

STELLAR EVOLUTION

by

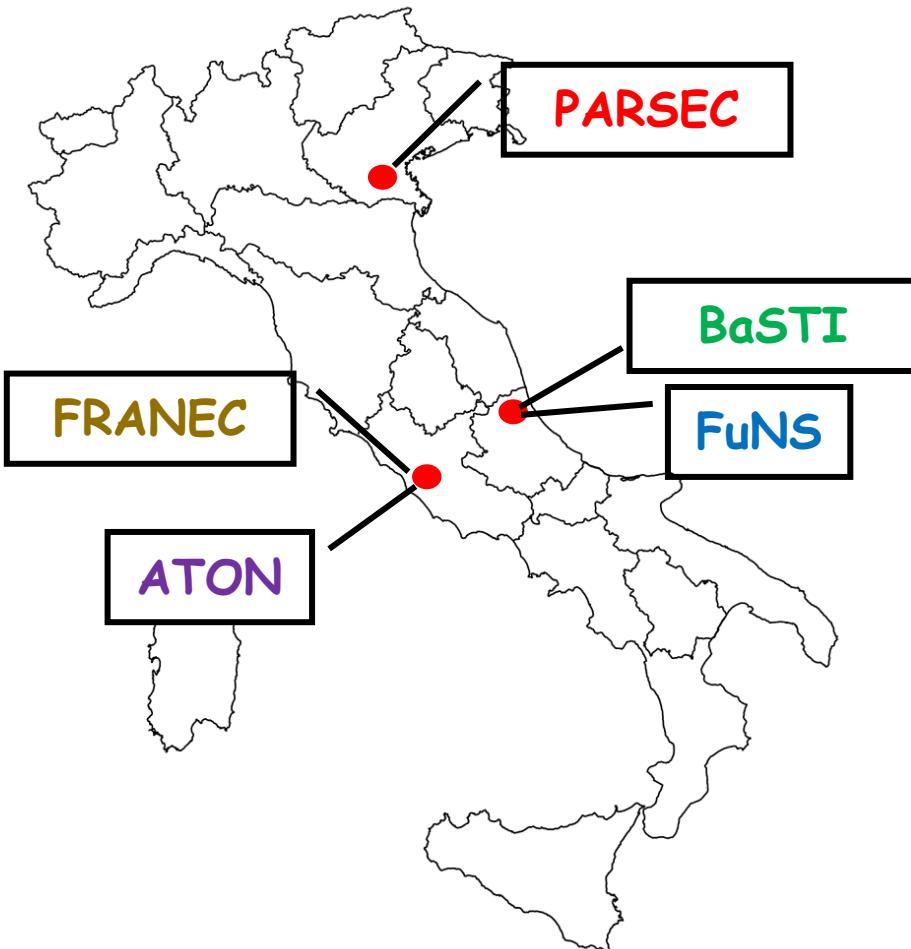
Coordinators of Raggruppamento Scientifico Nazionale 2

Characterization of chemical and physical properties of stars
with different initial chemical composition and mass, from their
formation to their end (quiescent or explosive)

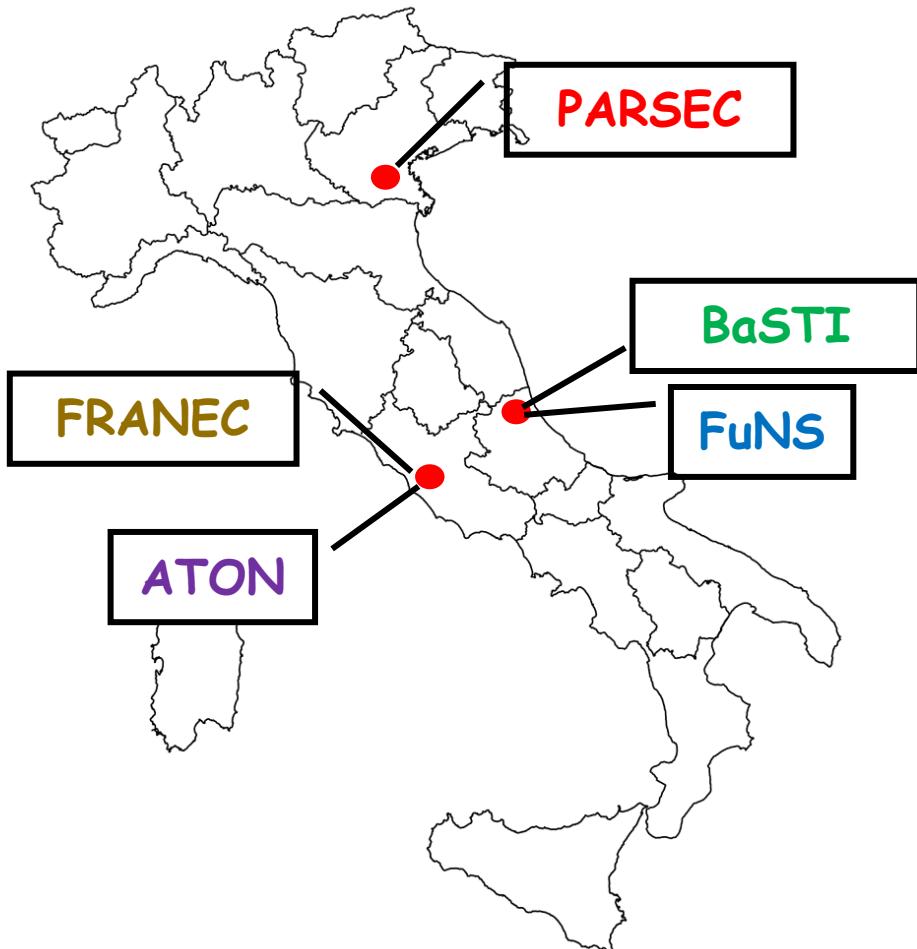
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Comparison between models from different codes provides the most reliable estimate of uncertainties on stellar observables.

