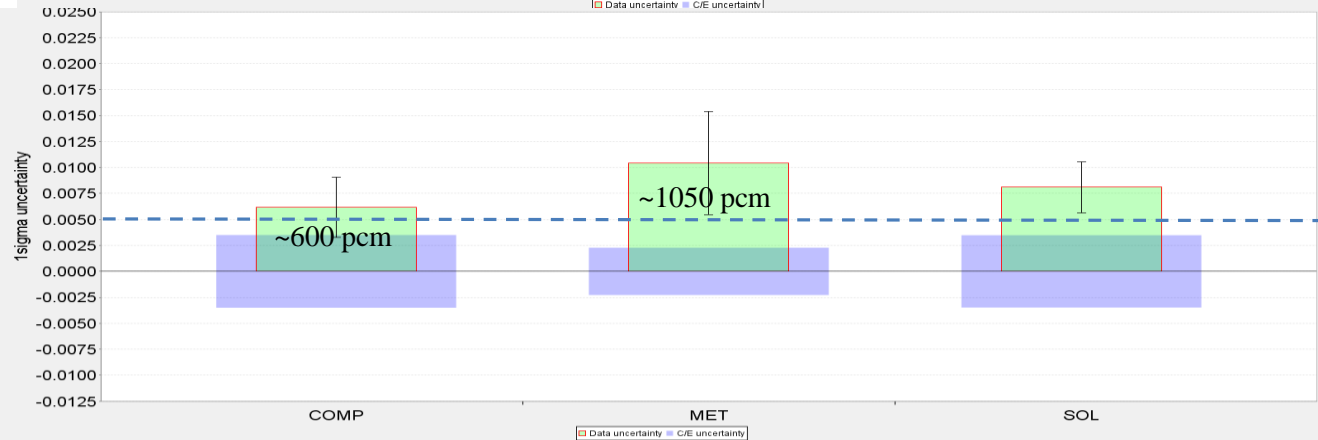
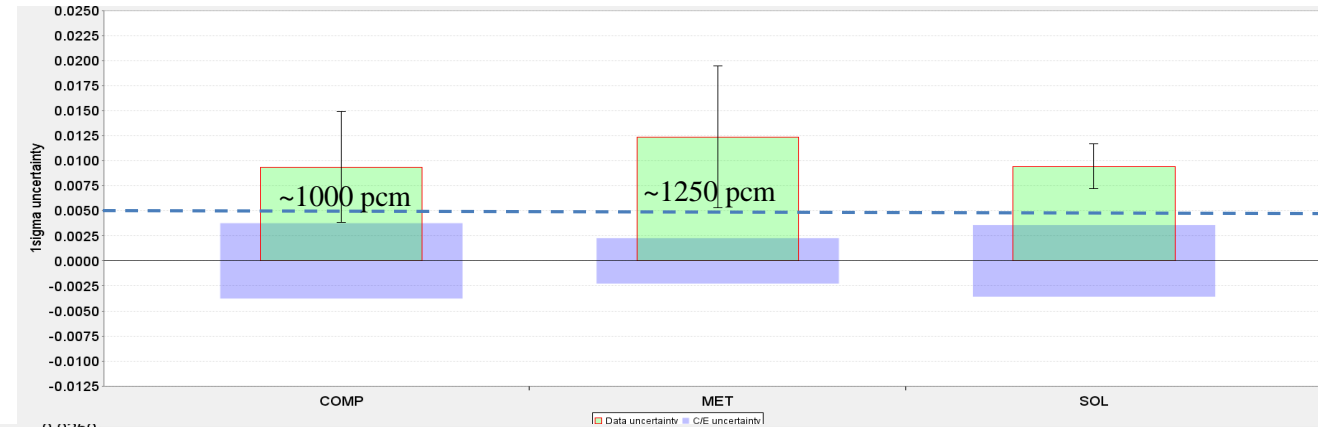


