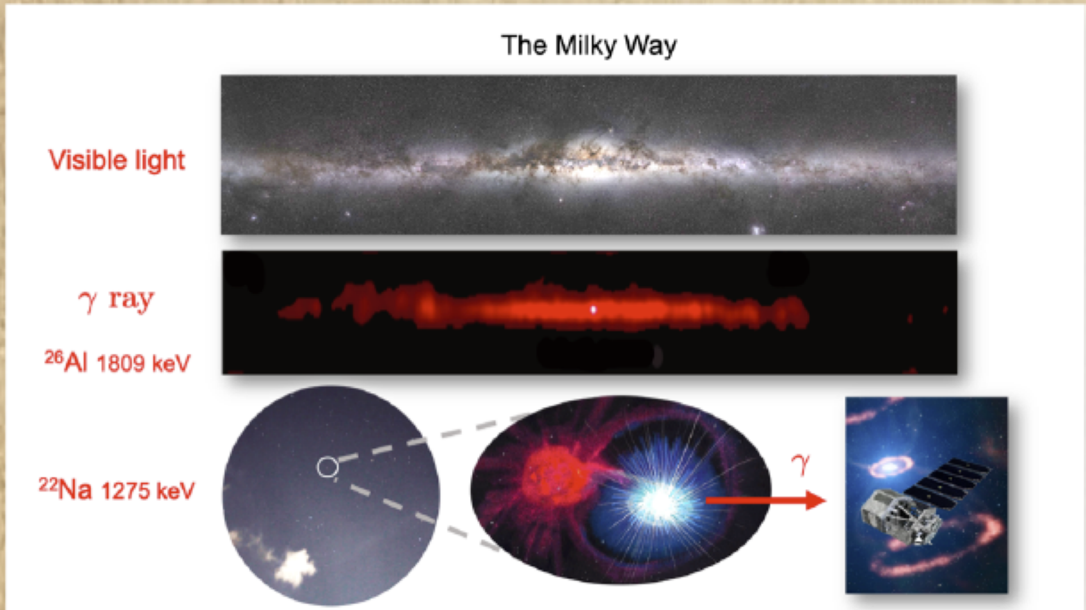
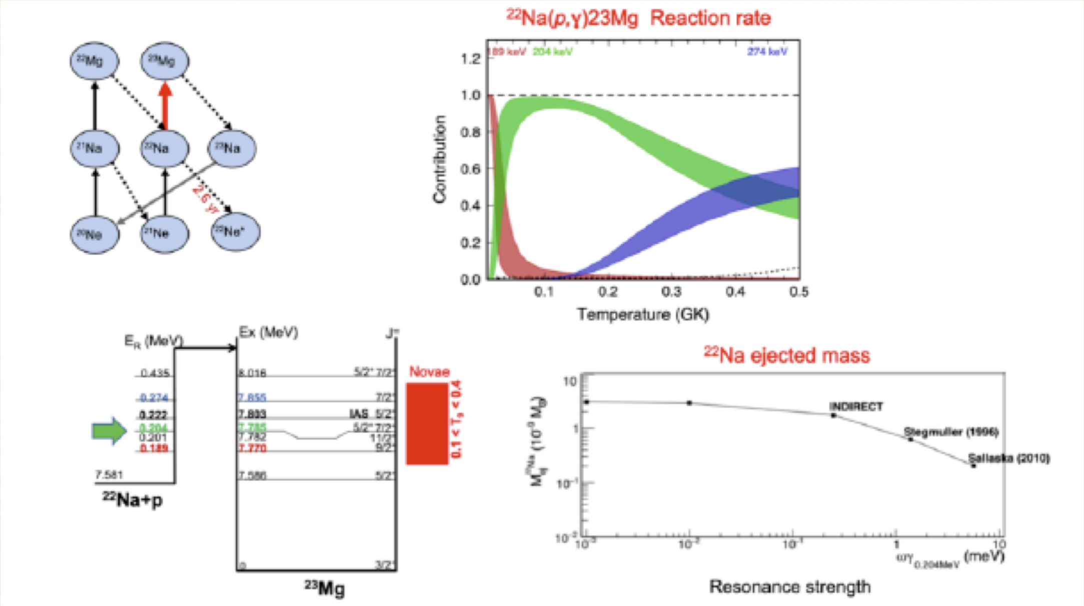
WANTED

^{22}Na DEAD or ALIVE

#138 Understanding the ^{22}Na cosmic abundance





MOTIVATIONS

Classical novae are thermonuclear explosions in stellar binary systems, and important sources of ^{26}Al and ^{22}Na. While γ rays from the decay of the former radioisotope have been observed throughout the Galaxy, ^{22}Na remains untraceable. Its half-life (2.6 yr) would allow the observation of its 1275 keV γ-ray line from the cosmic source, using for example the COSI wide-field γ-ray telescope. However, the prediction of such an observation requires good knowledge of its nucleosynthesis.

Credit: Drawing: M. Deconinck, Image by Jim Willis, courtesy of Northrop Grumman Corporation ½ Space Systems; background image courtesy of European Southern Observatory

NOVAE SIMULATIONS

About 10 reactions involving radioactive nuclei and charged particles have been directly measured at low energies. Among them, the ^{22}Na(p, γ)^{23}Mg reaction has a direct impact on the amount of radioactive ^{22}Na produced in novae. The rate of this reaction is mainly dictated by a single resonance in ^{23}Mg at 7785.0(7) keV. Our novae simulations show that, in the range of the debated values of the resonance strength, the mass (M) of ^{22}Na ejected in novae depends on the lifetime (τ) of this key state approximately as $M \propto \tau^{0.7}$.

Ref. C. Fougeres et al (2023). EPJ Web of Conferences (Vol. 279, p. 09001). EDP Sciences.