TENDL-2010: Reaching completeness and accuracy

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Motivations

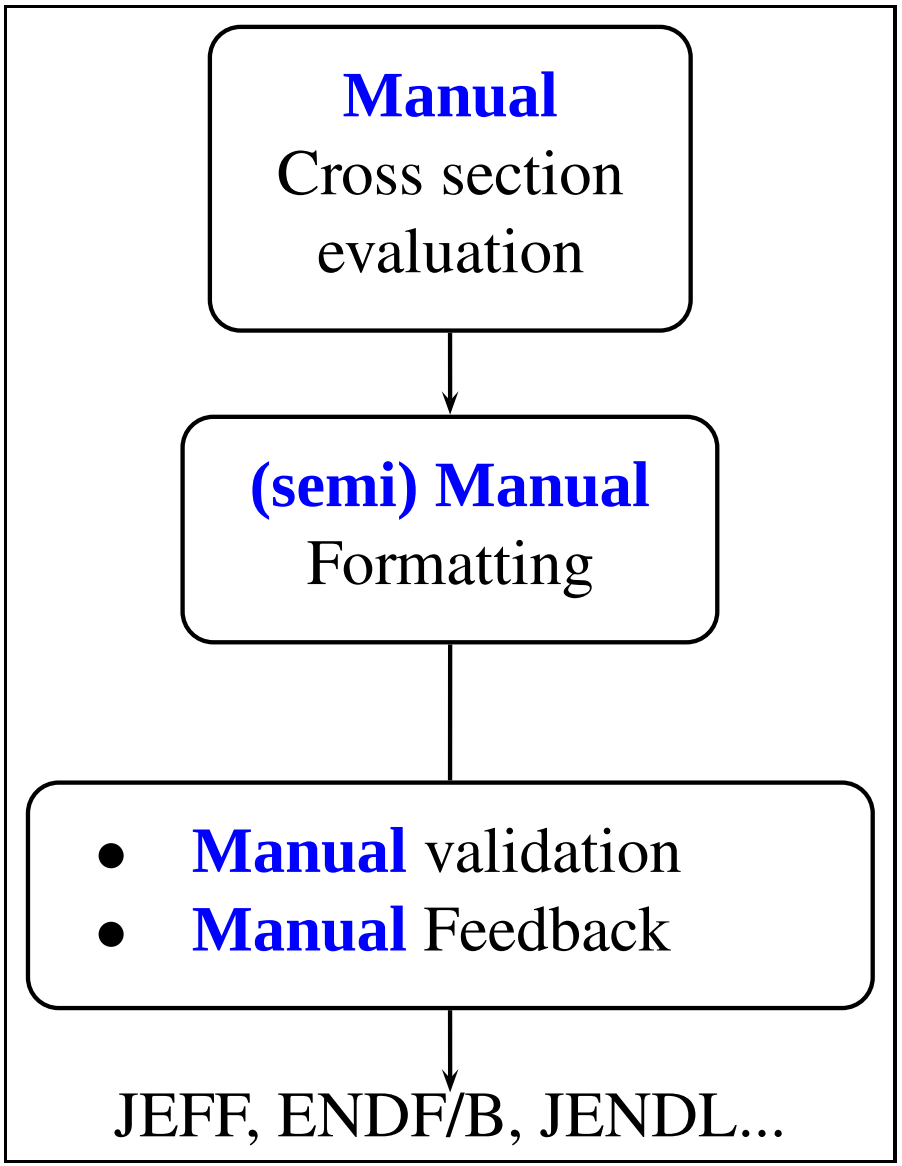
We need a consistent and complete nuclear data library to be integrated in reactor calculations, including realistic covariance data.

(*None of the existing libraries fulfill these requirements.*)

- Use global, robust TALYS method for the bulk of nuclides
- Use in-depth evaluation, adjustment... for important nuclides (e.g. ^{56}Fe, ^{239}Pu)
- Reproducible library

Produce TENDL-2008, -2009, -2010... with an increasing quality with regard to: differential data, model development, integral validation, completeness and covariance data