STEV index

Welcome to STEV, the OAPd server for stellar models. Here you'll find a series of web services related with stellar evolutionary tracks, isochrones, synthetic photometry, synthetic photometric data, and opacity tables.

Databases

Newest databases:

PARSEC tracks: The latest stellar evolutionary tracks from PARSEC v1.2S (non-rotating) and v2.0 (rotating). This database is kept by Guglielmo Costa.

pulsation: Periods and growth rates of long period variables. Codes and tables described in Michele Trabuch's papers.

Cstars: COMARCS/COMA Cool Star Spectra and Photometry, including all data files from Aringer's papers.

Databases which have not been updated for a while:

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dustyAGB07: data files for the calibrated TP-AGB tracks from Marigo & Girardi (2007), and their related optical-to-far-IR isochrones (Marigo et al. 2008). It includes interstellar extinction coefficients as in Girardi et al. (2008). Note: superseded by CMD and YBC.

YZCAT: stellar evolutionary tracks and isochrones for a large region of the Y-Z plane (Bertelli et

<https://stev.oapd.inaf.it/>

BaSTI
a Bag of Stellar Tracks and Isochrones

Home Models Tools News BaSTI: Previous release Papers Contact

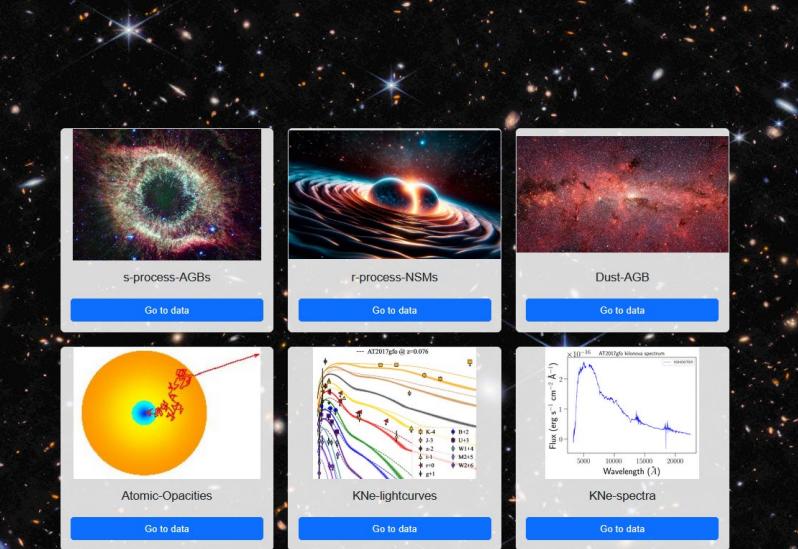
The Team

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<http://basti-iac.ia-abruzzo.inaf.it/>

Martini A platform dedicated to stars!

INAF Finanziato dall'Unione europea NextGenerationEU



The interface features a header with the Martini logo and INAF/NextGenerationEU funding information. Below is a grid of six cards, each with an image and a 'Go to data' button:

- s-process-AGBs
- r-process-NSMs
- Dust-AGB
- Atomic-Opacities
- KNe-lightcurves
- KNe-spectra

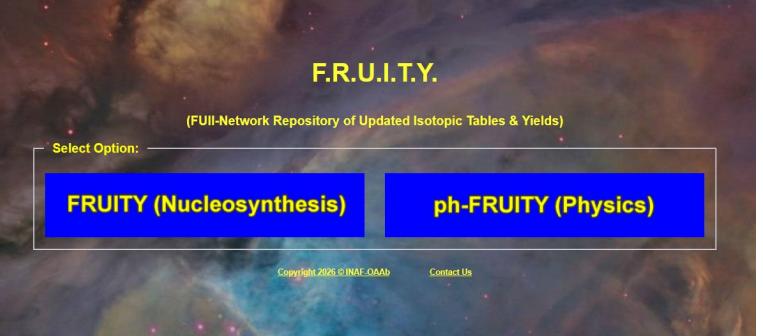
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F.R.U.I.T.Y.
(FULL-Network Repository of Updated Isotopic Tables & Yields)

Select Option:

FRUITY (Nucleosynthesis) **ph-FRUITY (Physics)**

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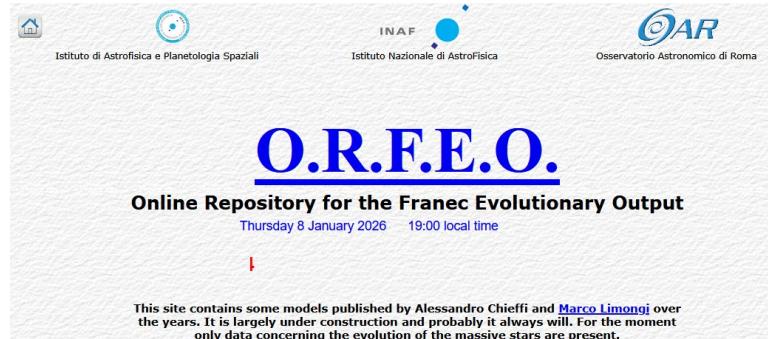


<http://fruity.ia-teramo.inaf.it/>

O.R.F.E.O.
Online Repository for the Franec Evolutionary Output
Thursday 8 January 2026 19:00 local time

I

This site contains some models published by Alessandro Chieffi and Marco Limongi over the years. It is largely under construction and probably it always will. For the moment only data concerning the evolution of the massive stars are present.



