A rapidly-accreting white dwarf (RAWD) is a white dwarf that accretes matter from a companion star (Fig.1), rapidly enough to steadily burn on its surface the accreted hydrogen into helium. Once a RAWD reaches a critical mass, the accumulated shell of helium undergoes a thermal flash that triggers convection. This convective motion ingests protons into the helium shell, which are thereafter captured by $^{12}$C to form $^{13}$N. While being transported by convection to the bottom of the helium shell, $^{13}$N decays into $^{13}$C. Neutrons are then released via the reaction $^{13}$C(alpha,n)$^{16}$O. The number density of neutrons in this convective-reactive process can reach a value of about $10^{15}$ neutrons per cm$^3$, intermediate between those characteristic of the slow (s) and rapid (r) neutron-capture processes, thus called the intermediate (i-) process.

In a recent study [1], we introduced the i-process yields calculated by P. Denissenkov [2] into our galaxy model [3] in order to quantify the contribution of RAWDs (via the i-process) on the chemical evolution of neutron-capture elements in the Milky Way. We found that RAWDs could contribute to a non-negligible fraction of first-peak neutron-capture elements observed in the Sun, such as Rb, Sr, Y, and Zr (Fig.2). We also demonstrated that the i process can complement the s process in recovering the isotopic composition of the Sun (e.g., $^{96}$Zr, $^{95}$Mo, and $^{97}$Mo). In addition, this study clearly highlighted that nuclear physics uncertainties [4] have a major impact on the predictive power of chemical evolution models, a reminder of the necessity of interdisciplinary collaborations.

Researchers: B. Côté (UVic, Konkoly Observatory), P. Denissenkov (UVic), F. Herwig (UVic), A. J. Ruiter (Australian National U.), C. Ritter (UVic, Keele U.), M. Pignatari (U. of Hull), K. Belczynski (Nicolaus Copernicus Astronomical Center)