Standard and modern approaches



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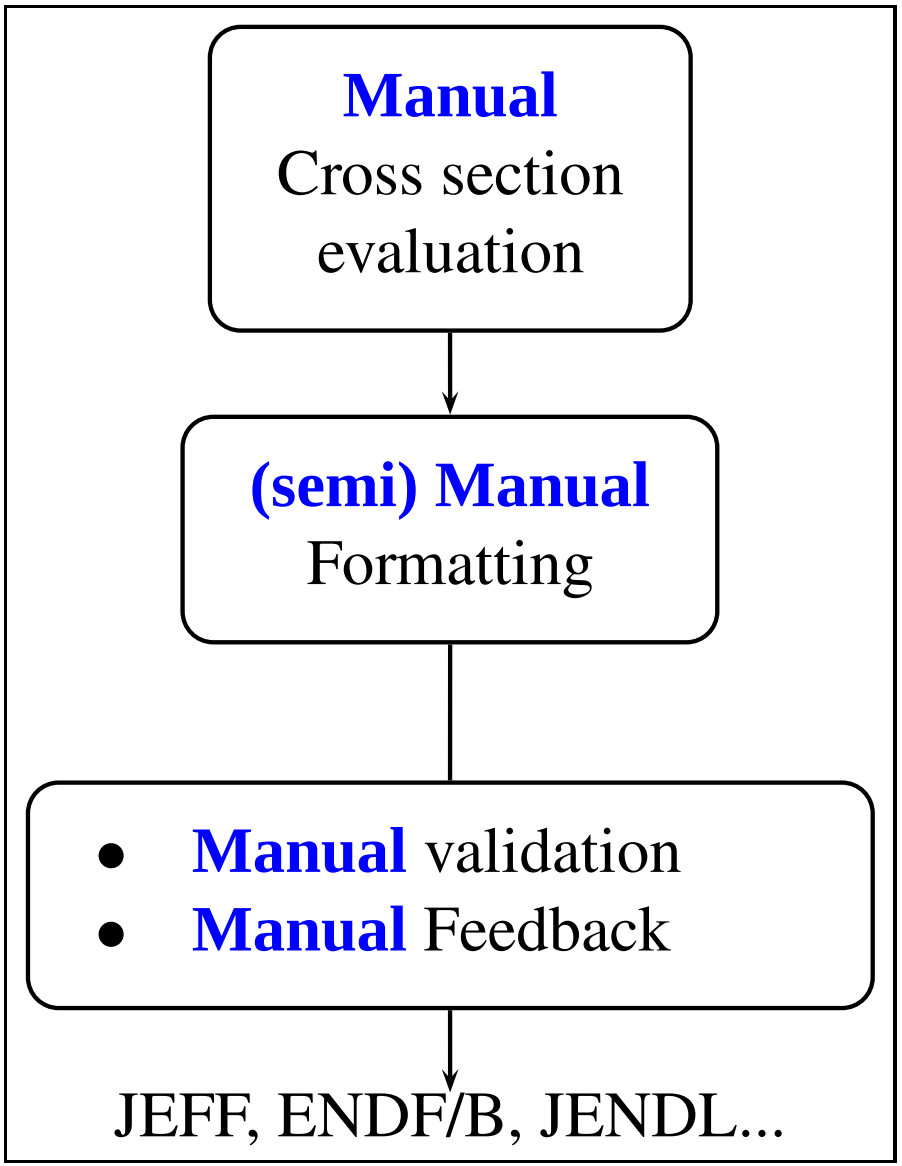