<https://orfeo.ia-roma.inaf.it/>

Giornate INAF del RSN2 - Napoli, 13-15 January, 2026

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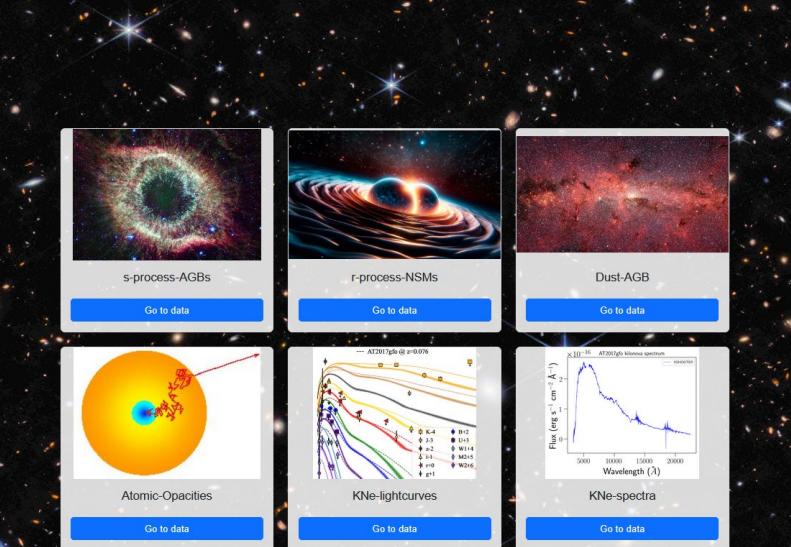
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Select Option:

FRUITY (Nucleosynthesis) **ph-FRUITY (Physics)**

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IAP Istituto Nazionale di AstroFisica
OAR Osservatorio Astronomico di Roma

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**Population synthesis study
Galactic chemical evolution
Surface Brightness Fluctuations**

Improving Physical Inputs

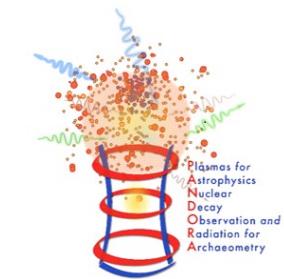
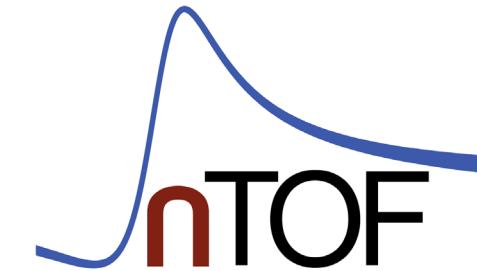
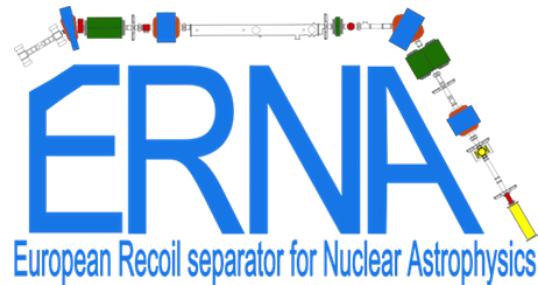
- Improving nuclear cross sections evaluation at astrophysical relevant energies

Improving Physical Inputs

- Improving nuclear cross sections evaluation at astrophysical relevant energies

GIANTS Collaboration

(Collaboration with INFN & ENEA)

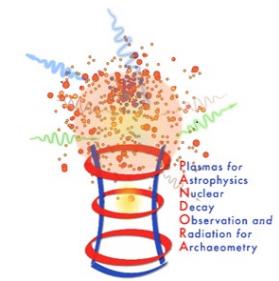
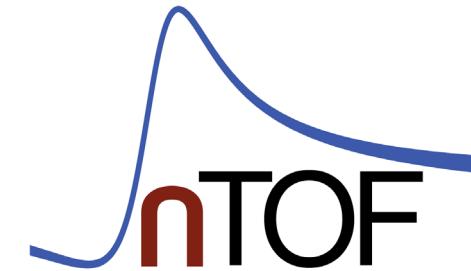
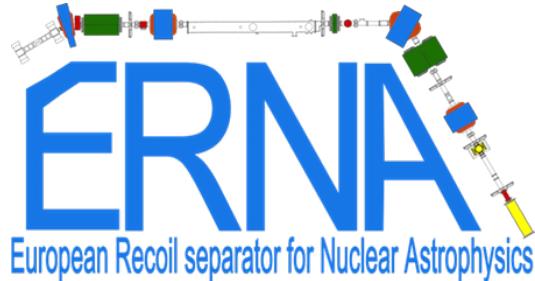


Improving Physical Inputs

- Improving nuclear cross sections evaluation at astrophysical relevant energies

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- Improving the treatment of stellar angular momentum evolution

Rotation affects:

