



Adding errors to database collections

Martin O'Mullane

Classification of ADAS datasets

All of ADAS data can be grouped into one of 3 types:

- ▶ **Fundamental data** are core atomic data necessary for modelling: A-values, cross sections, effective collision strengths etc.,
 - Many sources: collaborators, literature, data centres etc.
 - Many resolutions: from simplistic to the forefront of computational physics.

- ▶ **Derived data** are data tailored for modelling: electron temperature and density dependent effective emission coefficients, effective ionisation/recombination rates, radiated power, spectral emissivities etc.,
 - Fundamental data processed via population models.
 - Most of these data are *not* catalogued in data centres.

- ▶ **Driver data** allow complete regeneration of all ADAS derived data (and some fundamental data) in conjunction with the various ADAS codes, are core atomic data necessary for modelling:
 - unique to ADAS and of no use/interest to non-ADAS users.

The goal

A measure of uncertainty or confidence should be available for each dataset in the first two classes

▶ Fundamental data

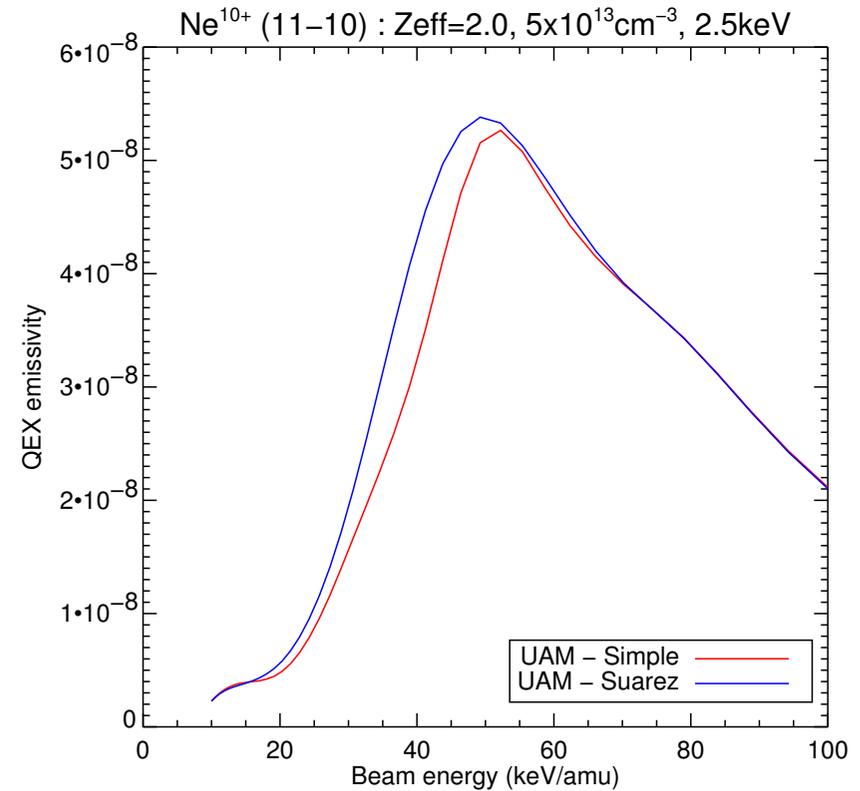
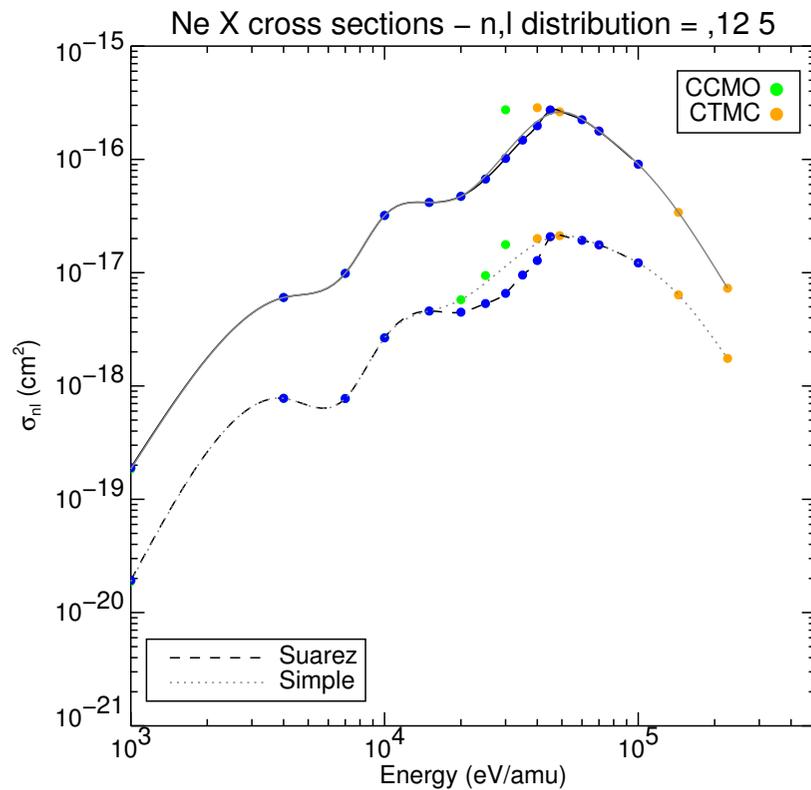
- Bespoke methods for most types.
- A degree of automation possible by data producer.
- Expert scrutiny required.
- Impacts on ADAS atomic data production codes, eg adas801, adas211.