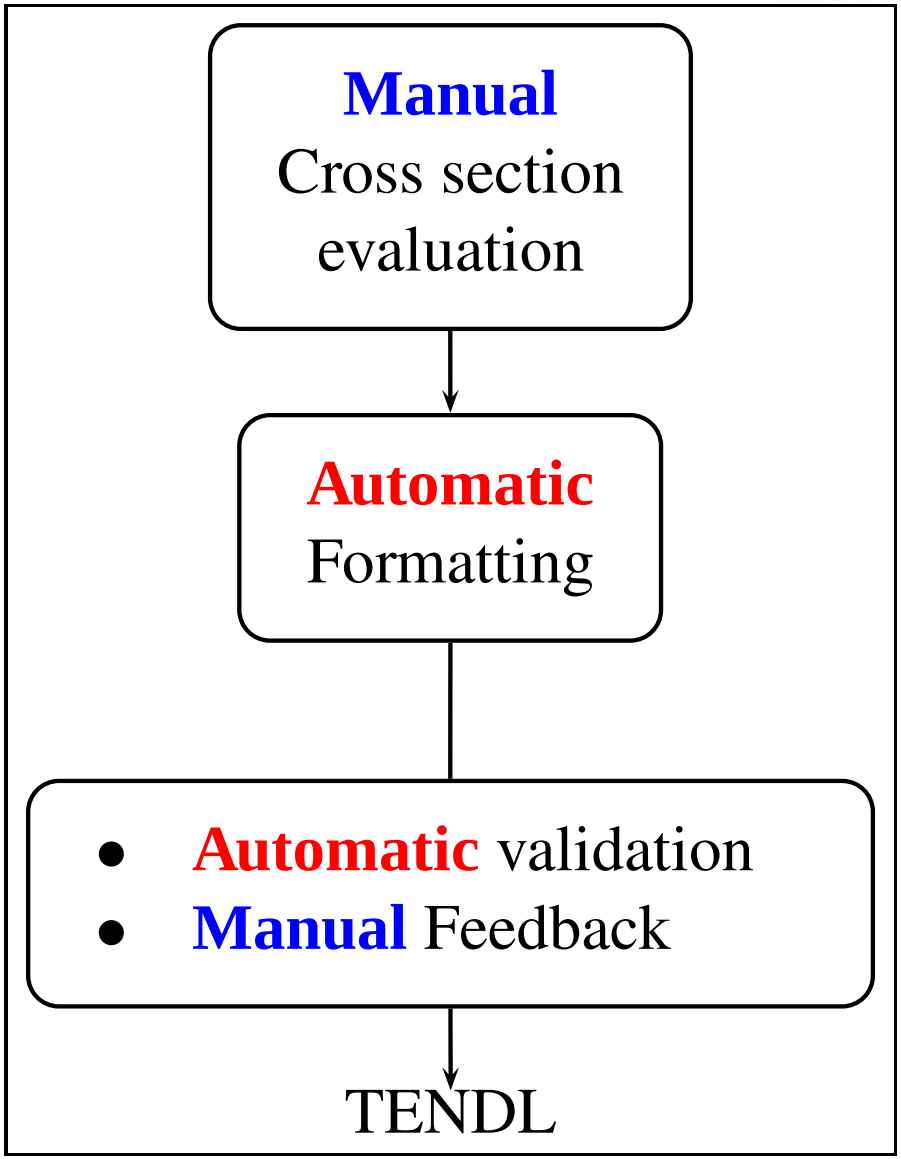
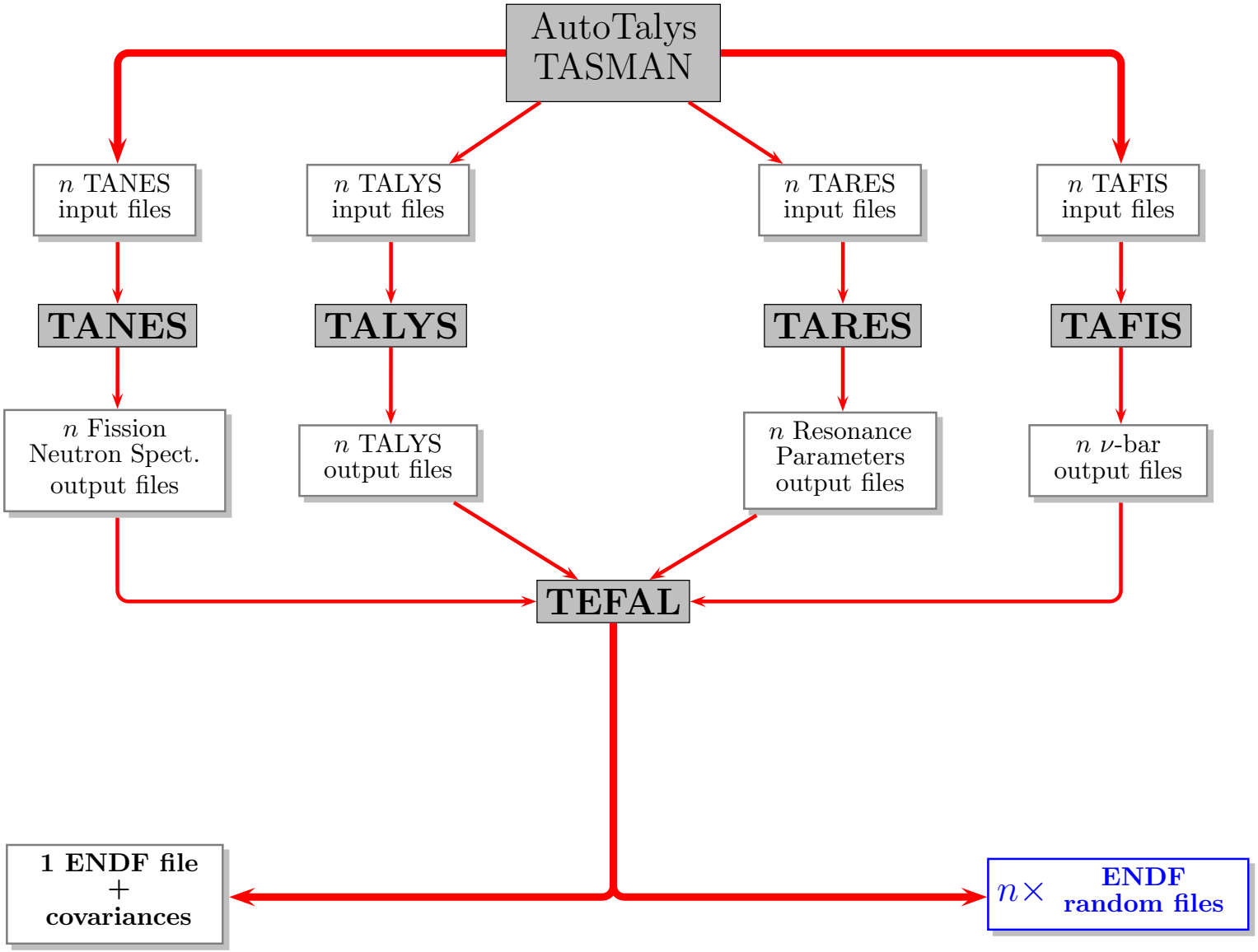
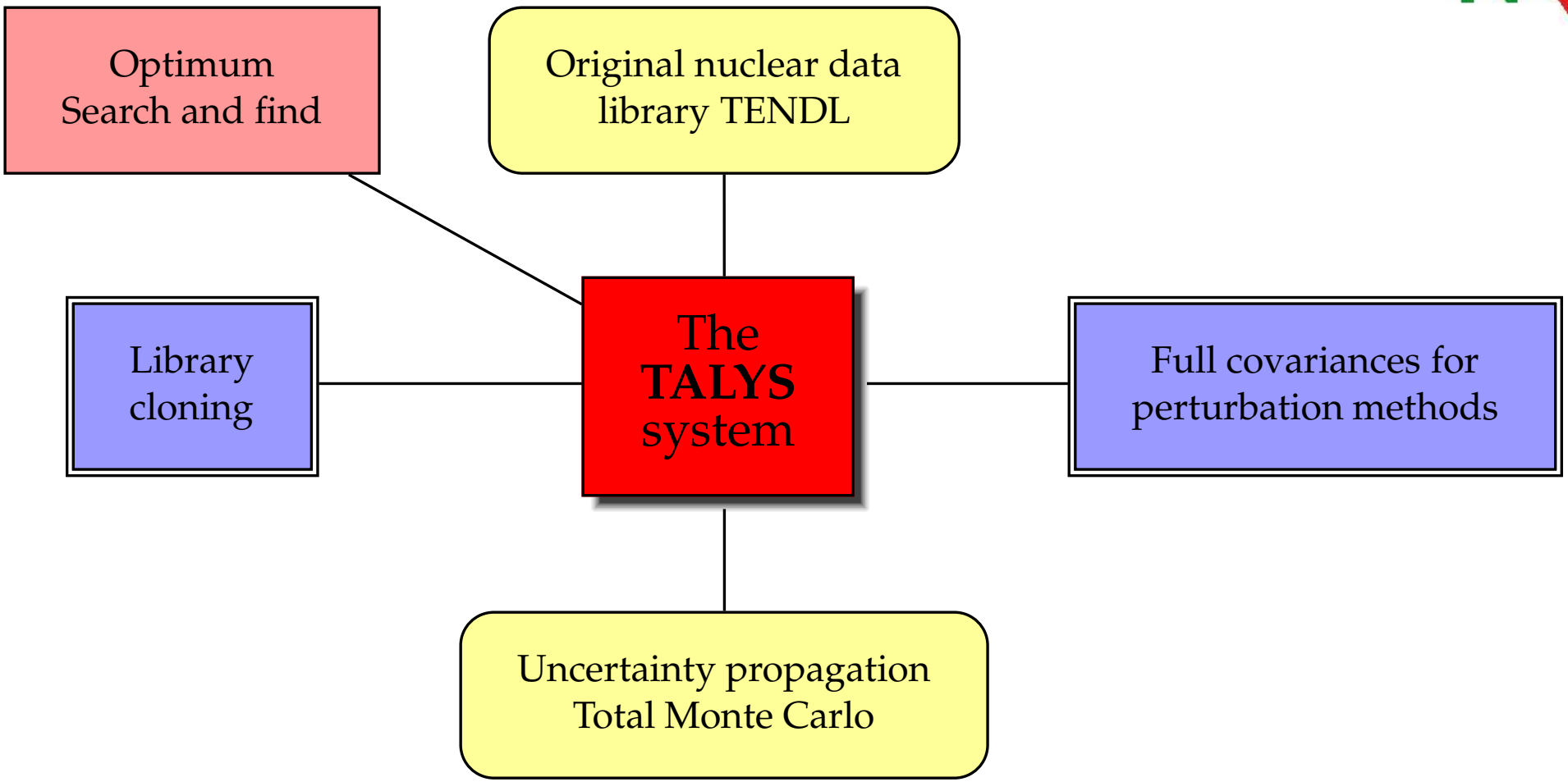