T and ρ distribution

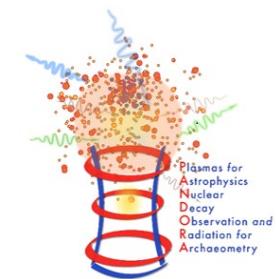
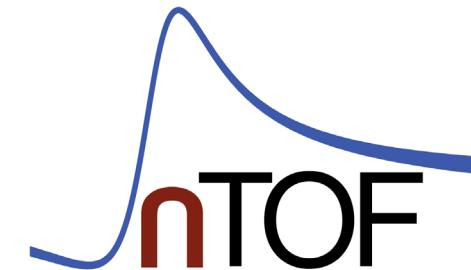
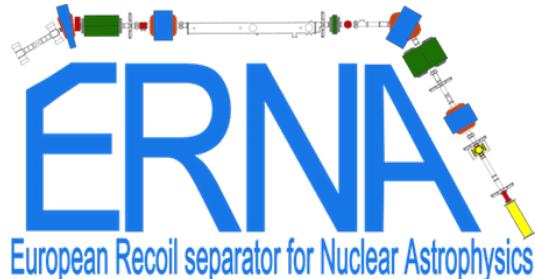
Chemical profiles

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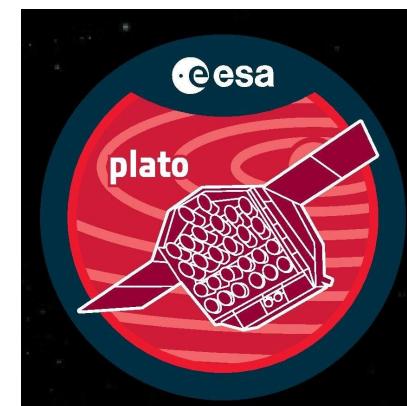
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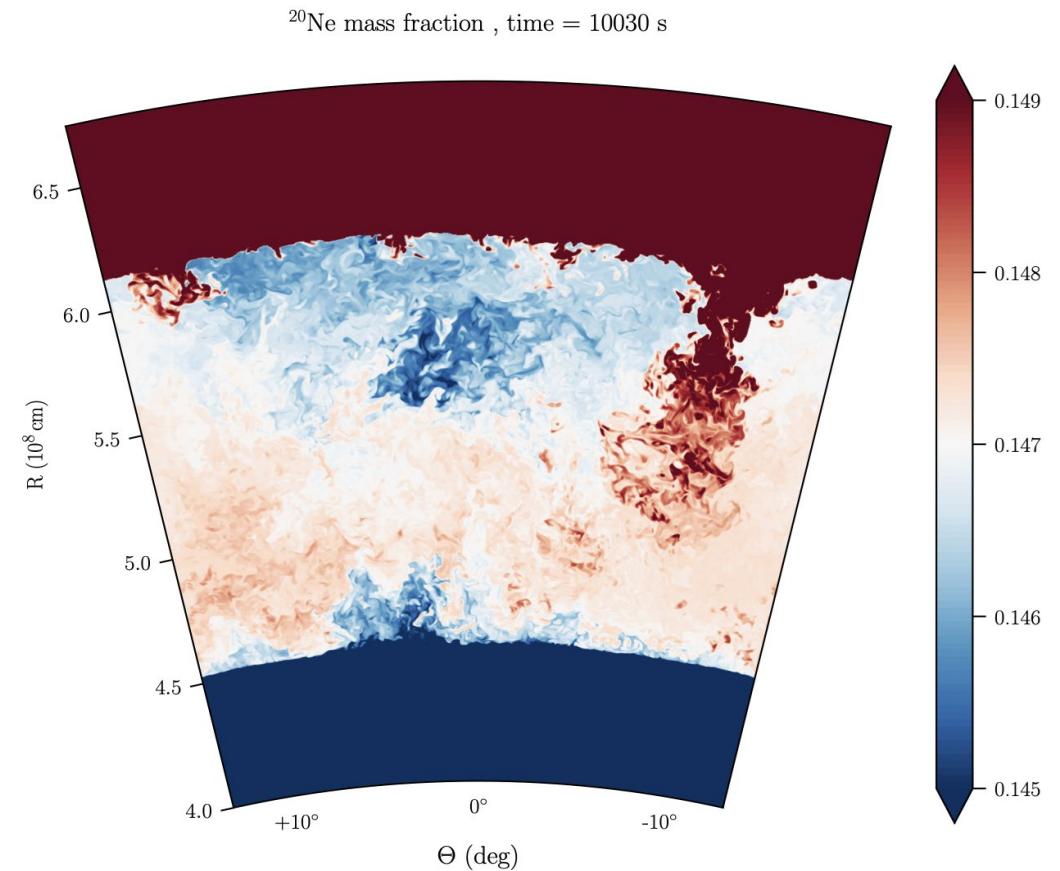
Asteroseismic observations