ENDF/B-VII.1

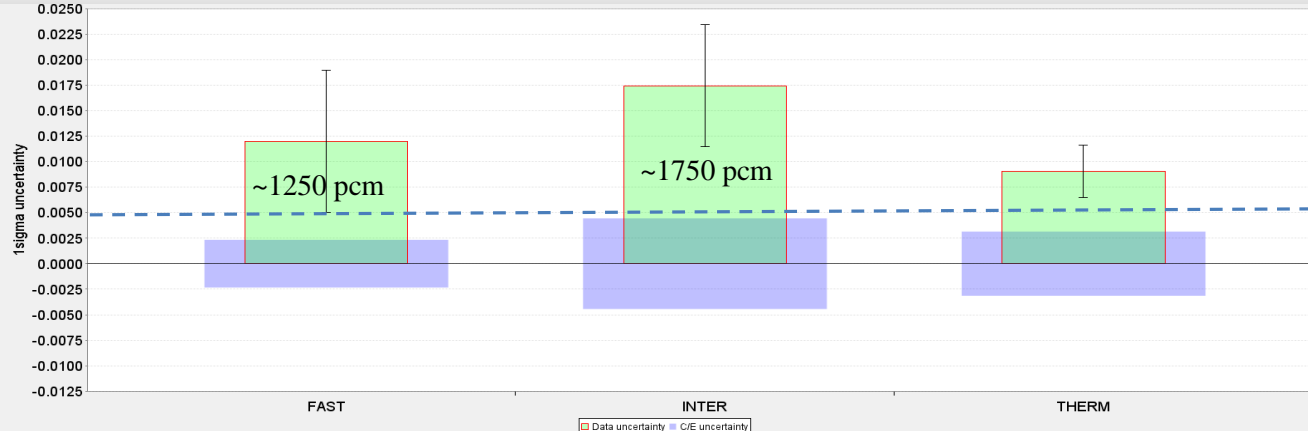


JENDL-4.0

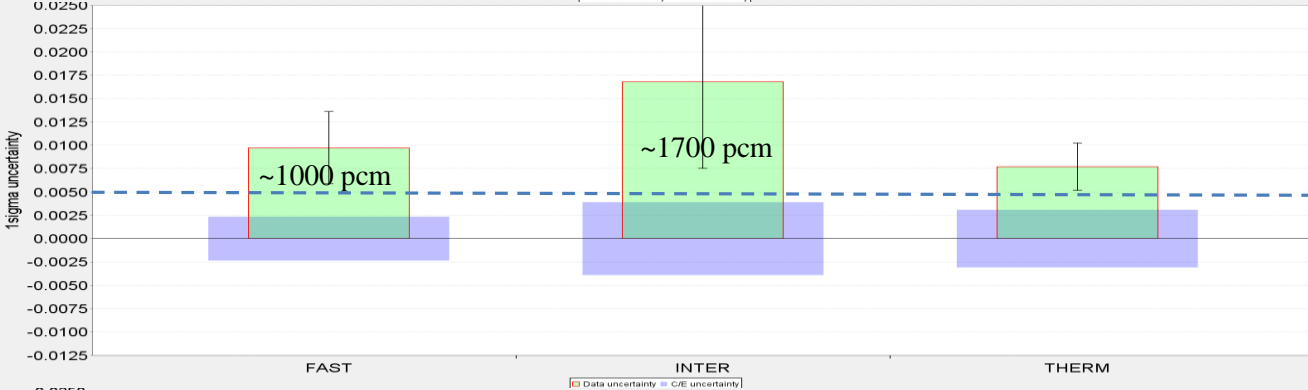
Group Average by Form



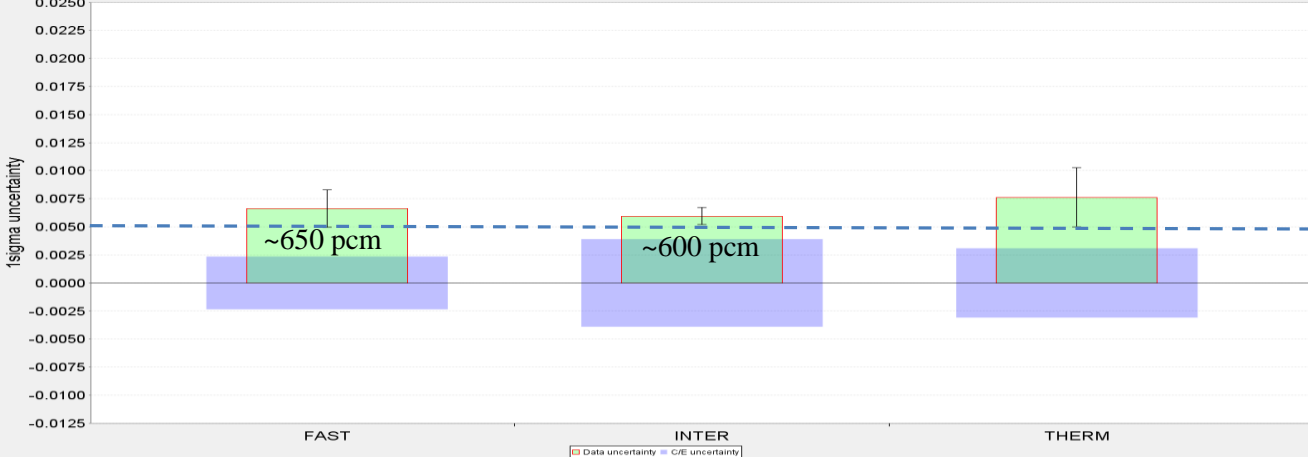
Group Average by Spectra



JEFF-3.3T3



ENDF/B-VII.1



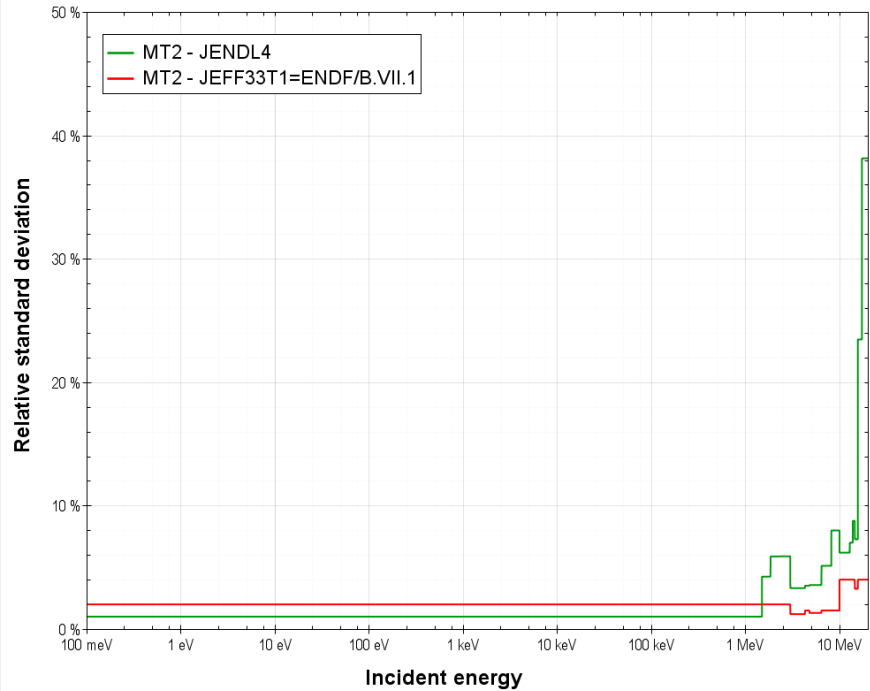
JENDL-4.0

Selected Example Benchmarks

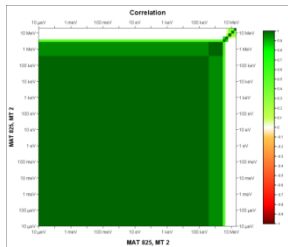
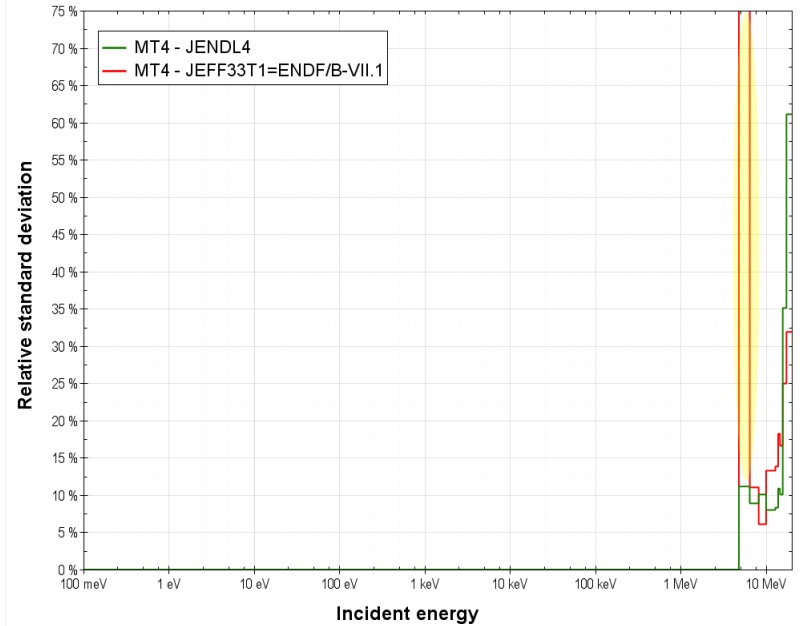
Case label	Sensitivity Code	1 σ JEFF-3.3 T3	1 σ JEFF-3.3 T1	Diff J33T3 – J33T1 (pcm)	1 σ ENDF/B-VII.1	1 σ JENDL-4.0	Ratio J33T1 / E7.1
PCI001-001	KENO ENDF/B-VII.0 / 238-Group	0.020410	0.020364	+5	0.005471	0.006559	3.72
HMF001-001 (Godiva)	KENO ABBN-93 / 299-Group	0.014788	0.014788	0	0.006302	0.008816	2.34
IMF003-001 (Detailed Model)	KENO ENDF/B-VII.0 / 238-Group	0.020409	0.020409	0	0.012785	0.007286	1.59
PST011-006	KENO ENDF/B-VII.0 / 238-Group	0.011741	0.009639	+481	0.009423	0.009537	1.02
UMF001-001	KENO ENDF/B-VII.0 / 238-Group	0.009813	0.009813	0	0.009813	0.008172	1.00
LCT008-001	KENO ENDF/B-VII.0 / 238-Group	0.004455	0.002937	+151	0.003879	0.004038	0.76
HST032-001	KENO ABBN-93 / 299-Group	0.004103	0.001186	+292	0.002306	0.002300	0.51
HMI006-001	KENO ENDF/B-VII.0 Continuous	0.017284	0.015995	+129	0.019962	0.006437	0.80
PMF001-001 (Detailed Model)	KENO ENDF/B-VII.0 / 238-Group	0.002943	0.003036	-9	0.007796	0.005421	0.38

Oxygen-16 Comparison

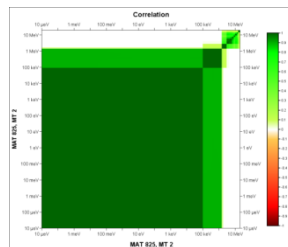
Incident neutron data // MAT0825 / MT=2 : (z,elastic) /
Covariances data (BOXER) Relative standard deviation



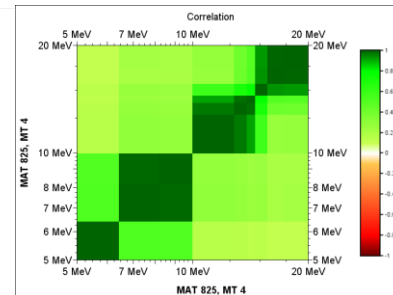
Incident neutron data // MAT0825 / MT=4 : (z,n') /
Covariances data (BOXER) Relative standard deviation



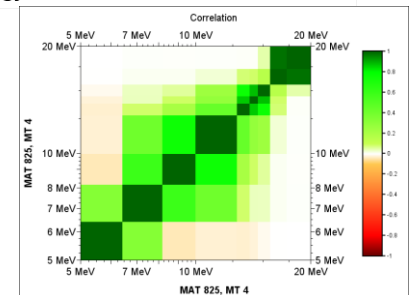
ENDF/B-VII.1



JENDL-4.0



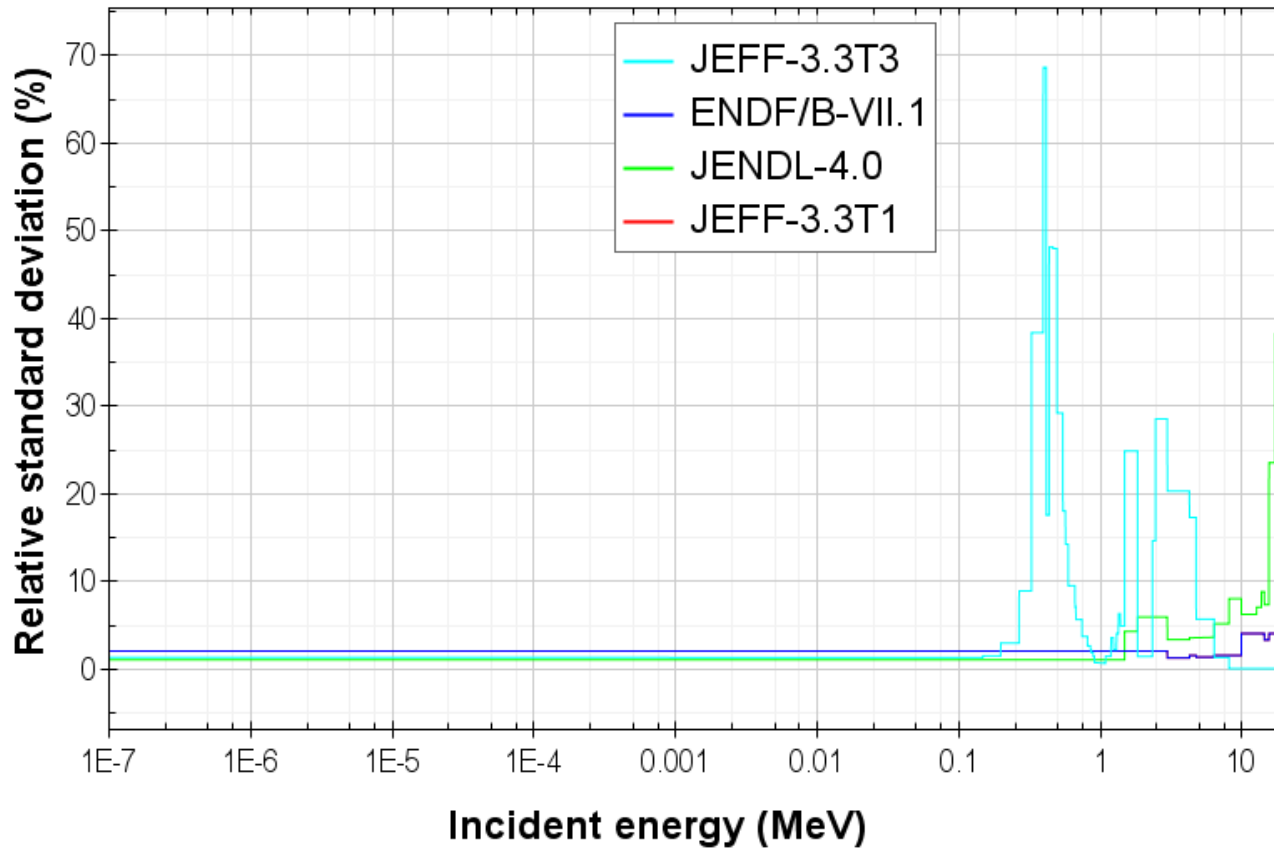
ENDF/B-VII.1
= JEFF-3.3T1



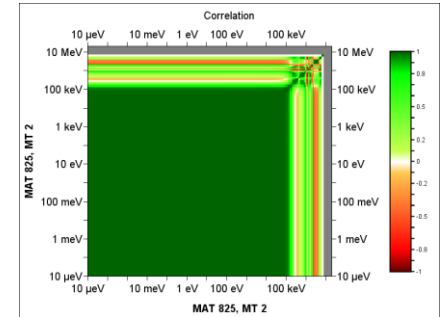
JENDL-4.0

Oxygen-16 Comparison

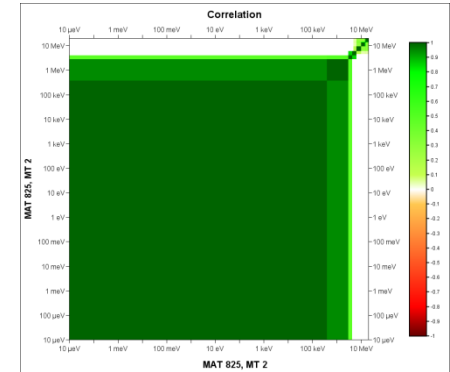
Incident neutron data // O16 / MT=2 : (z,elastic) /
Covariances data (BOXER) Relative standard deviation



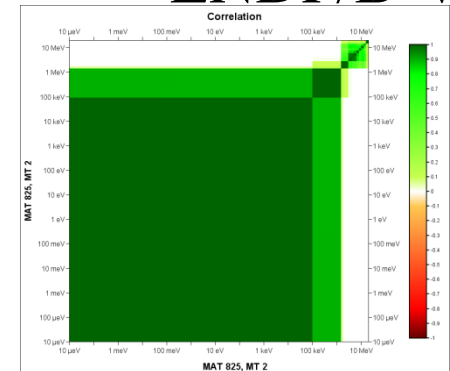
No BOXER file processed for MT4



JEFF-3.3T3



ENDF/B-VII.1

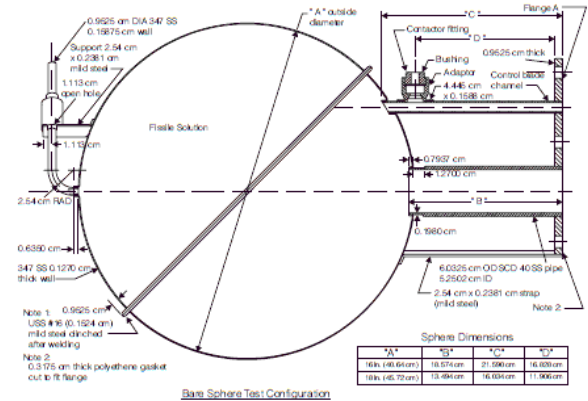


JENDL-4.0

PST011-006

JEFF-3.3T3	O16 2	O16 4
O16 2	4.75E-05	
O16 4		

Total
4.75E-05
(0.006894)