Nuclear data file evaluation and production with the TALYS system.



Possible outcomes based on the TALYS system



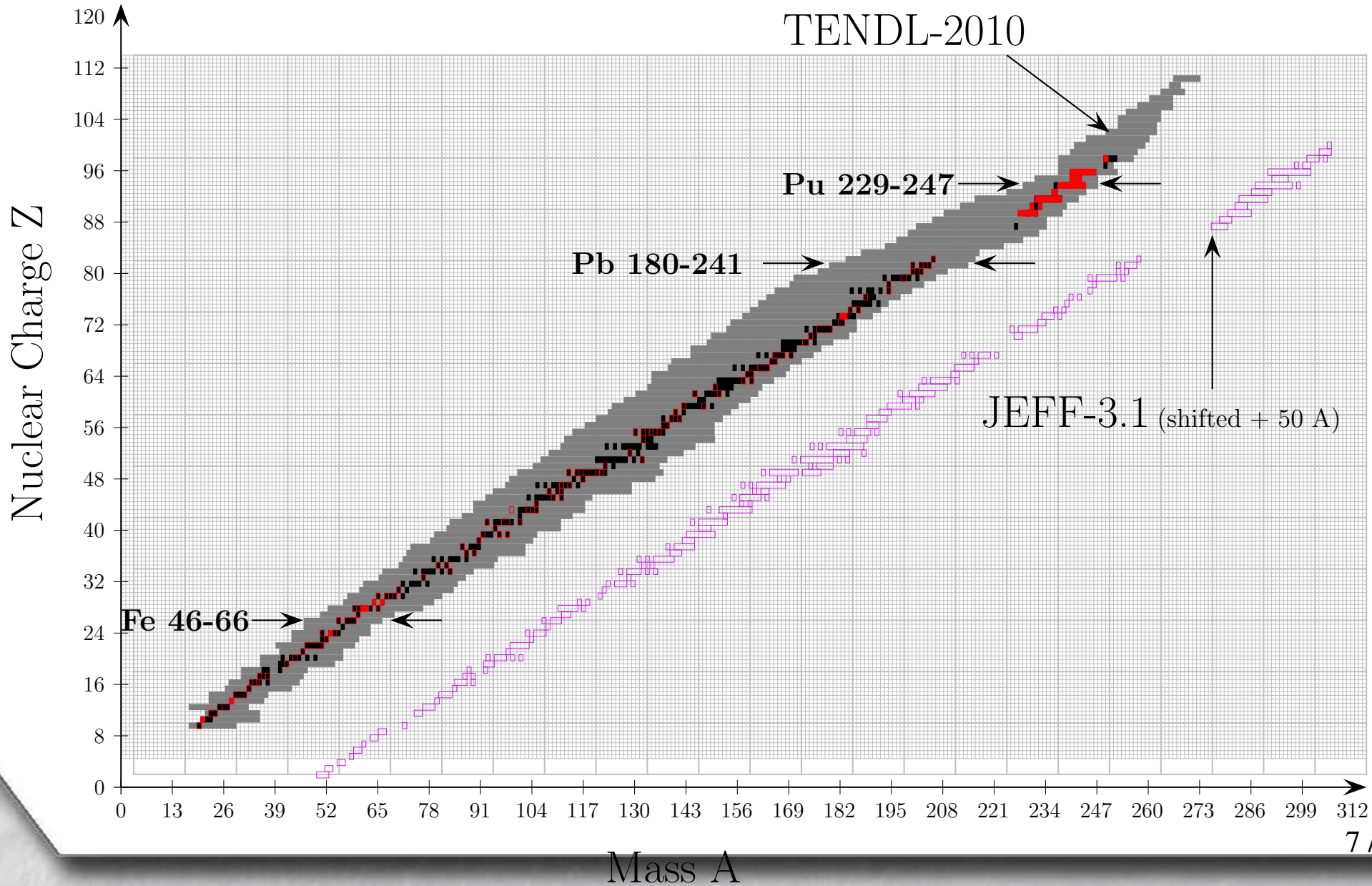
Content 1- TENDL-2010

- Available at www.talys.eu/tendl-2010
- Neutrons: ENDF files (MF1-15 and MF31-35), plots, ACE, EAF, processed files and random files (do your own Total Monte Carlo)
- Protons, deuterons, tritons, alphas, gammas: ENDF, ACE, EAF files
- Based on TALYS + automatic normalization

	Neutron	Proton	Deuteron	Triton	Alpha	Helium3	Photon	Fi. Yields
TENDL-2010	**2394**	**1157**	**1159**	**1156**	**1159**	**1140**	**1152**	**529**
TENDL-2009	**2375**	**1163**	**1164**	**1116**	**1163**	**1127**	**1165**	**509**
TENDL-2008	348	344	336	339	342	338	327	
(JEFF-3.1)	*381*	*26*						*44*
(ENDF/B-VII.0)	*393*	*48*	*5*	*3*			*163*	*80*

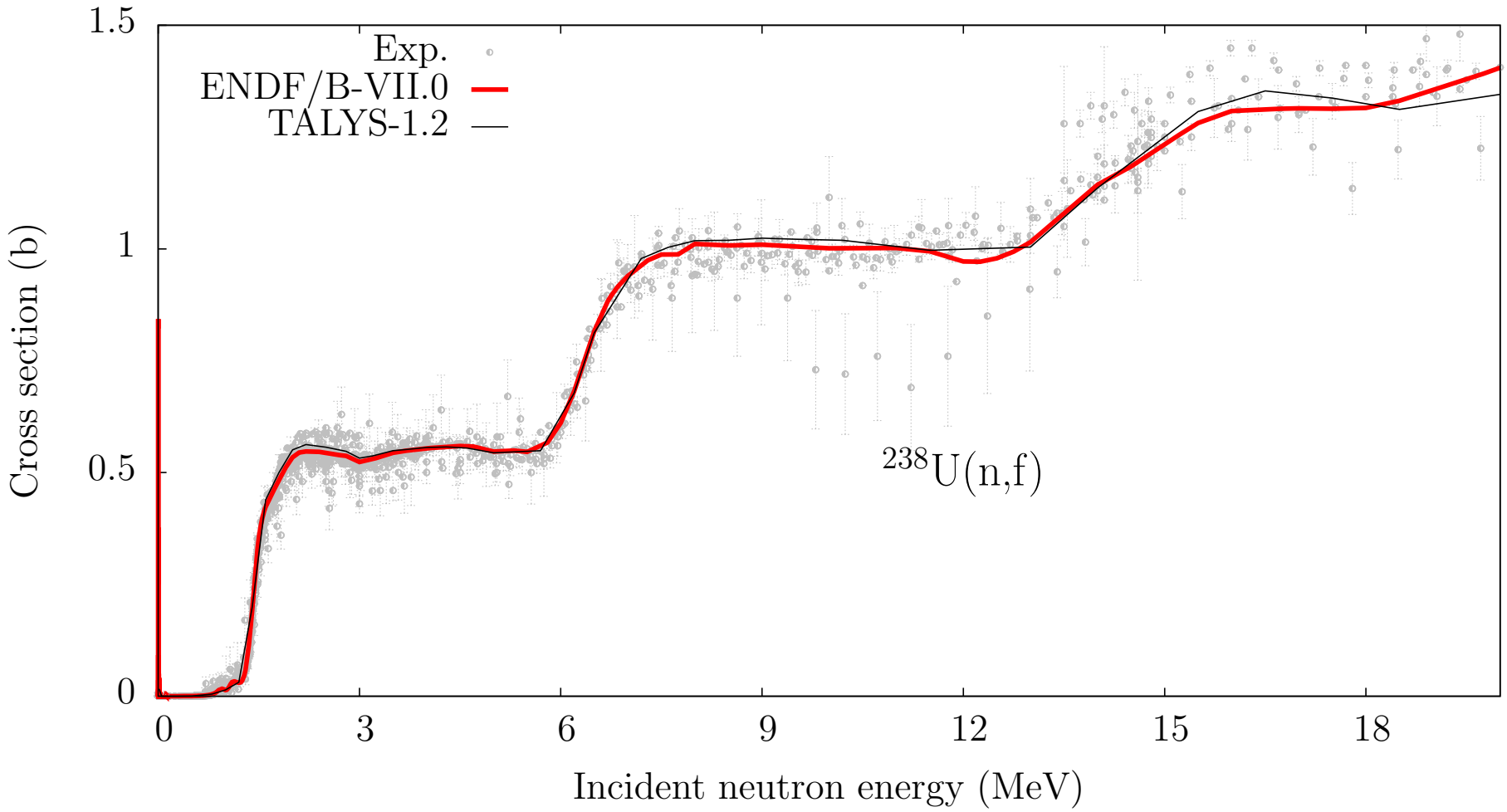
Content 2- TENDL-2010 Neutron library: ^{19}F to ^{281}Ds ($t_{1/2} > 1$ sec)

Default Calculations | Medium Quality | Activation Quality | Better Quality



TENDL-2010 Automatic normalization

When TALYS can not reproduce experimental cross sections, normalization is applied