Improving Physical Inputs

- Developing 3D evolutionary models

Rotation and convection are intrinsically multidimensional phenomena

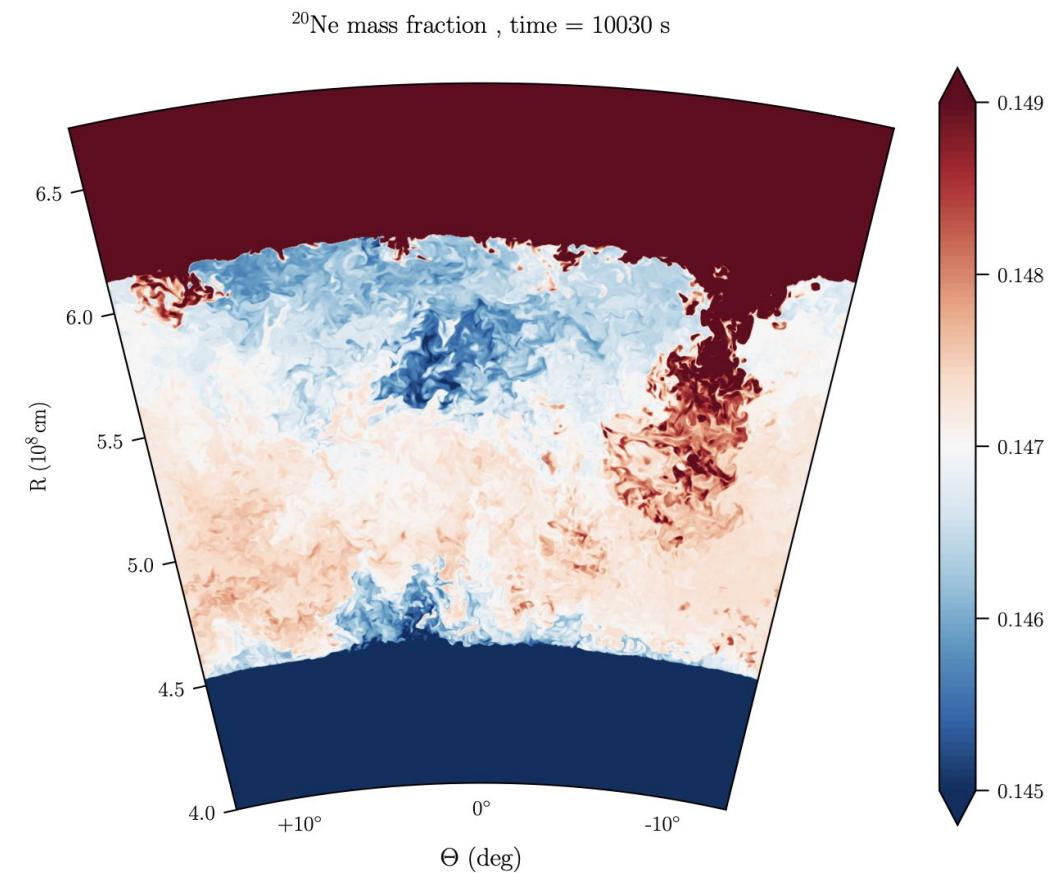


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- Developing 3D evolutionary models

Rotation and convection are intrinsically multidimensional phenomena

National Centre for HPC, Big Data and Quantum Computing



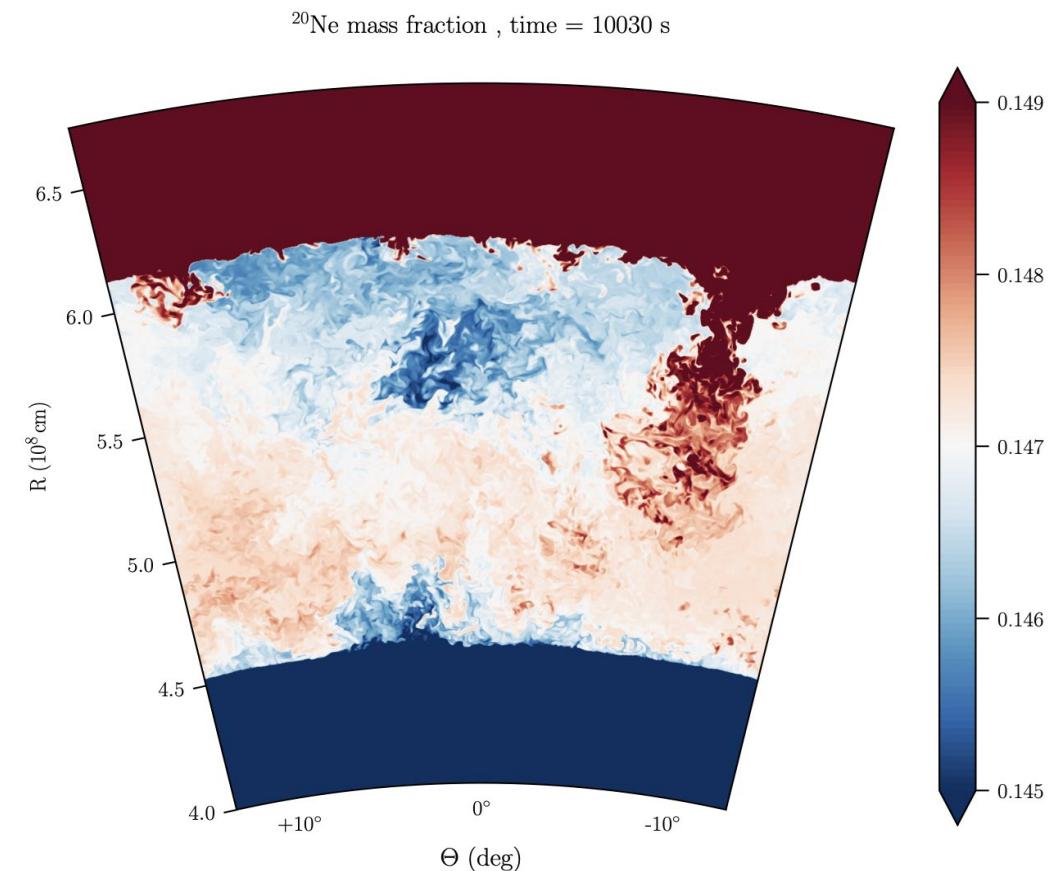
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3D simulations will be used to inform 1D model