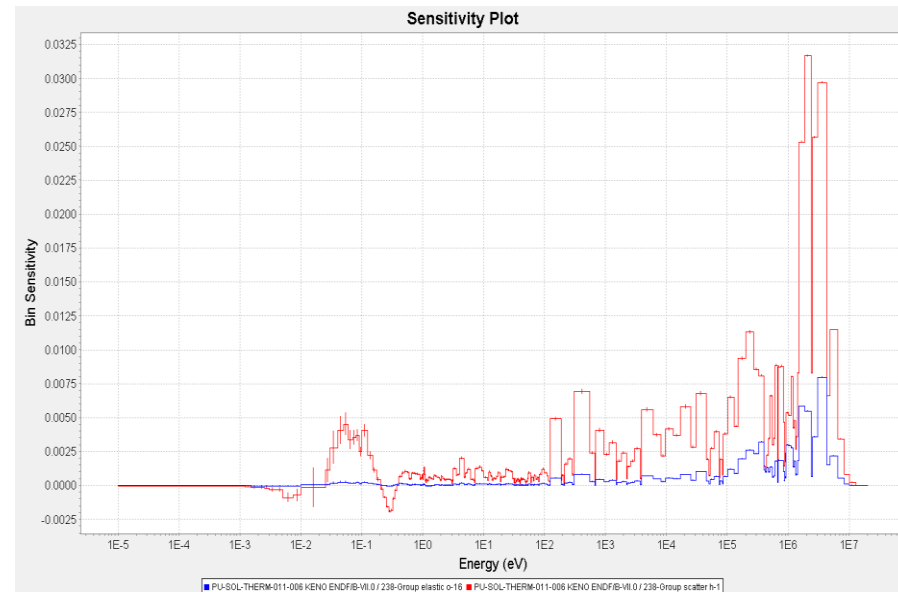
JEFF-3.3T1 =ENDF/B-VII.1	O16 2	O16 4
O16 2	1.07E-06	-8.09E-10
O16 4	-8.09E-10	1.25E-08

Total
1.08E-06
(0.001038)

For epithermal sensitive systems, this may add significant uncertainty

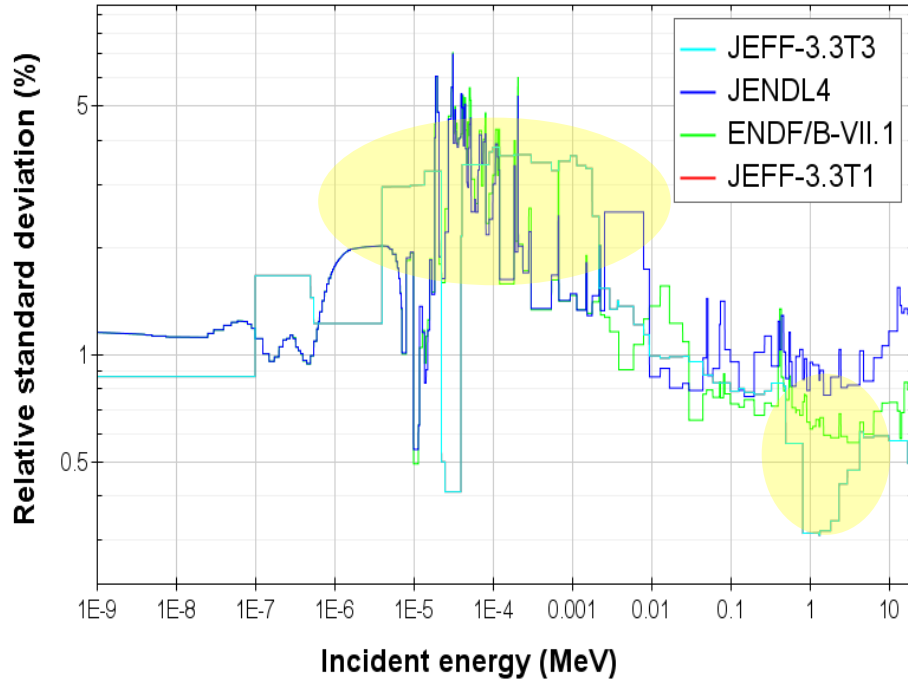
JENDL-4.0	O16 2	O16 4
O16 2	1.80E-06	-1.01E-09
O16 4	-1.01E-09	4.80E-09

Total
1.80E-06
(0.001342)

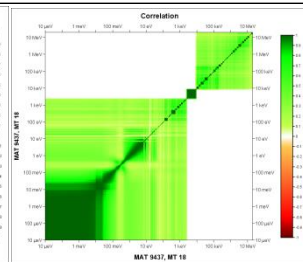
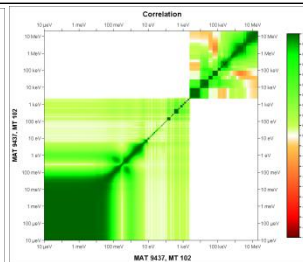
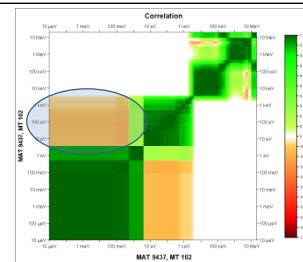
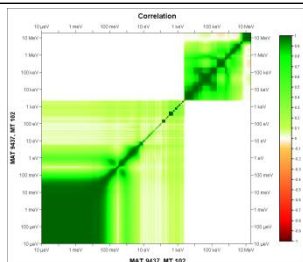
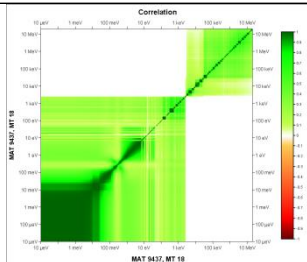
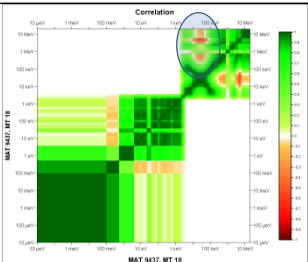
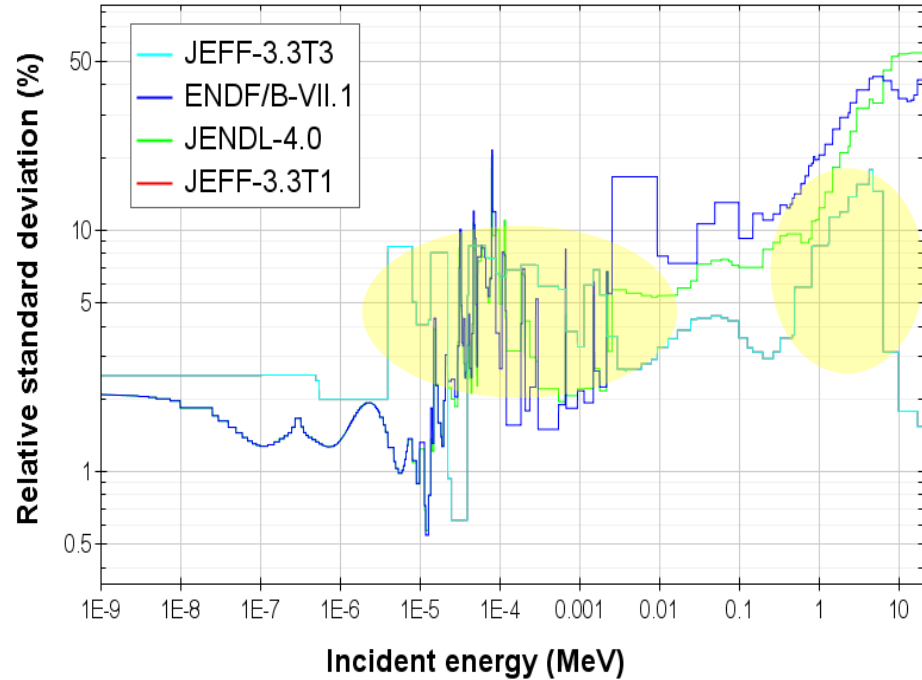


Plutonium 239 Comparison

Incident neutron data // Pu239 / MT=18 : (z,fission) /
Covariances data (BOXER) Relative standard deviation



Incident neutron data // Pu239 / MT=102 : (z,g) /
Covariances data (BOXER) Relative standard deviation



JEFF-3.3T1/T3

ENDF/B-VII.1

JENDL-4.0

JEFF-3.3T1/T3

ENDF/B-VII.1

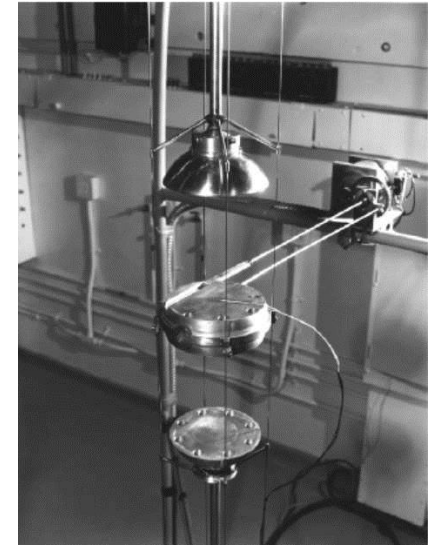
JENDL-4.0

JEFF-3.3T1	Pu239 2	Pu239 4	Pu239 16	Pu239 18	Pu239 102
Pu239 2	8.06E-07	1.31E-06	8.33E-10	-1.55E-06	-2.53E-07
Pu239 4	1.31E-06	2.26E-06	1.95E-09	-2.77E-06	-3.25E-07
Pu239 16	8.33E-10	1.95E-09	1.41E-09	-1.14E-08	1.86E-11
Pu239 18	-1.55E-06	-2.77E-06	-1.14E-08	9.29E-06	3.75E-07
Pu239 102	-2.53E-07	-3.25E-07	1.86E-11	3.75E-07	9.03E-08

JEFF-3.3T3	Pu239 2	Pu239 4	Pu239 16	Pu239 18	Pu239 102
Pu239 2	8.06E-07	1.33E-06	3.10E-08	-1.81E-06	-2.59E-07
Pu239 4	1.33E-06	2.26E-06	5.45E-08	-3.27E-06	-4.17E-07
Pu239 16	3.10E-08	5.45E-08	1.41E-09	-8.28E-08	-9.17E-09
Pu239 18	-1.81E-06	-3.27E-06	-8.28E-08	9.29E-06	6.55E-07
Pu239 102	-2.59E-07	-4.17E-07	-9.17E-09	6.55E-07	9.03E-08