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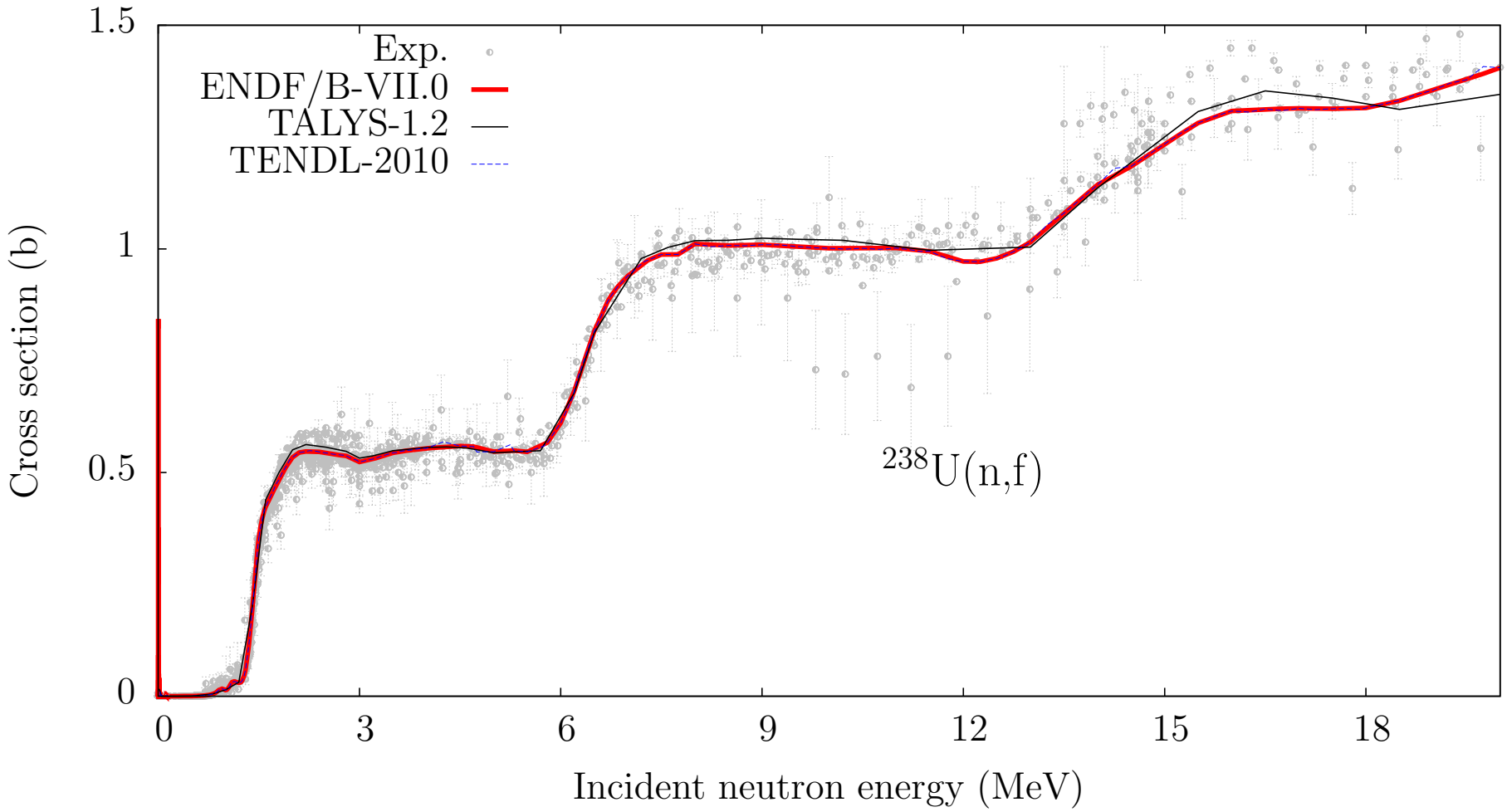
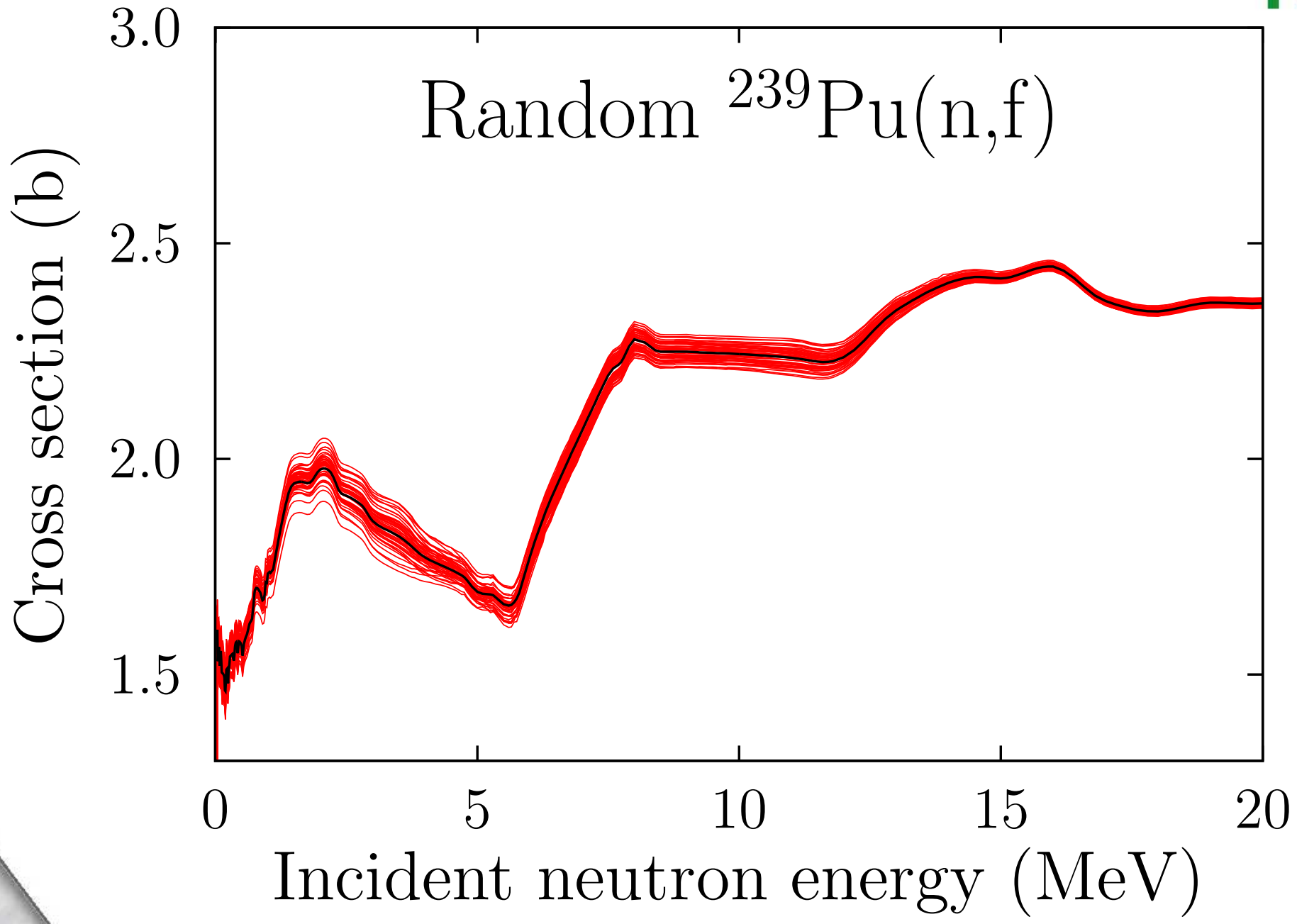