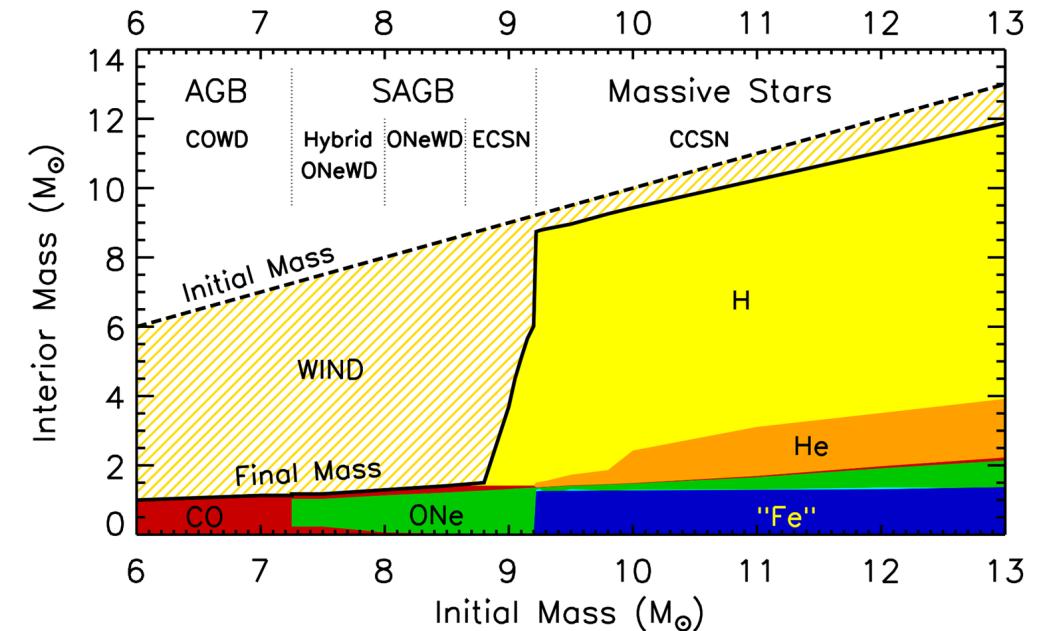
More accurate 1D computation

Improving Physical Inputs

- Understanding the physical mechanisms driving mass loss in different evolutionary phases

Initial-to-final mass relation

Yields from stars in the full range of mass



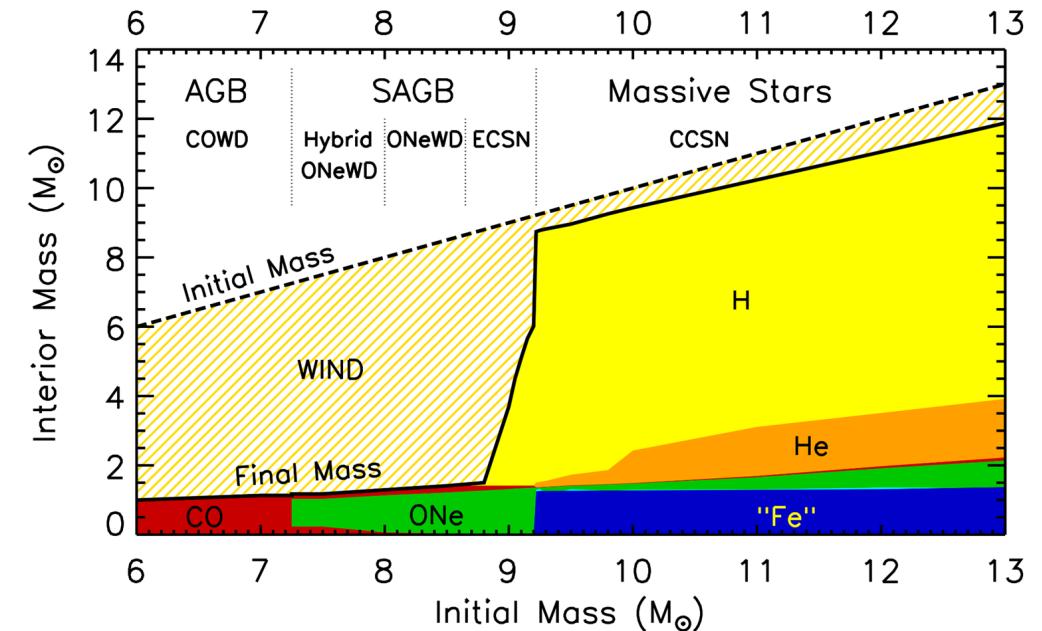
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→ Chemical evolution of galaxies