ENDF/B-VII.1	Pu239 2	Pu239 4	Pu239 16	Pu239 18	Pu239 102
Pu239 2	1.92E-05	-3.31E-05	-5.04E-10	-3.21E-07	6.23E-08
Pu239 4	-3.31E-05	6.35E-05			
Pu239 16	-5.04E-10		8.60E-09		
Pu239 18	-3.21E-07			1.09E-05	-3.06E-14
Pu239 102	6.23E-08			-3.06E-14	5.42E-07

PMF1 – Jezebel



Total
6.00E-06
(0.002445)

Additional cross-correlations are significant

Fast region uncertainties lowered

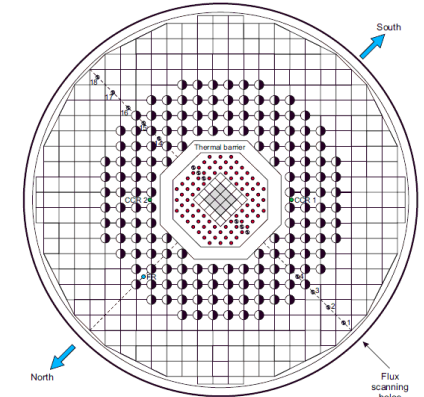
Total
2.74E-05
(0.005233)

JEFF-3.3T1	Pu239 2	Pu239 4	Pu239 16	Pu239 18	Pu239 102
Pu239 2	1.34E-08	-2.51E-09	-1.72E-12	-2.90E-07	3.41E-07
Pu239 4	-2.51E-09	6.30E-10	2.55E-12	2.85E-08	-9.38E-10
Pu239 16	-1.72E-12	2.55E-12	1.19E-13	3.36E-12	3.33E-14
Pu239 18	-2.90E-07	2.85E-08	3.36E-12	2.87E-04	5.80E-07
Pu239 102	3.41E-07	-9.38E-10	3.33E-14	5.80E-07	1.27E-04

JEFF-3.3T3	Pu239 2	Pu239 4	Pu239 16	Pu239 18	Pu239 102
Pu239 2	1.34E-08	-1.37E-09	-1.73E-11	-6.35E-07	9.42E-07
Pu239 4	-1.37E-09	6.30E-10	8.36E-12	9.01E-09	1.16E-08
Pu239 16	-1.73E-11	8.36E-12	1.19E-13	1.78E-10	1.79E-10
Pu239 18	-6.35E-07	9.01E-09	1.78E-10	2.87E-04	1.41E-06
Pu239 102	9.42E-07	1.16E-08	1.79E-10	1.41E-06	1.27E-04

ENDF/B-VII.1	Pu239 2	Pu239 4	Pu239 16	Pu239 18	Pu239 102
Pu239 2	1.25E-07	2.82E-08	-2.52E-13	-8.75E-08	-1.59E-07
Pu239 4	2.82E-08	1.97E-08			
Pu239 16	-2.52E-13		7.17E-13		
Pu239 18	-8.75E-08			2.49E-05	-2.04E-06
Pu239 102	-1.59E-07			-2.04E-06	7.04E-06

PCI1



Symbol	Hole	Size
●	Driver region fuel elements	7.6-cm dia. x 15.24-cm pitch
●	Buffer region fuel elements	3.33-cm dia. x 7.6-cm pitch
⊕	Flux scanning holes (1-18 West to East)	4.13-cm dia.
⊖	Coarse control rods (CCR 2 N.E. Face, CCR 1 S.W. Face)	4.13-cm dia.
⊙	Fine control rod	4.13-cm dia.

Figure 1. HECTOR Reactor Core Plan (P1 Core).

Total
4.15E-04
(0.020377)

Intermediate region uncertainties not increased but comparatively large

Total
2.76E-05
(0.005250)

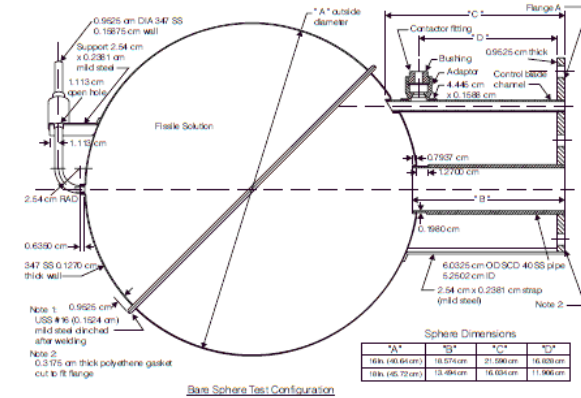
JEFF-3.3T1	Pu239 2	Pu239 4	Pu239 16	Pu239 18	Pu239 102
Pu239 2	9.15E-12	8.71E-12	9.04E-15	-2.65E-09	4.45E-09
Pu239 4	8.71E-12	3.43E-11	1.22E-13	-4.20E-11	-8.04E-12
Pu239 16	9.04E-15	1.22E-13	7.45E-14	-2.76E-13	2.59E-16
Pu239 18	-2.65E-09	-4.20E-11	-2.76E-13	2.55E-05	-1.38E-05
Pu239 102	4.45E-09	-8.04E-12	2.59E-16	-1.38E-05	2.67E-05

JEFF-3.3T3	Pu239 2	Pu239 4	Pu239 16	Pu239 18	Pu239 102
Pu239 2	9.15E-12	1.01E-11	4.39E-13	-1.48E-10	5.22E-10
Pu239 4	1.01E-11	3.43E-11	1.54E-12	-4.09E-11	-3.16E-11
Pu239 16	4.39E-13	1.54E-12	7.45E-14	-2.19E-12	-1.61E-12
Pu239 18	-1.48E-10	-4.09E-11	-2.19E-12	2.55E-05	-1.36E-05
Pu239 102	5.22E-10	-3.16E-11	-1.61E-12	-1.36E-05	2.67E-05

ENDF/B-VII.1	Pu239 2	Pu239 4	Pu239 16	Pu239 18	Pu239 102
Pu239 2	3.90E-11	-1.54E-10	-4.70E-15	3.95E-10	-1.52E-10
Pu239 4	-1.54E-10	9.00E-10			
Pu239 16	-4.70E-15		4.36E-13		
Pu239 18	3.95E-10			2.11E-05	5.51E-06
Pu239 102	-1.52E-10			5.51E-06	7.63E-06

PST011-006

Total
2.47E-05
(0.004971)

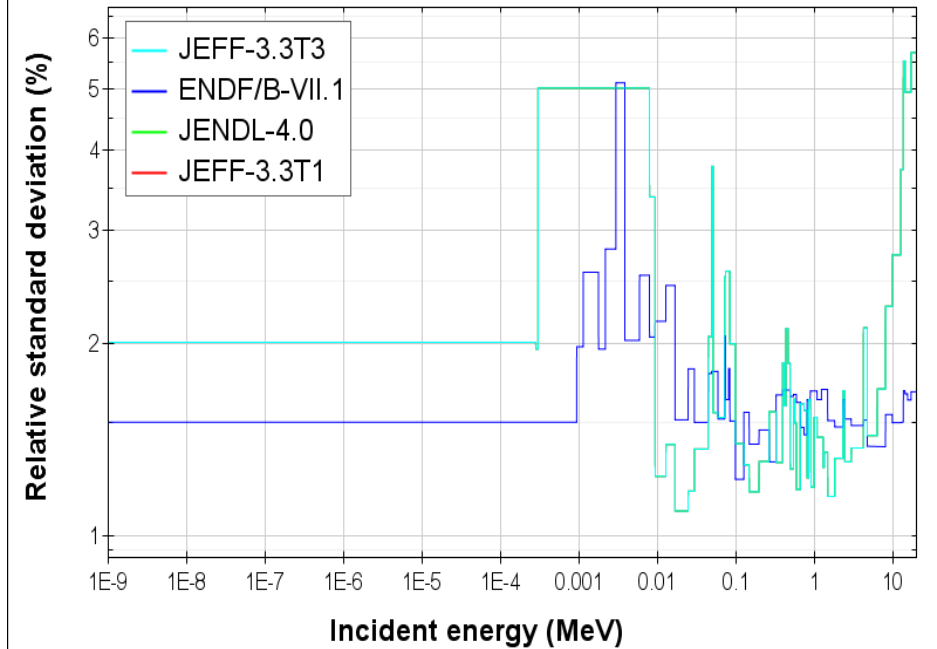


Thermal region uncertainties
more or less consistent

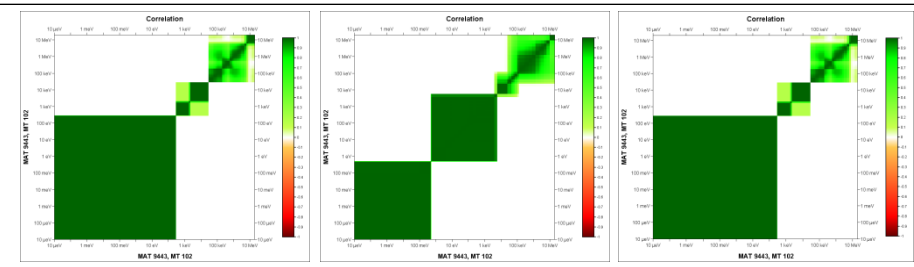
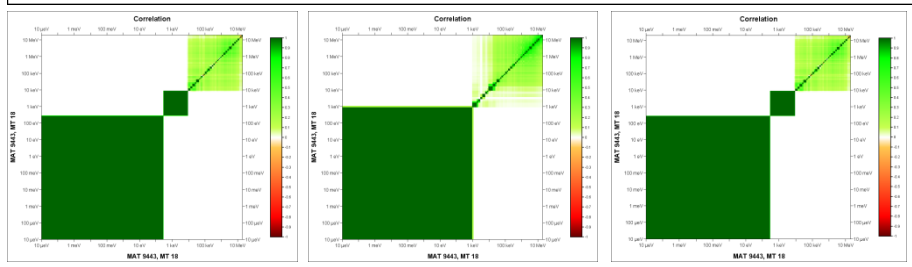
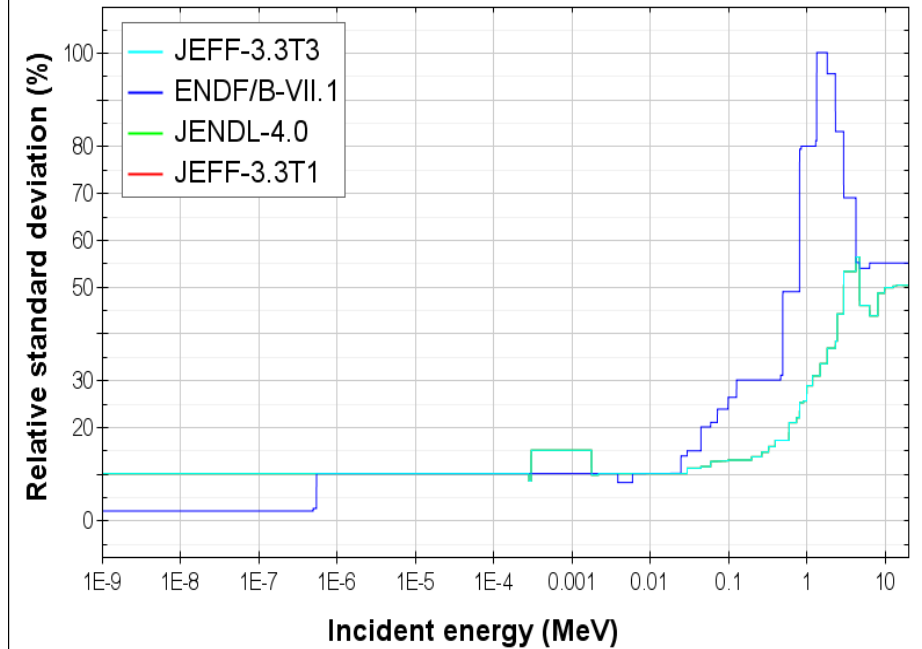
Total
3.98E-05
(0.006309)

