



Rydberg atomic complexes in astrophysical plasmas

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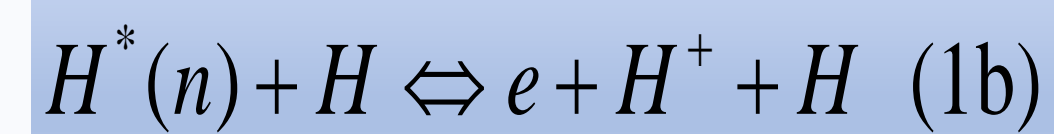
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-In order to analyze the shape of the spectral lines and improve the modeling it is necessary to take into account the influence of all the relevant collisional processes.

-The ionization processes in atom-Rydberg atom collisions Eqs. (1a) and (1b) are investigated in this contribution. The method [1,2] is applied to the cases of H collisions for the principal quantum numbers $2 \leq n \leq 20$ and temperatures $4\,000\text{ K} \leq T \leq 20\,000\text{ K}$.

-The ionization processes in collisions of excited hydrogen atoms with atoms in ground states were considered, with a particular accent to the applications for astrophysical and laboratory hydrogen plasma research and its non-local thermodynamic equilibrium modeling [3,4].



In this contribution we:

- Present the results of calculation of the cross sections (Fig. 1a,b) and rate coefficients (Fig. 2) of the corresponding ionization processes (1a) and (1b).

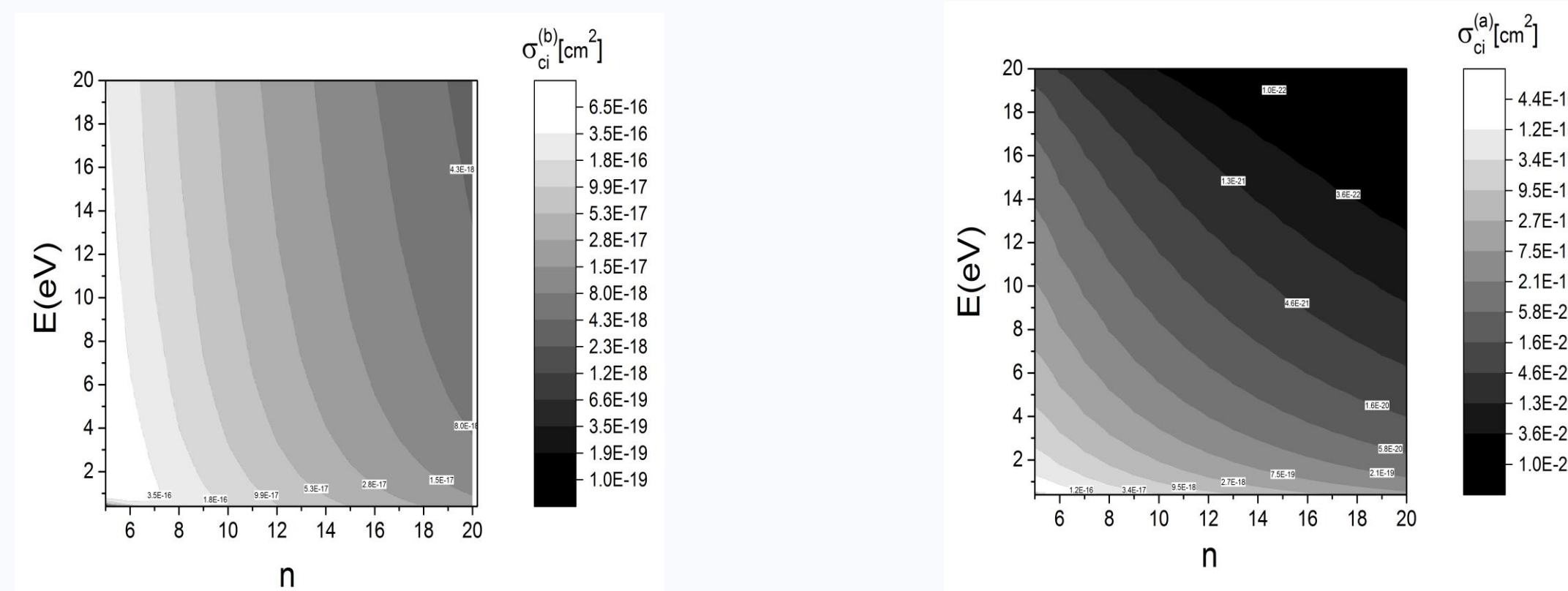


Fig1. The surface plot of the partial cross sections for channels (1a) and (1b).