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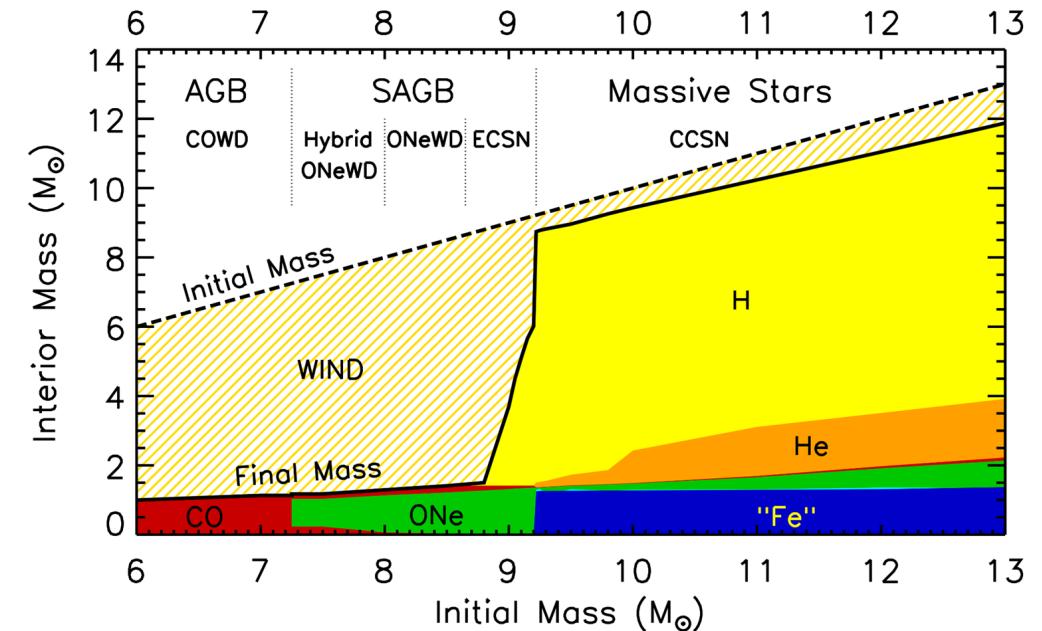
Yields from stars in the full range of mass

→ Chemical evolution of galaxies

IR, millimeter and radio observations of AGB and RGB stars, pulsating stars, O-type stars in MS

UV and X observations of material around exploding massive stars

JWST, ALMA, SKA, ELT, Spitzer, VLT, Rubin-LSST, SOXS, NTE, Athena



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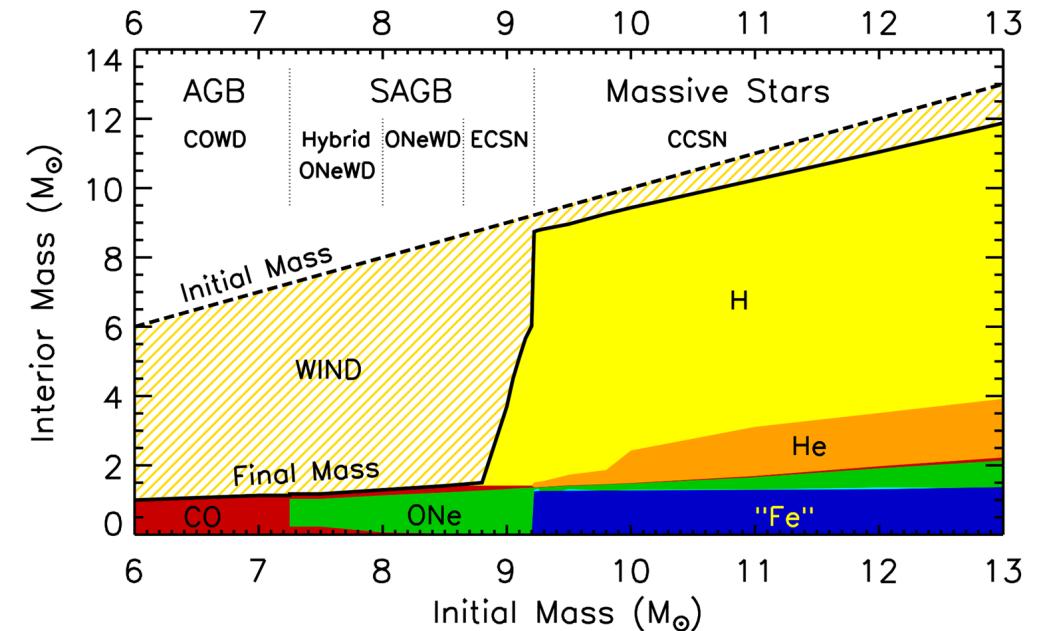
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Improving dust formation codes on the base of observations of dusty environments