Plutonium-241 Comparison

Incident neutron data // Pu241 / MT=18 : (z,fission) /
Covariances data (BOXER) Relative standard deviation



Incident neutron data // Pu241 / MT=102 : (z,y) /
Covariances data (BOXER) Relative standard deviation



JEFF-3.3T1/T3 ENDF/B-VII.1 JENDL-4.0

JEFF-3.3T1/T3 ENDF/B-VII.1 JENDL-4.0

JEFF-3.3T1	Pu241 2	Pu241 4	Pu241 16	Pu241 18	Pu241 102
Pu241 2	3.93E-09				
Pu241 4		3.72E-10			
Pu241 16			5.26E-14		
Pu241 18				8.18E-09	
Pu241 102					1.83E-09

JEFF-3.3T3	Pu241 2	Pu241 4	Pu241 16	Pu241 18	Pu241 102
Pu241 2	3.93E-09				
Pu241 4		3.72E-10			
Pu241 16			5.26E-14		
Pu241 18				8.18E-09	
Pu241 102					1.83E-09

ENDF/B-VII.1	Pu241 2	Pu241 4	Pu241 16	Pu241 18	Pu241 102
Pu241 2	9.03E-10				
Pu241 4		3.31E-09			
Pu241 16			3.27E-14		
Pu241 18				4.33E-09	
Pu241 102					2.68E-09

PCI1

Total
1.43E-08
(0.00012)

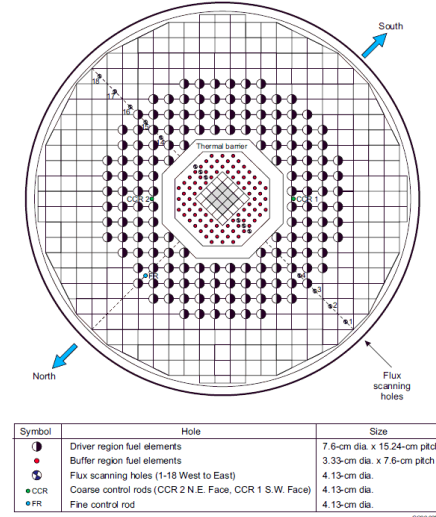


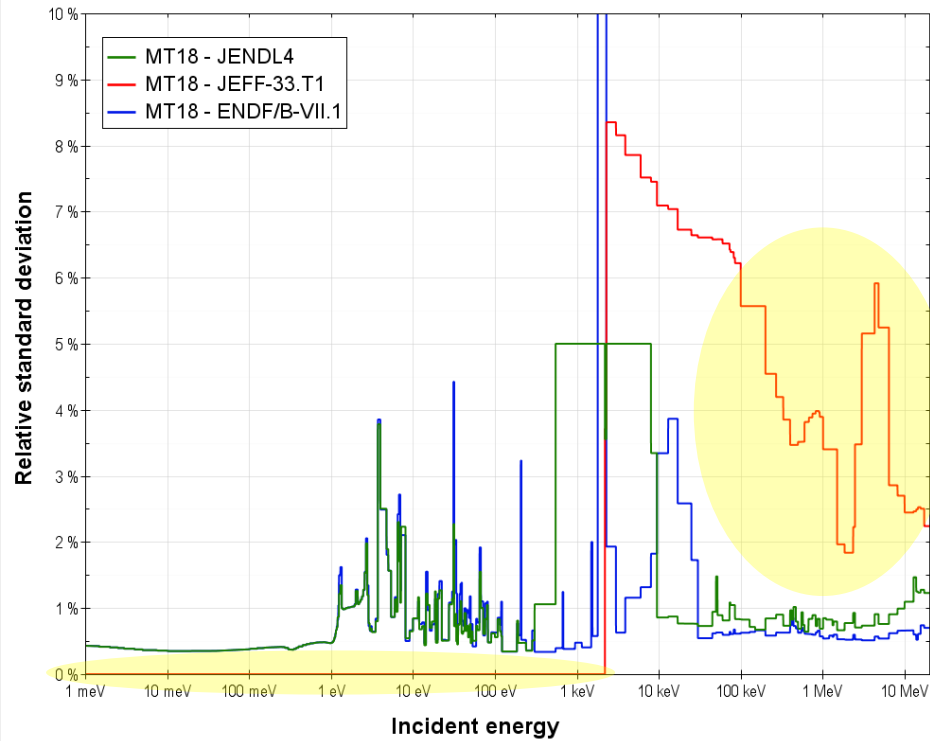
Figure 1. HECTOR Reactor Core Plan (P1 Core).

JEFF-3.3 values are identical to
JENDL-4.0
Although very low, uncertainties
more or less consistent

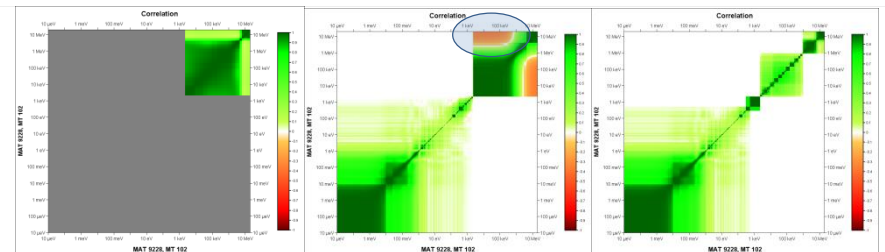
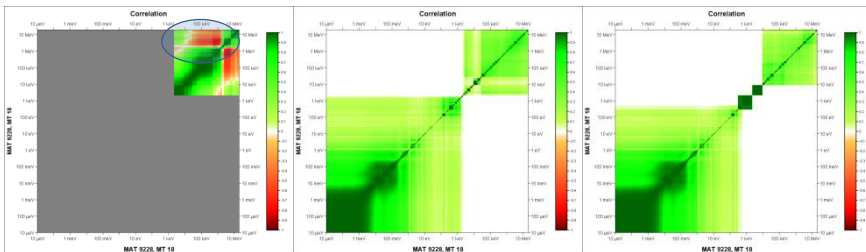
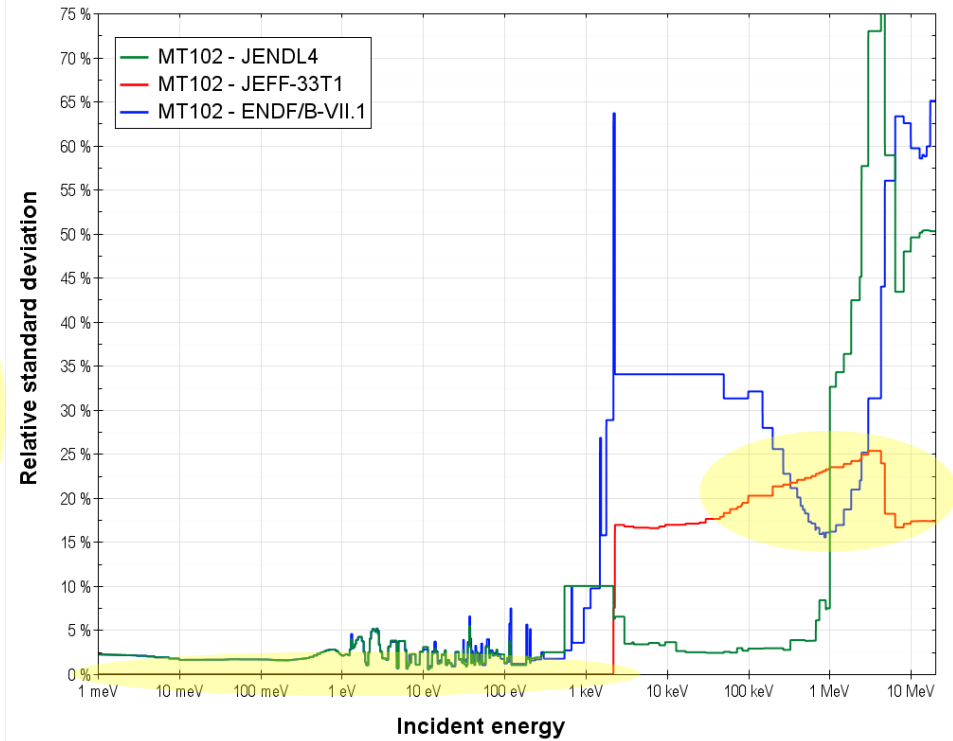
Total
1.12E-08
(0.00011)

Uranium-235 Comparison – T1 file

Incident neutron data // MAT9228 / MT=18 : (z,fission)
/ Covariances data (BOXER) Relative standard deviation



Incident neutron data // MAT9228 / MT=102 : (z,y) /
Covariances data (BOXER) Relative standard deviation