▶ Derived data

- Full automation possible to generate these uncertainties.
- May require `offline_adas` series but the code should be part of ADAS proper.
- Of interest to modellers and plamsa analysts — provides a *locked* parameter to a model.
- May need to provide demonstration codes on use of uncertainties.

Example of the two types of error

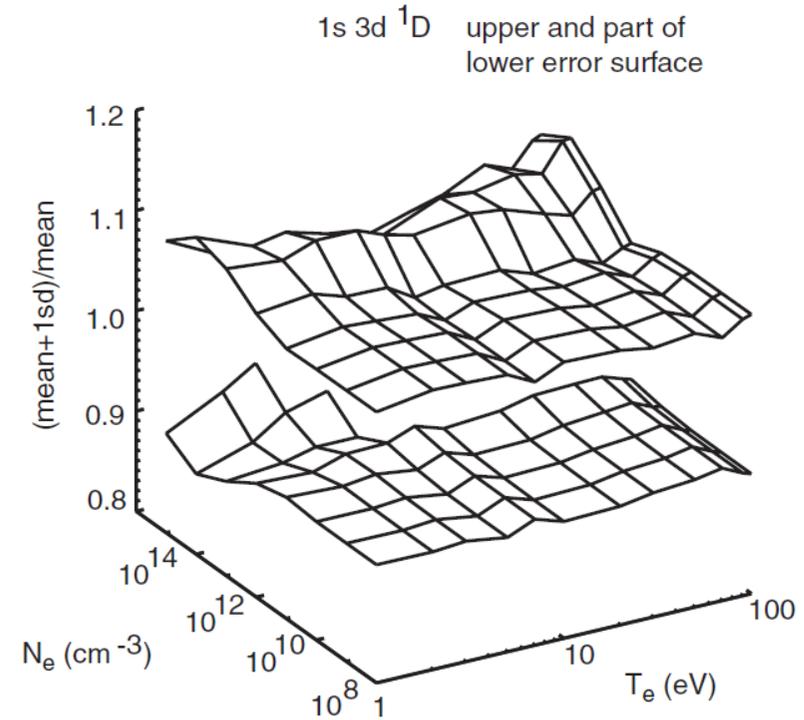
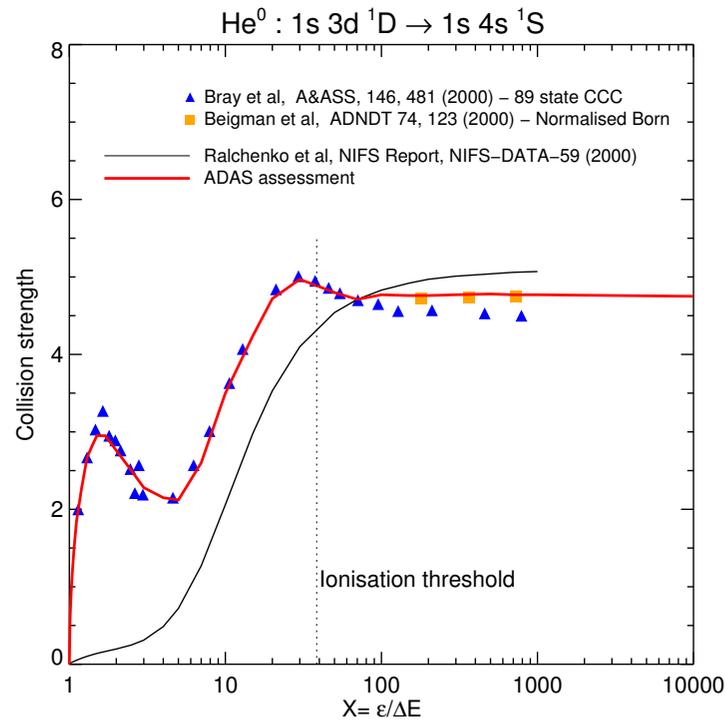
Different methods and ways of linking them lead to a natural working uncertainty.



Different fit and difference in derived emissivity.

A more complex example

The error may vary over an energy range.



Zones of difference and propagated Monte-Carlo error.

How to store uncertainty data

The simplest way is to archive a parallel database such that every *.dat* file has a corresponding *.err* (or *.err+* and *.err-*) file.

- ▶ ADAS dataset names are unique.
- ▶ adf specification gather all relevant information for a procedure/process in one place.
- ▶ The simplest way to handle uncertainty in all quantities is to have an error structure/object identical to the data structure.
- ▶ *.err* in same directory or `.../error/adf04/copaw#f/?`
- ▶ OPEN-ADAS should give the option to provide the data and error file(s).

A listing of each ADAS dataset with a comment — an enhanced *datastatus* document — would also be of great benefit in assessing the relative quality of an individual ADAS file.