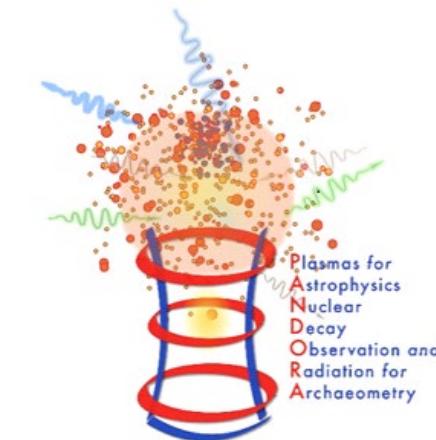


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Improving Physical Inputs

- Improving the description of stellar atmosphere

Optical properties of highly ionized species



Evaluation of more accurate boundary conditions for stellar models

Future Challenges

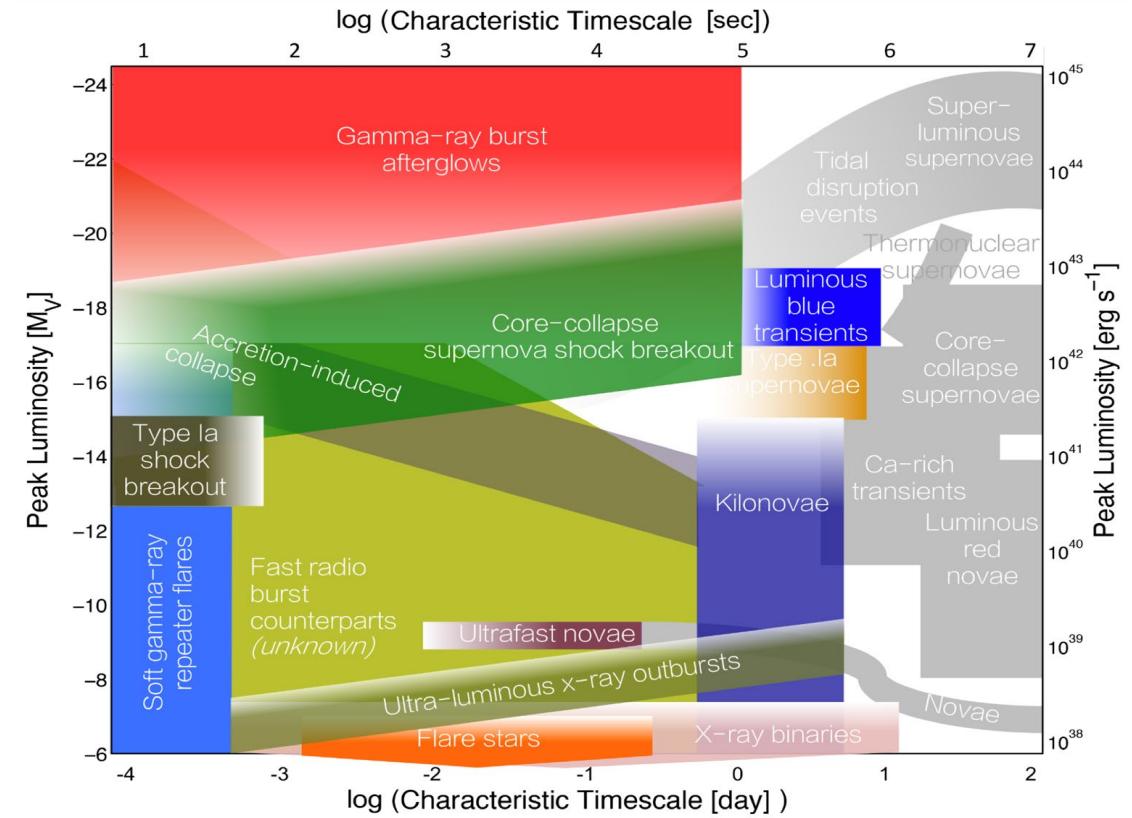
Large synoptic surveys, such as Rubin-LSST, will discover new classes of transient phenomena

What progenitors?

Physical properties

Explosive nucleosynthesis

Variability in binary systems



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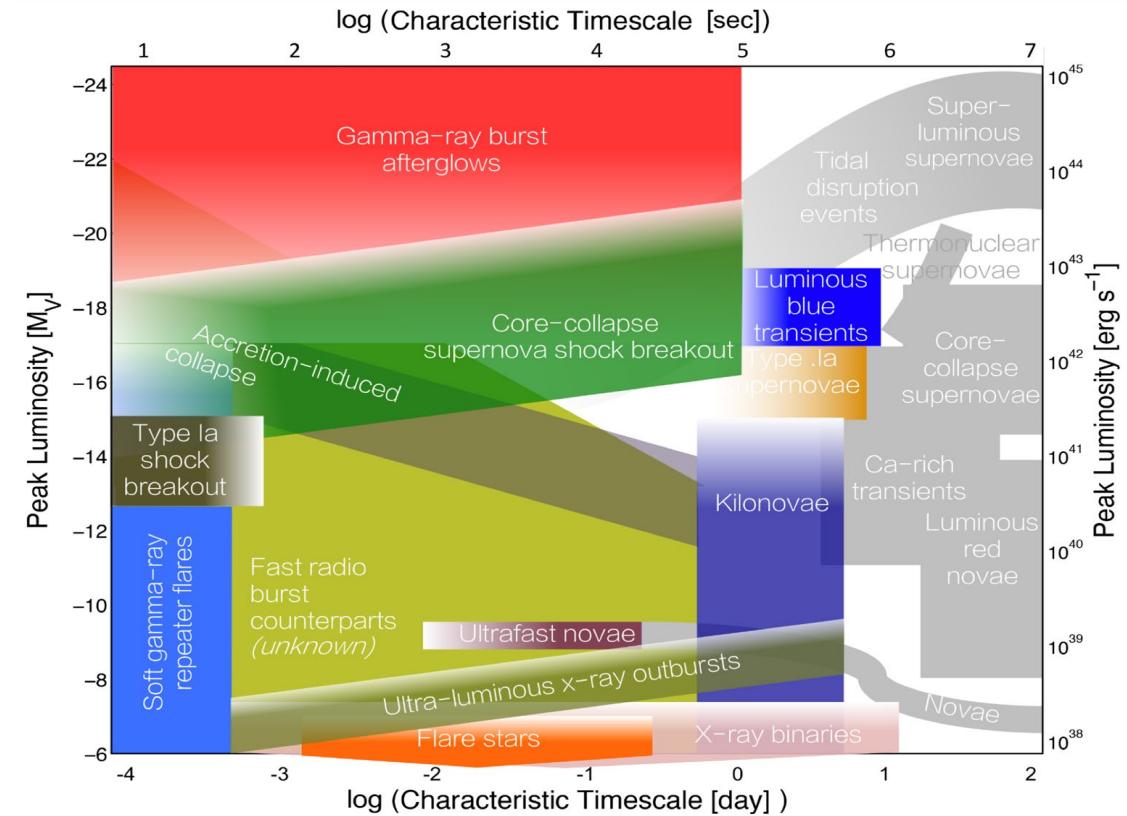
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Future instrumentations

Probing the reionization epoch



MeerKAT ASKAP