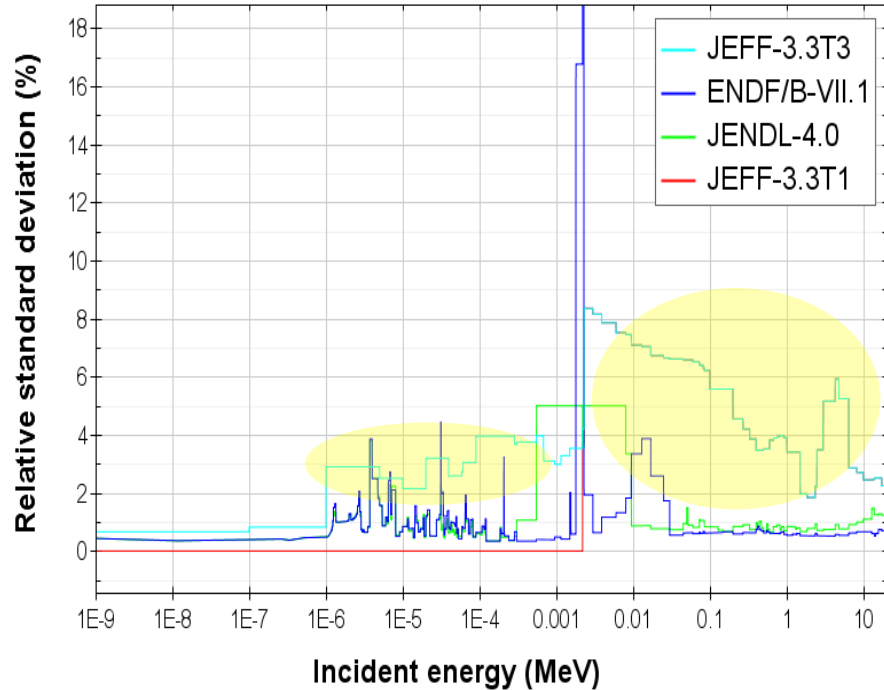


JEFF-3.3T1 ENDF/B-VII.1 JENDL-4.0

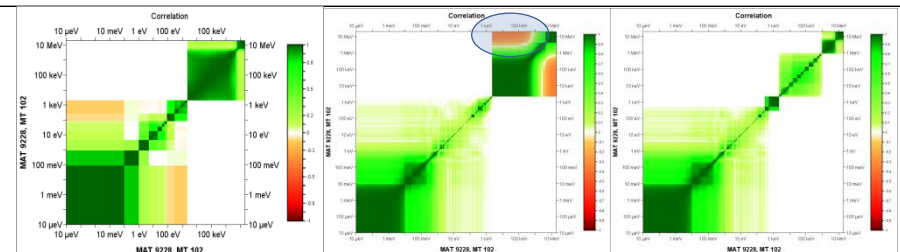
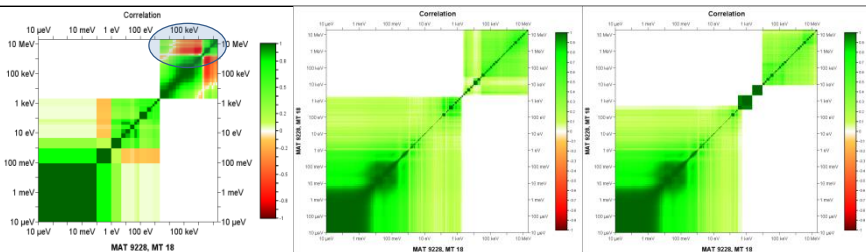
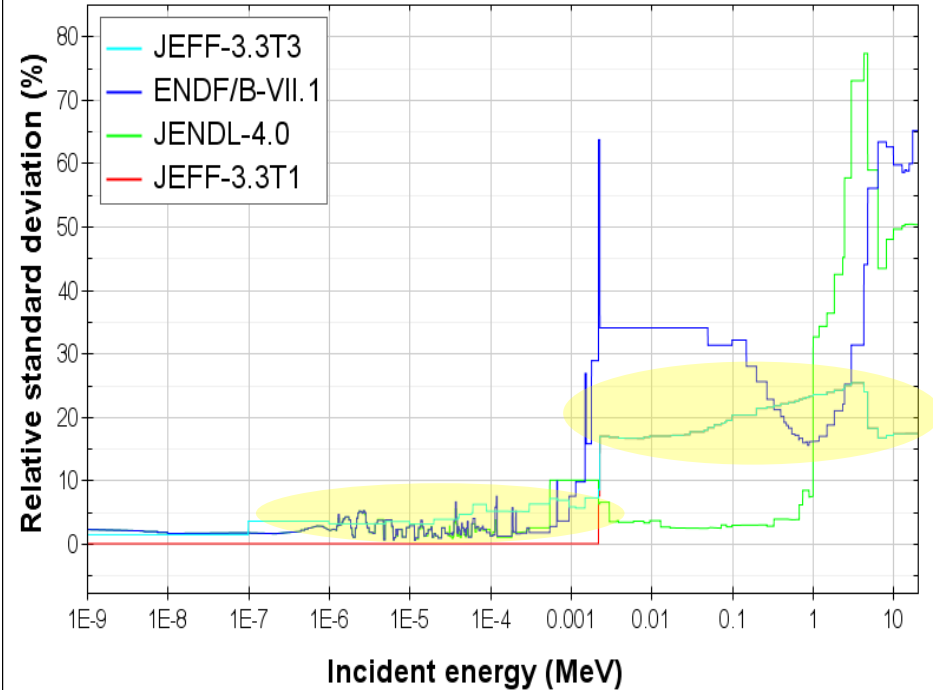
JEFF-3.3T1 ENDF/B-VII.1 JENDL-4.0

Uranium-235 Comparison – new T3 file

Incident neutron data // U235 / MT=18 : (z,fission) /
Covariances data (BOXER) Relative standard deviation



Incident neutron data // U235 / MT=102 : (z,y) /
Covariances data (BOXER) Relative standard deviation



JEFF-3.3T3 ENDF/B-VII.1 JENDL-4.0

JEFF-3.3T3 ENDF/B-VII.1 JENDL-4.0

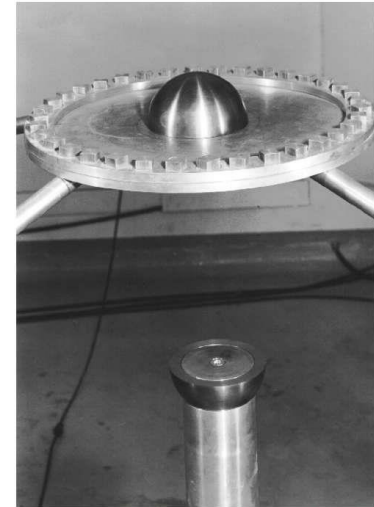
JEFF-3.3T1	U235 2	U235 4	U235 16	U235 18	U235 102
U235 2	1.18E-06				
U235 4		4.97E-05			
U235 16			0		
U235 18				1.68E-04	
U235 102					0

JEFF-3.3T3	U235 2	U235 4	U235 16	U235 18	U235 102
U235 2	1.18E-06				
U235 4		4.97E-05			
U235 16			0		
U235 18				1.68E-04	
U235 102					0

ENDF/B-VII.1	U235 2	U235 4	U235 16	U235 18	U235 102
U235 2	8.41E-06	-1.47E-05	0	-2.66E-07	0
U235 4	-1.47E-05	3.89E-05			
U235 16	0		0		
U235 18	-2.66E-07			7.03E-06	0
U235 102	0			0	0

HMF001 - Godiva

Total
2.18E-04
(0.014780)



Fast fission uncertainties are higher
and some correlations are lacking

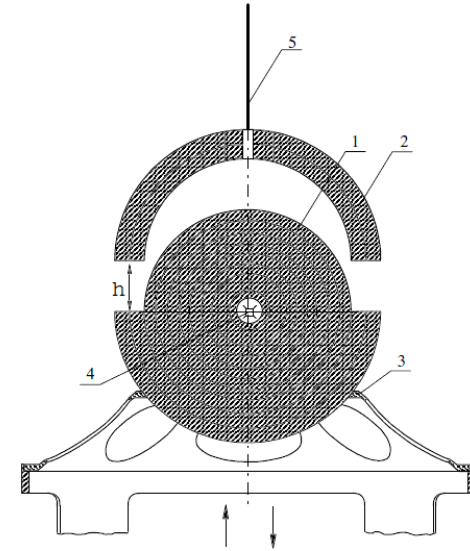
Total
2.44E-05
(0.004935)

JEFF-3.3T1	U235 2	U235 4	U235 16	U235 18	U235 102
U235 2	2.92E-07				
U235 4		9.69E-06			
U235 16			1.51E-09		
U235 18				2.73E-04	
U235 102					9.33E-05

JEFF-3.3T3	U235 2	U235 4	U235 16	U235 18	U235 102
U235 2	2.92E-07				
U235 4		9.69E-06			
U235 16			1.51E-09		
U235 18				2.73E-04	
U235 102					9.33E-05

ENDF/B-VII.1	U235 2	U235 4	U235 16	U235 18	U235 102
U235 2	2.30E-06	-2.96E-06	-8.18E-11	-1.17E-07	4.76E-06
U235 4	-2.96E-06	6.85E-06			
U235 16	-8.18E-11		2.71E-09		
U235 18	-1.17E-07			5.19E-06	1.23E-09
U235 102	4.76E-06			1.23E-09	1.31E-04

IMF003



Total
3.77E-04
(0.019404)

In contrast, fast region uncertainties for (n,gamma) are marginally lower

Total
2.44E-05
(0.012206)

JEFF-3.3T1	U235 2	U235 4	U235 16	U235 18	U235 102
U235 2	9.63E-08				
U235 4		1.44E-06			
U235 16			5.61E-10		
U235 18				2.26E-04	
U235 102					2.36E-04

JEFF-3.3T3	U235 2	U235 4	U235 16	U235 18	U235 102
U235 2	3.02E-08				
U235 4		5.34E-07			
U235 16			3.06E-10		
U235 18				1.48E-04	
U235 102					1.50E-04

ENDF/B-VII.1	U235 2	U235 4	U235 16	U235 18	U235 102
U235 2	2.93E-08	2.34E-08	-3.23E-12	-2.48E-08	2.57E-06
U235 4	2.34E-08	4.54E-07			
U235 16	-3.23E-12		1.98E-10		
U235 18	-2.48E-08			5.12E-06	1.53E-06
U235 102	2.57E-06			1.53E-06	3.89E-04

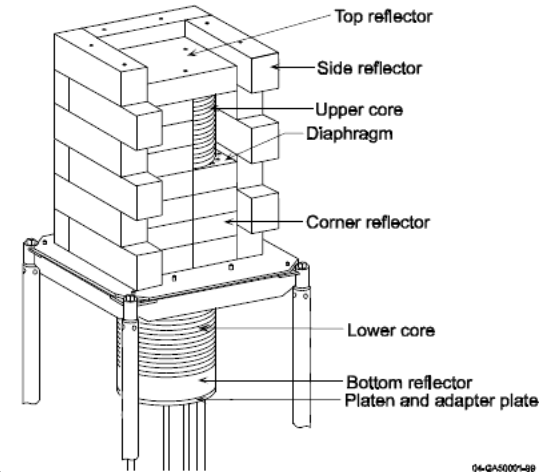
HMI006-001

Total
4.64E-04
(0.021536)

Total
2.98E-04
(0.017283)

Intermediate region uncertainties have increased a little with the T3 file, but give similar totals

Total
4.03E-04
(0.020064)



04-QAS0001-08

JEFF-3.3T1	U235 2	U235 4	U235 16	U235 18	U235 102
U235 2	1.01E-13				
U235 4		3.97E-12			
U235 16			0		
U235 18				1.47E-09	
U235 102					0

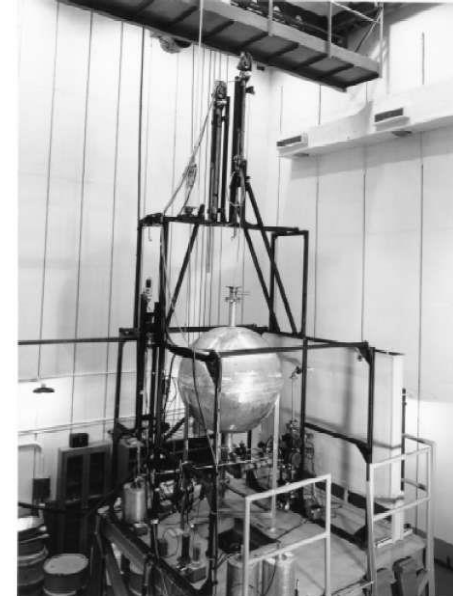
JEFF-3.3T3	U235 2	U235 4	U235 16	U235 18	U235 102
U235 2	2.97E-13				
U235 4		3.97E-12			
U235 16			0		
U235 18				1.33E-05	
U235 102					0