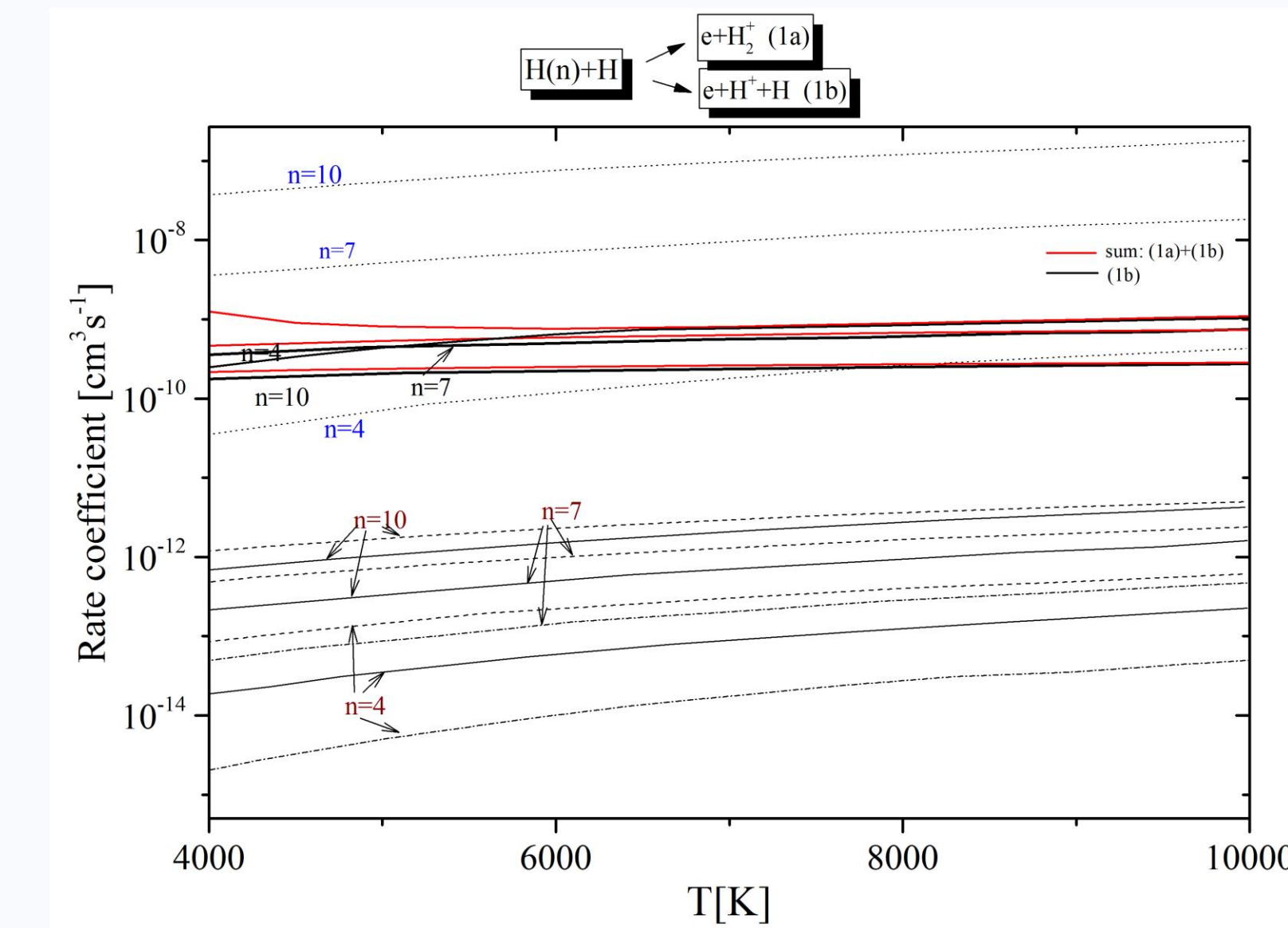
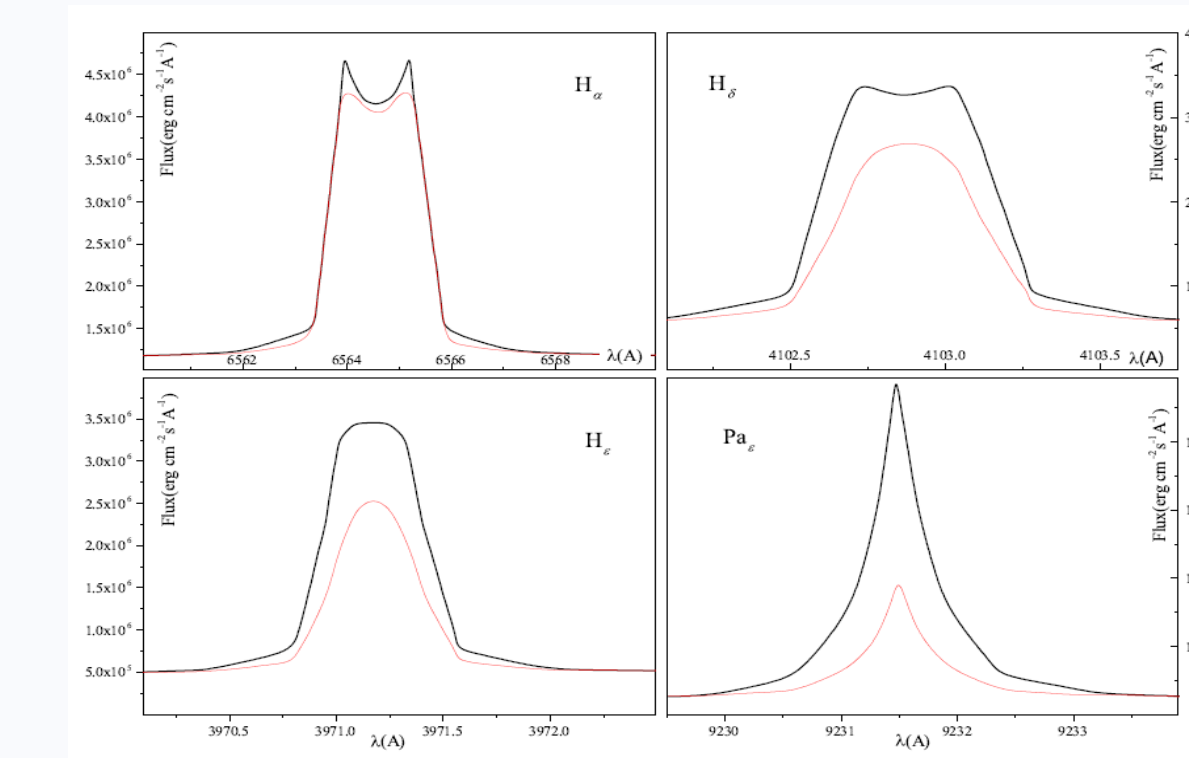


Fig2. Plot of collisional ionization H(n)+ H(1s) rate coefficients for selected temperatures and excited states (n=4, 7, 10). Bold black and red lines are data from this work, others are data found in the literature.

-It was established that considered processes with $n < 10$ strongly influence to the hydrogen atom population, as well as to the electron density. As the consequence of these facts, we expect the significant change of the shape of the hydrogen atomic spectral lines as in [4] (fig 3.).

Fig.3



References

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