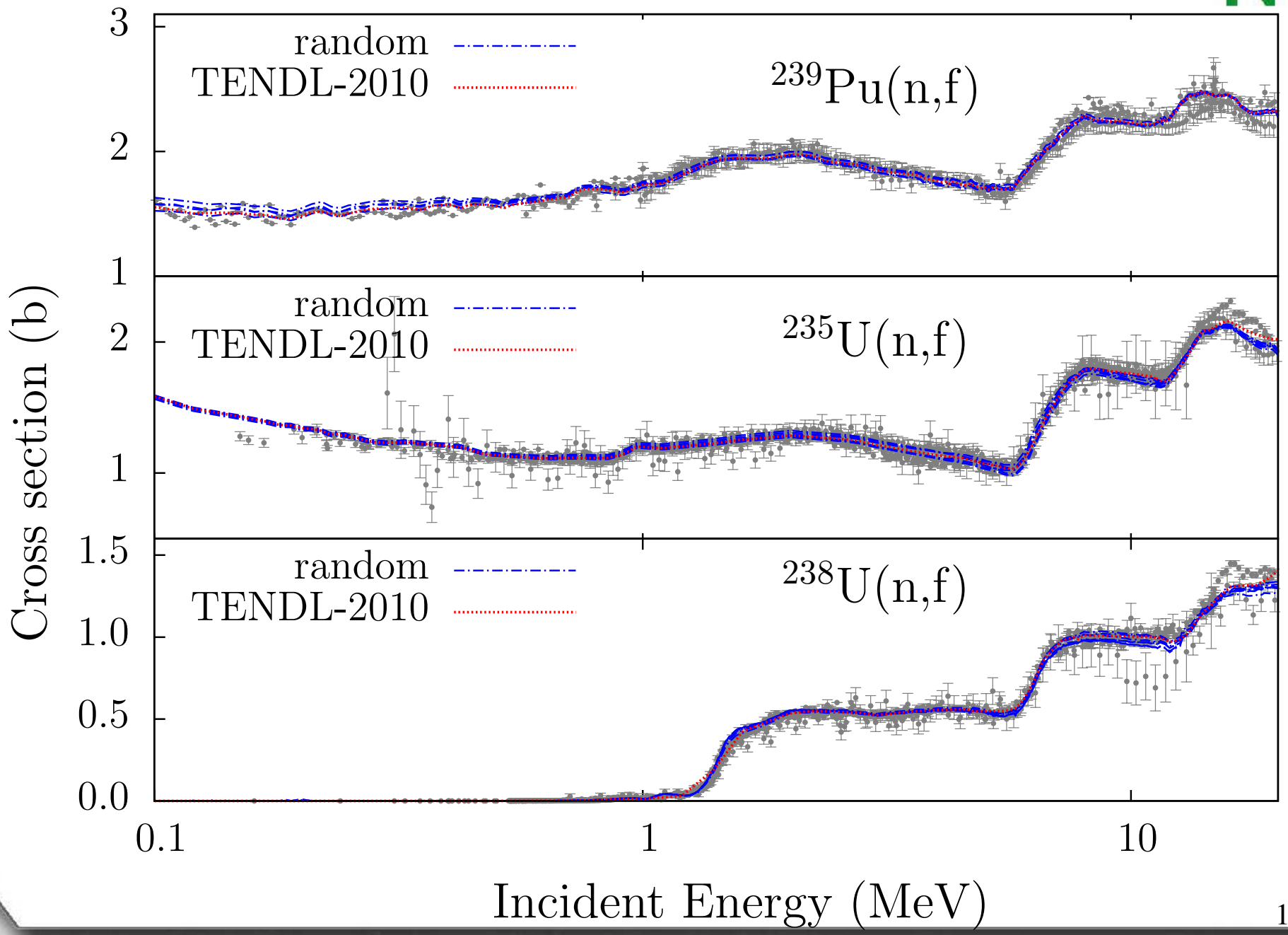
Why do we normalize to other data ?

- Because we want the best source (ENDF/B-VII.0, JEFF-3.1, JENDL-4.0, EAF, TALYS...) now
- We will get rid of many non-TALYS sources in the coming years
- We can generate random data (and covariances) around the best central values now

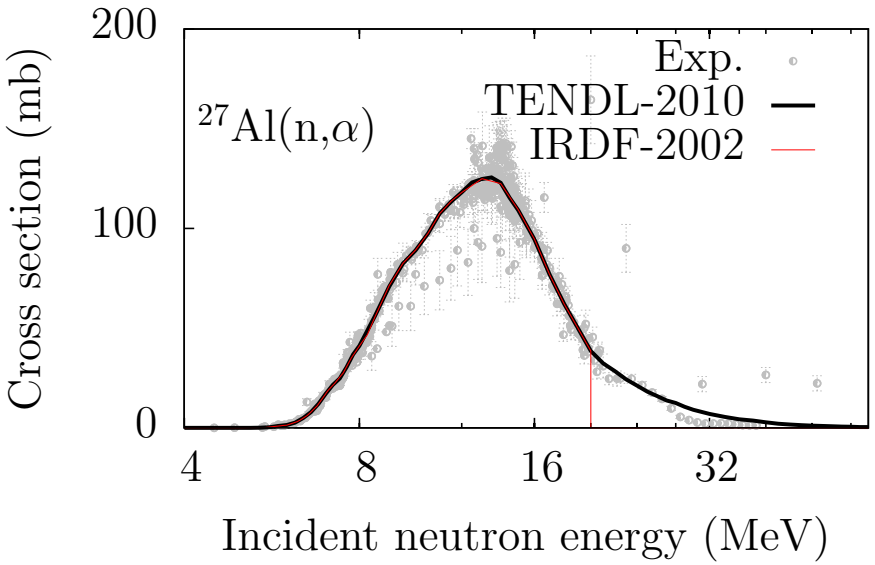
Why do we normalize to other data ?