ENDF/B-VII.1	U235 2	U235 4	U235 16	U235 18	U235 102
U235 2	2.51E-13	-7.69E-13	0	-9.89E-11	0
U235 4	-7.69E-13	5.74E-12			
U235 16	0		0		
U235 18	-9.89E-11			3.92E-06	0
U235 102	0			0	0

HST032

Total
1.48E-09
(0.00004)

Total
1.33E-05
(0.003642)

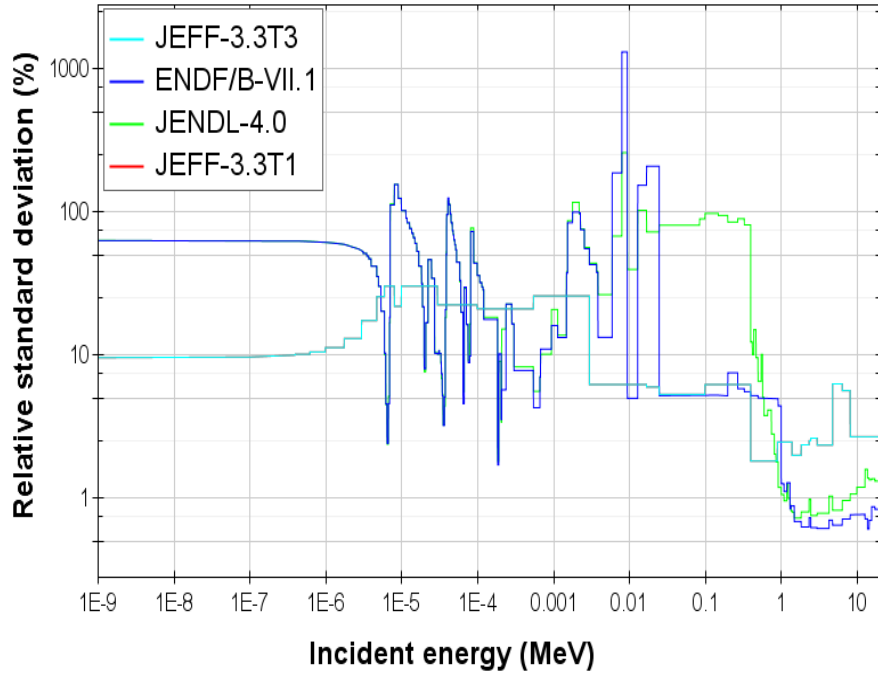


Outcome of missing thermal data is was about 200 pcm

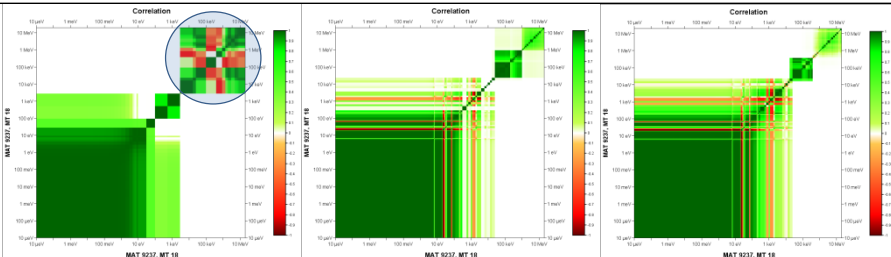
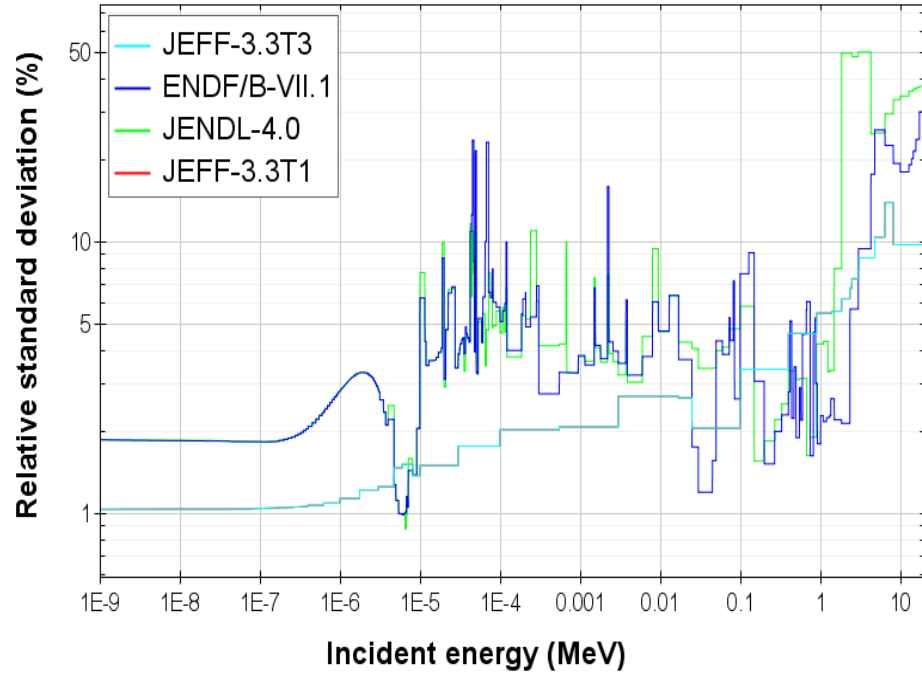
Total
3.92E-06
(0.001981)

Uranium 238 Comparison

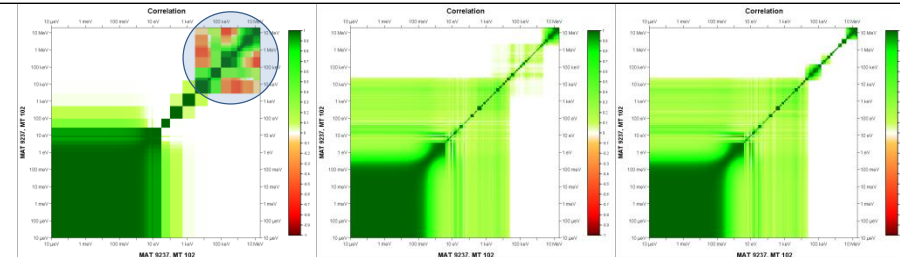
Incident neutron data // U238 / MT=18 : (z,fission) /
Covariances data (BOXER) Relative standard deviation



Incident neutron data // U238 / MT=102 : (z,gamma) /
Covariances data (BOXER) Relative standard deviation



JEFF-3.3T1/T3 ENDF/B-VII.1 JENDL-4.0



JEFF-3.3T1/T3 ENDF/B-VII.1 JENDL-4.0

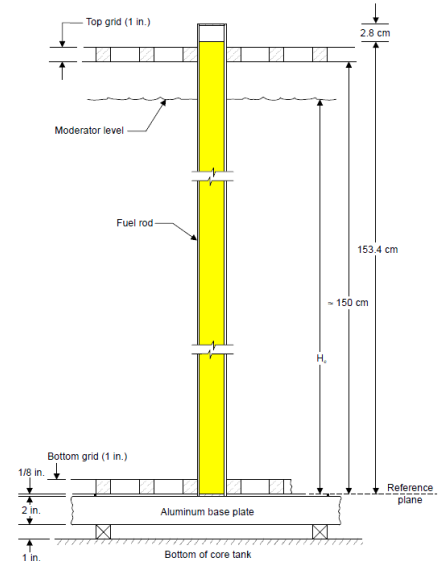
JEFF-3.3T1	U238 2	U238 4	U238 16	U238 18	U238 102
U238 2	1.04E-08	3.56E-09	4.62E-09	8.65E-08	2.45E-08
U238 4	3.56E-09	3.38E-09	5.06E-09	3.94E-08	-7.88E-09
U238 16	4.62E-09	5.06E-09	1.06E-08	5.30E-08	2.37E-09
U238 18	8.65E-08	3.94E-08	5.30E-08	1.54E-06	1.42E-07
U238 102	2.45E-08	-7.88E-09	2.37E-09	1.42E-07	2.89E-06

JEFF-3.3T3	U238 2	U238 4	U238 16	U238 18	U238 102
U238 2	1.04E-08	3.56E-09	4.62E-09	8.65E-08	2.45E-08
U238 4	3.56E-09	3.38E-09	5.06E-09	3.94E-08	-7.88E-09
U238 16	4.62E-09	5.06E-09	1.06E-08	5.30E-08	2.37E-09
U238 18	8.65E-08	3.94E-08	5.30E-08	1.54E-06	1.42E-07
U238 102	2.45E-08	-7.88E-09	2.37E-09	1.42E-07	2.89E-06

ENDF/B-VII.1	U238 2	U238 4	U238 16	U238 18	U238 102
U238 2	5.04E-08	-8.09E-10	-7.04E-11	-1.21E-10	8.98E-10
U238 4	-8.09E-10	1.18E-08			
U238 16	-7.04E-11		1.96E-08		
U238 18	-1.21E-10			5.36E-08	1.94E-10
U238 102	8.98E-10			1.94E-10	6.59E-06

LCT008-001

Total
5.16E-06
(0.00227)

