Keep-in-Touch VIP meeting
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Optimization methods for cross section fitting of swarm data

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The deconvolution of swarm transport parameters is a powerful, well established, method to obtain self-consistent sets of cross sections, complementing the information obtained through direct measurement of the cross sections or the theoretical computation. It has, however, some limitations:

- ➢ It is a time consuming method of trial and error requiring a good physical intuition;

- ➢ The set of transport data available is usually limited and the problem is underdetermined: the resultant cross section set is just one among many possible;

- ➢ There is no estimation of the uncertainty of the fitting parameters.

The use of numerical optimization methods is tempting but conventional algorithms fail in this type of problem. On this talk we discuss the application of evolutionary computing methods to automatic fitting of cross sections. After briefly introducing the formalism adopted in this work for a) the analysis of swarm experiments and b) the evolutionary methods, we apply these concepts to cross section fitting. We start with a simple model gas and a genetic algorithm allowing to introduce the basic concepts of this field. Then we study the evolution of a population of cross sections and see how good fitting parameters are obtained as well as a statistical estimation of the uncertainty of the cross sections. The statistical analysis of the optimized solutions also show the presence of correlations between different cross sections. Finally we apply these algorithms to real gases.