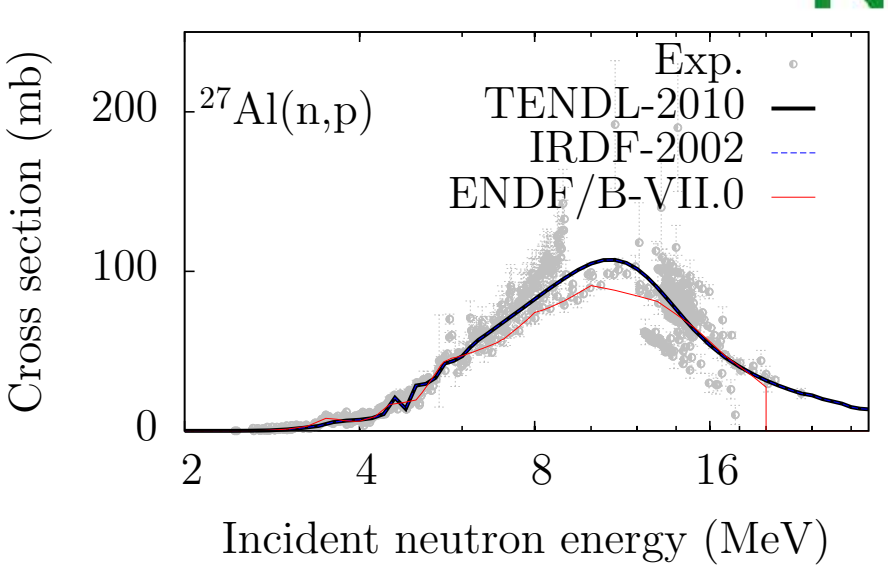


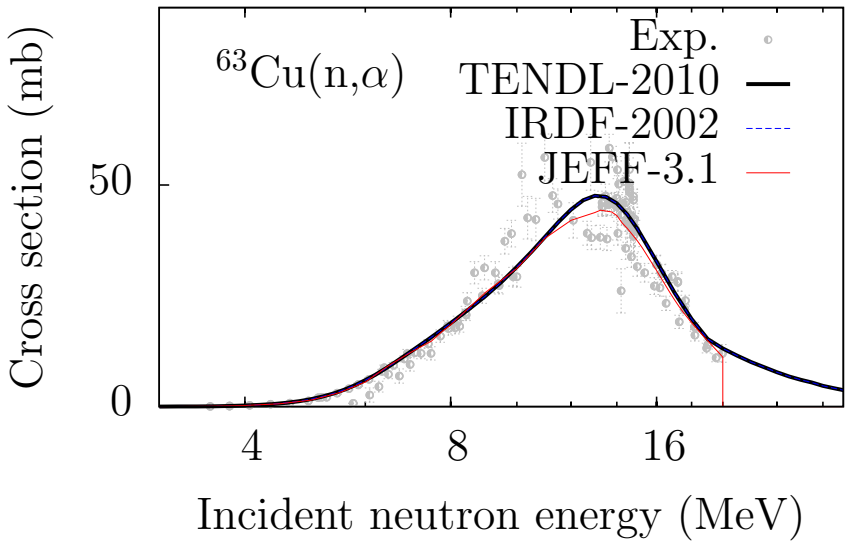
Examples: Some actinides of TENDL-2010

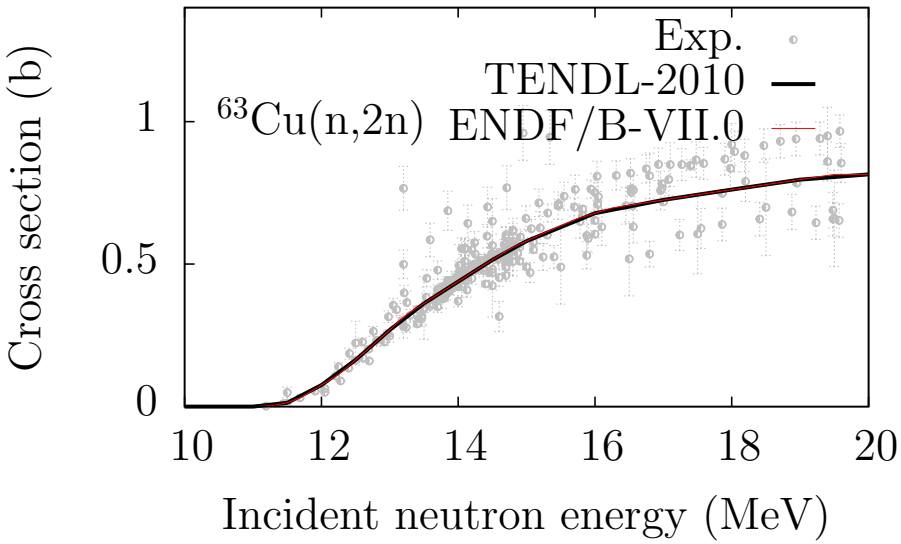


Examples 5: TENDL-2010 adjusted for activation







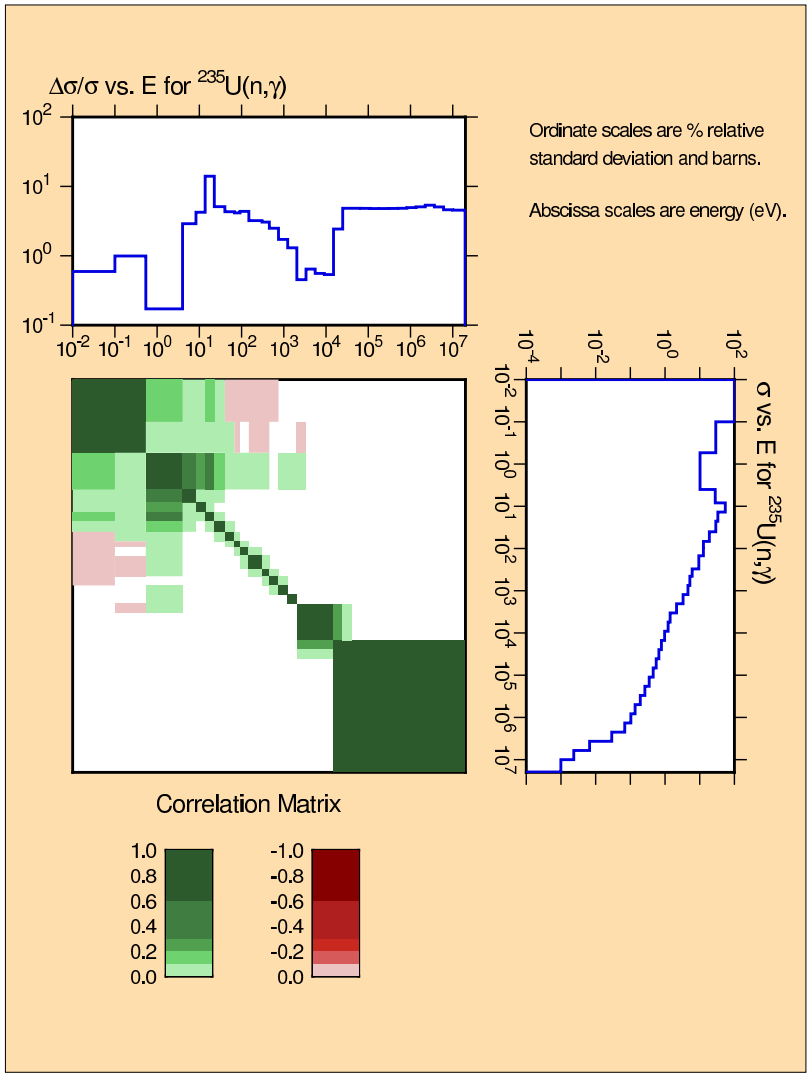


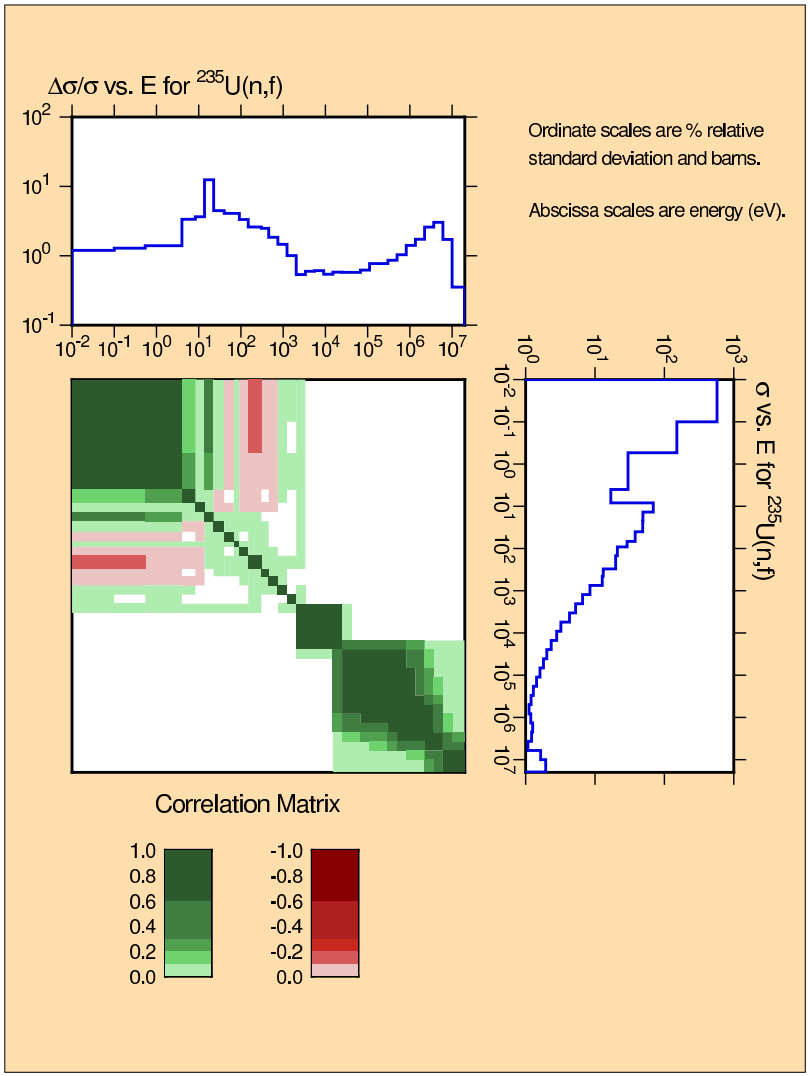
^{235,238}U, ^{239,241}Pu covariances for JEFF-3.1.2

1. TENDL-2010 contains covariances for all actinides: MF31, 32, 33, 34 and 35
2. TENDL-2010 contains covariances for all channels (with cross channel correlations)
3. Main actinides covariances will be further improved during the ANDES project (WP2-3) with CEA Cadarache
4. TENDL covariances are now directly tested with/by various parties: universities, industries...
5. Covariance files processed with NJOY (33, 44, 187 groups), PUFF (33 groups)