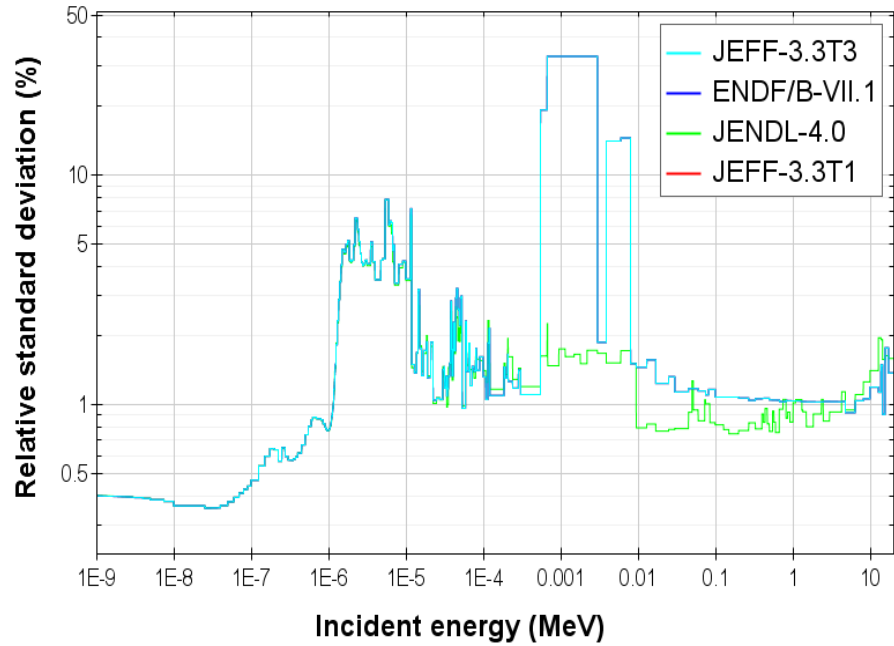


More detailed spread of important correlations, but values appear reasonable

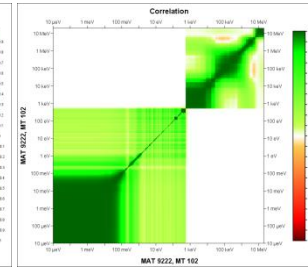
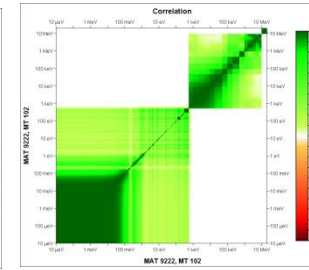
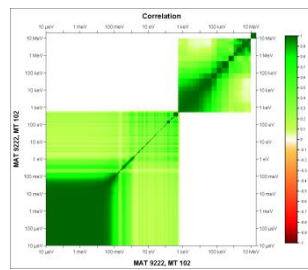
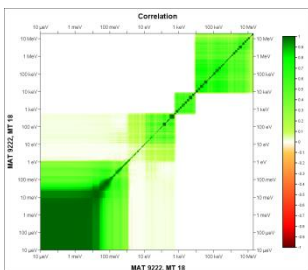
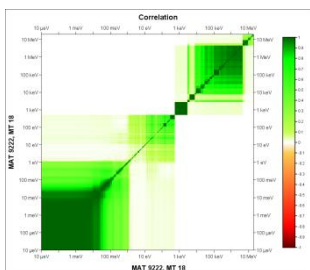
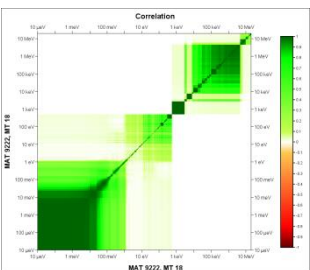
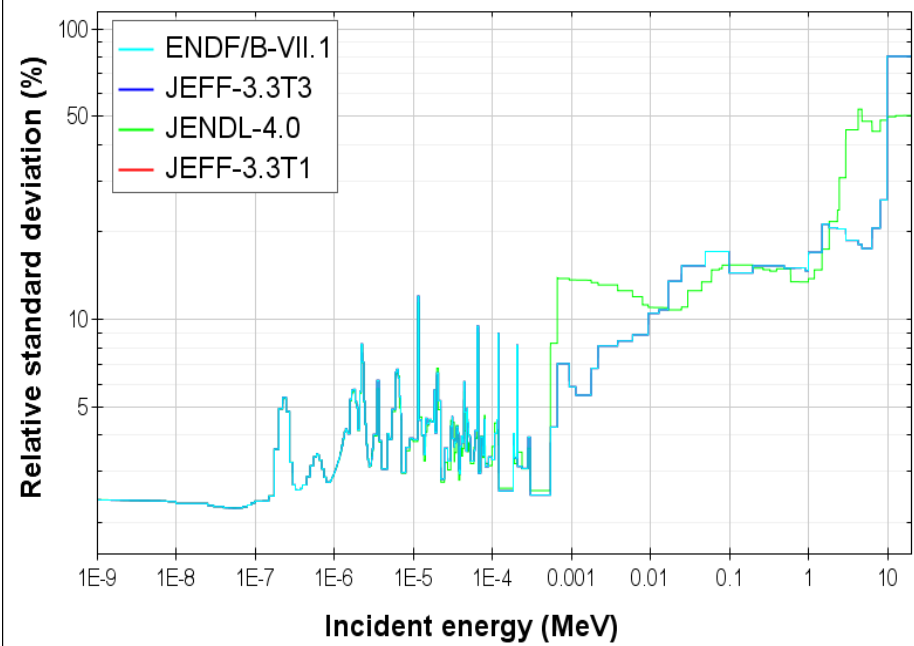
Total
6.72E-06
(0.00259)

Uranium-233 Comparison

Incident neutron data // U233 / MT=18 : (z,fission) /
Covariances data (BOXER) Relative standard deviation



Incident neutron data // U233 / MT=102 : (z,γ) /
Covariances data (BOXER) Relative standard deviation



JEFF-3.3T1/T3

ENDF/B-VII.1

JENDL-4.0

JEFF-3.3T1/T3

ENDF/B-VII.1

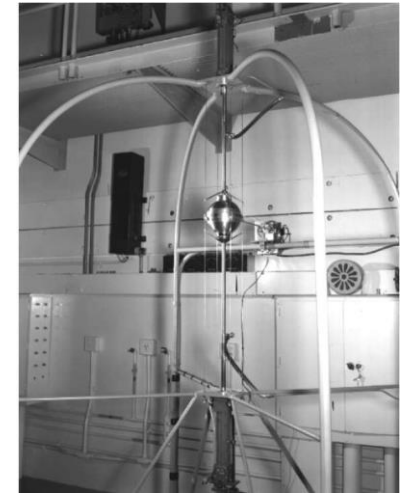
JENDL-4.0

JEFF-3.3T1	U233 2	U233 4	U233 16	U233 18	U233 102
U233 2	1.07E-05	-2.14E-05	-4.82E-09	-1.92E-06	3.46E-07
U233 4	-2.14E-05	6.17E-05			
U233 16	-4.82E-09		1.05E-07		
U233 18	-1.92E-06			4.36E-05	6.99E-18
U233 102	3.46E-07			6.99E-18	3.10E-06

JEFF-3.3T3	U233 2	U233 4	U233 16	U233 18	U233 102
U233 2	1.07E-05	-2.14E-05	-4.82E-09	-1.92E-06	3.46E-07
U233 4	-2.14E-05	6.17E-05			
U233 16	-4.82E-09		1.05E-07		
U233 18	-1.92E-06			4.36E-05	6.99E-18
U233 102	3.46E-07			6.99E-18	3.10E-06

JENDL-4.0	U233 2	U233 4	U233 16	U233 18	U233 102
U233 2	3.44E-06			-1.40E-18	-6.82E-13
U233 4		3.93E-05			
U233 16			5.17E-08		
U233 18	-1.40E-18			2.07E-05	-4.43E-18
U233 102	-6.82E-13			-4.43E-18	3.32E-06

UMF001-001 U233 Jezebel



Total
7.33E-05
(0.00856)

ENDF/B-VII.1 data used, so comparison to JENDL-4.0 is shown
Distribution of uncertainties varies, but giving reasonably similar totals

Total
6.68E-05
(0.00817)

Previous Summary

- Processing problem for ^{16}O inelastic scatter due to position of reaction threshold on group (duplicated from ENDF/B-VII.1)
- ^{235}U missing thermal region uncertainties and correlations between reactions which are of importance
 - Fast fission uncertainty value (5-6%) appears inconsistent and could be over-estimated
- ^{239}Pu in better shape, containing more complete information
 - But intermediate values (2-10%) appear higher over a wider range significantly affecting some benchmarks
 - Also, the lower ‘valley’ (<0.5%) on the fast peak may also be questionable as this affects PMF type benchmarks
- Confirm some negative correlations that differ between evaluations
- ^{233}U , ^{238}U and ^{241}Pu do not show any obvious faults but more specific tests may be beneficial

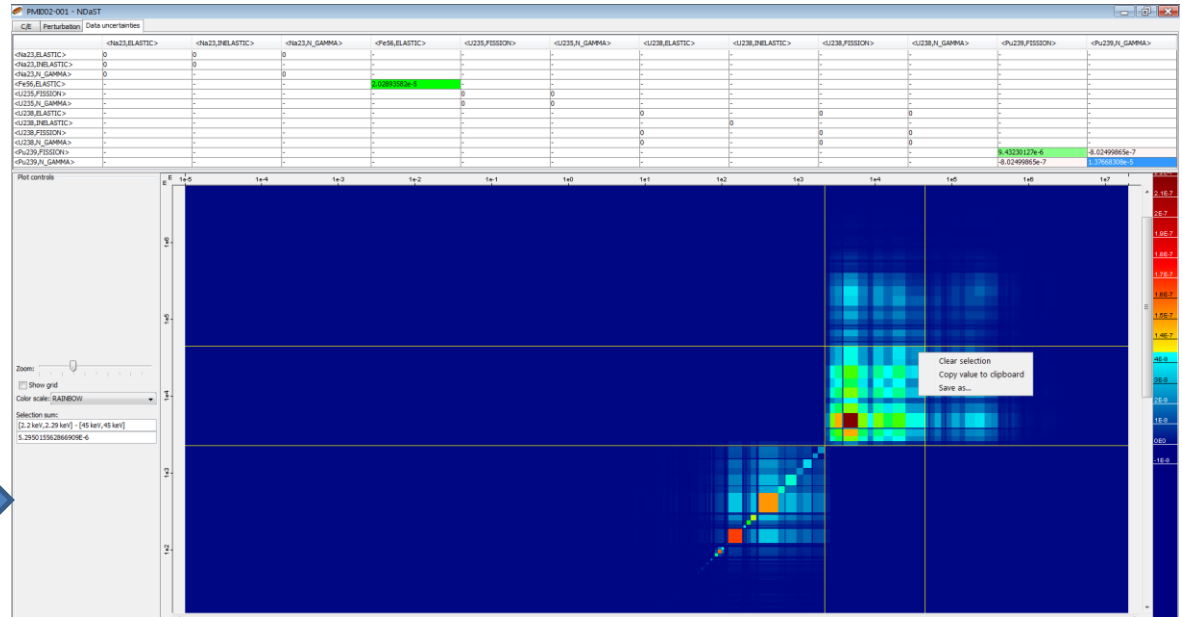
Revised Summary

- ~~Processing problem for ^{16}O inelastic scatter due to position of reaction threshold on group (duplicated from ENDF/B-VII.1)~~
- Intermediate / fast region uncertainties for ^{16}O elastic scatter are comparatively high against other libraries
 - As demonstrated this can add of the order of 500pcm uncertainty in k_{eff} to certain sensitive benchmarks
 - They also exhibit some strong anti-correlations not seen elsewhere
- Although the reaction is of secondary importance, the ^{16}O inelastic data is missing (but n,alpha file is included, might be useful to certain applications).
- ~~^{235}U missing thermal region uncertainties and correlations between reactions which are of importance~~
- ^{235}U thermal and intermediate uncertainties are now complete, with values and correlations appearing broadly consistent, adding 200 – 300 pcm
- ^{235}U fission uncertainties higher across all energies than comparable libraries
 - Fast fission uncertainty value (5-6%) appears inconsistent and could be over-estimated

2017 NDaST Covariance Developments

- Energy breakdown of uncertainty is already available since 2016

- Visualise or select region sum



- Working on handling further uncertainties and reactions:
 - MF31 (nubar) multiplicity data
 - MF35 (Chi) fission spectrum data
- Implement complete covariance library selection option
- Allow JANIS ENDF file import through NDaST (avoid 2 step process)

Thanks for your attention

james.dyrda@oecd.org