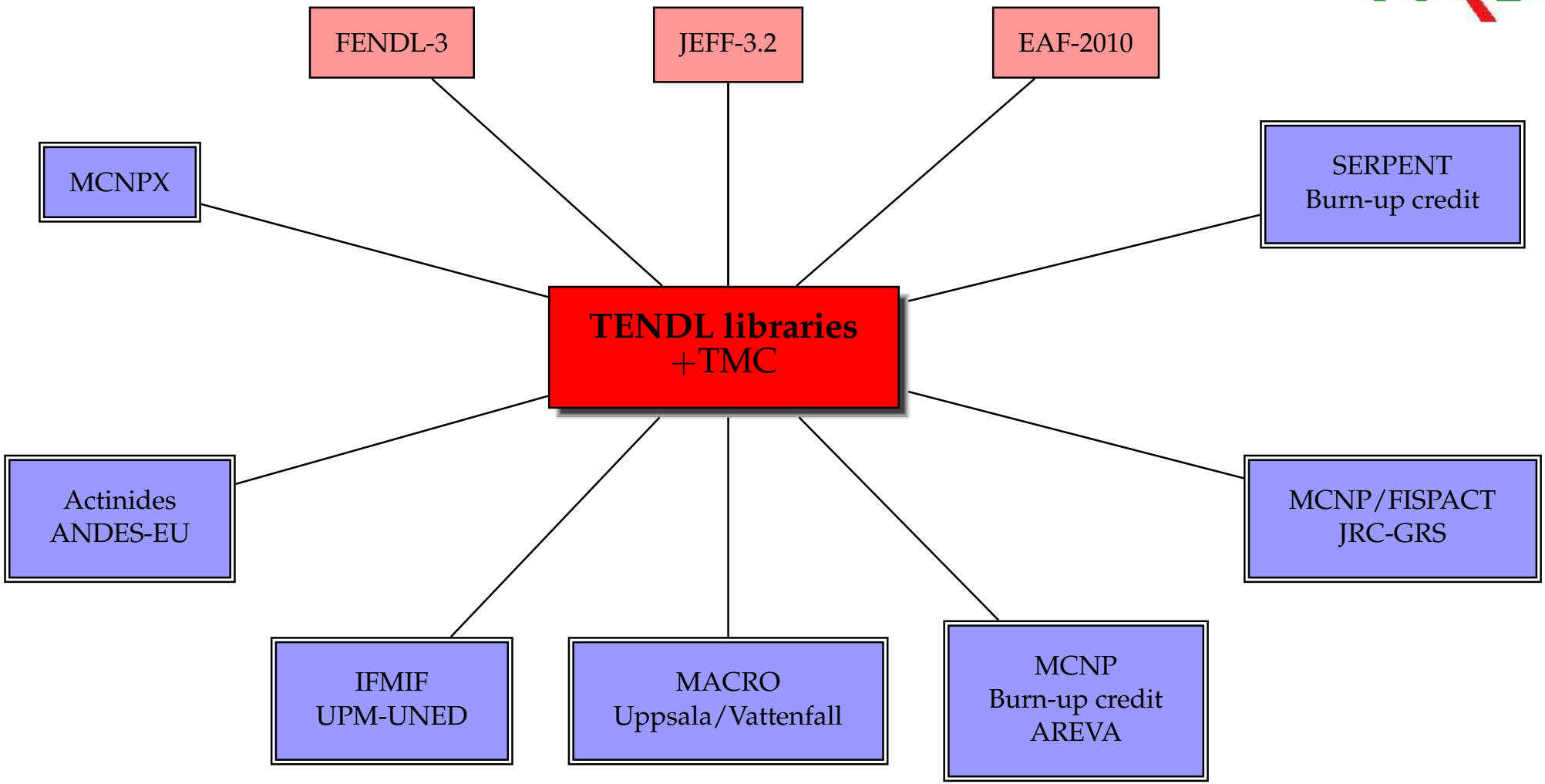
$\Longrightarrow$ We are proposing ^{235,238}U, ^{239,241}Pu covariances from TENDL-2010 (or 2011) for JEFF-3.1.2

Covariance examples





Current and future (next year) partnerships



Conclusions and Future improvements

- Consistent, complete data files with automatic updates for all nuclides, projectiles, energies reaction channels and quantities,
- Extensive set of covariance files, some proposed for JEFF-3.1.2
- Includes 315 URRs, random files
- Detailed TALYS and resonance parameter fitting per individual isotope

Release date: December 8th, 2010

- Possibility to adopt an entire existing data library (e.g. JEFF-3.1.1) and make it complete
- More extensive validation (burn-up...) with uncertainties
- Improve global model and uncertainties, Addition of original URR