This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101008324 (ChETEC-INFRA).

WP4 "Astronuclear HPC"

- Marco Pignatari – Konkoly Observatory/CSFK, Hungary
- WP4 main team: U. Battino (UHULL), J. Keegans (UKEELE), S. Martinet (ULB), A. Sanz (UPC), R. Hirschi (UKEELE), J. Jose (UPC), S. Goriely (ULB)

JRA2/WP4 Members and Status

- A) WP members, communication / coordination:
  - WP4 mailing-list = 37 members
- B) Status of staff hiring for the person-months inside this WP.
  - PDRA UHULL (2.0 years; until May 2024 @ U.Battino)
  - PDRA UKEELE (2.0 years; until March 2024 @ J. Keegans)
  - PDRA ULB (10 months; until February 2024 @ S. Martinet)
  - PhD UPC (4 years; started: October 2027 @ A. Sanz)
- C) Associated partners
  - University of York, University of Edinburgh

Marco Pignatari, Konkoly Observatory/CSFK, marco.pignatari@csfk.org, chetec-infra.eu

TASKS

- **Task 4.1** Stellar Nucleosynthesis Software Tools for Access to HPC (PI: R. Hirschi, UKEELE, participants: CSFK, UHULL)
- **Task 4.2** Nuclear Astrophysics Software Pipeline (PI: M. Pignatari, Konkoly/CSFK, participants: UKEELE, UPC, GUF, ULB, UPC, HZDR, York, Edinburgh)
- **Task 4.3** EXNUC Explosive Nucleosynthesis Codes (PI: J. José, UPC, participants: ULB, UKEELE)

Marco Pignatari, Konkoly Observatory/CSFK, marco.pignatari@csfk.org, chetec-infra.eu

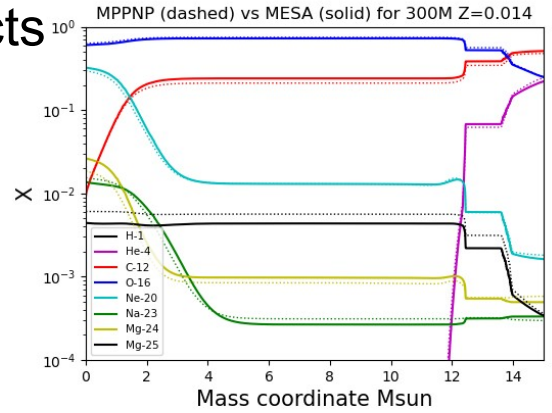
TASK 4.1

User Training and Online Training Course: HPC Nucleosynthesis Calculations

HPC UHull VIPER racks of nodes for computation

GOAL: provide the stellar nucleosynthesis tools and user-friendly support to access these capabilities within an HPC framework

Activity:
- ongoing training for 3 PhDs and 2 Postdoc
- training material on the **ChETEC-INFRA YouTube channel**
- broad spectrum of help and support activities for new and ongoing projects

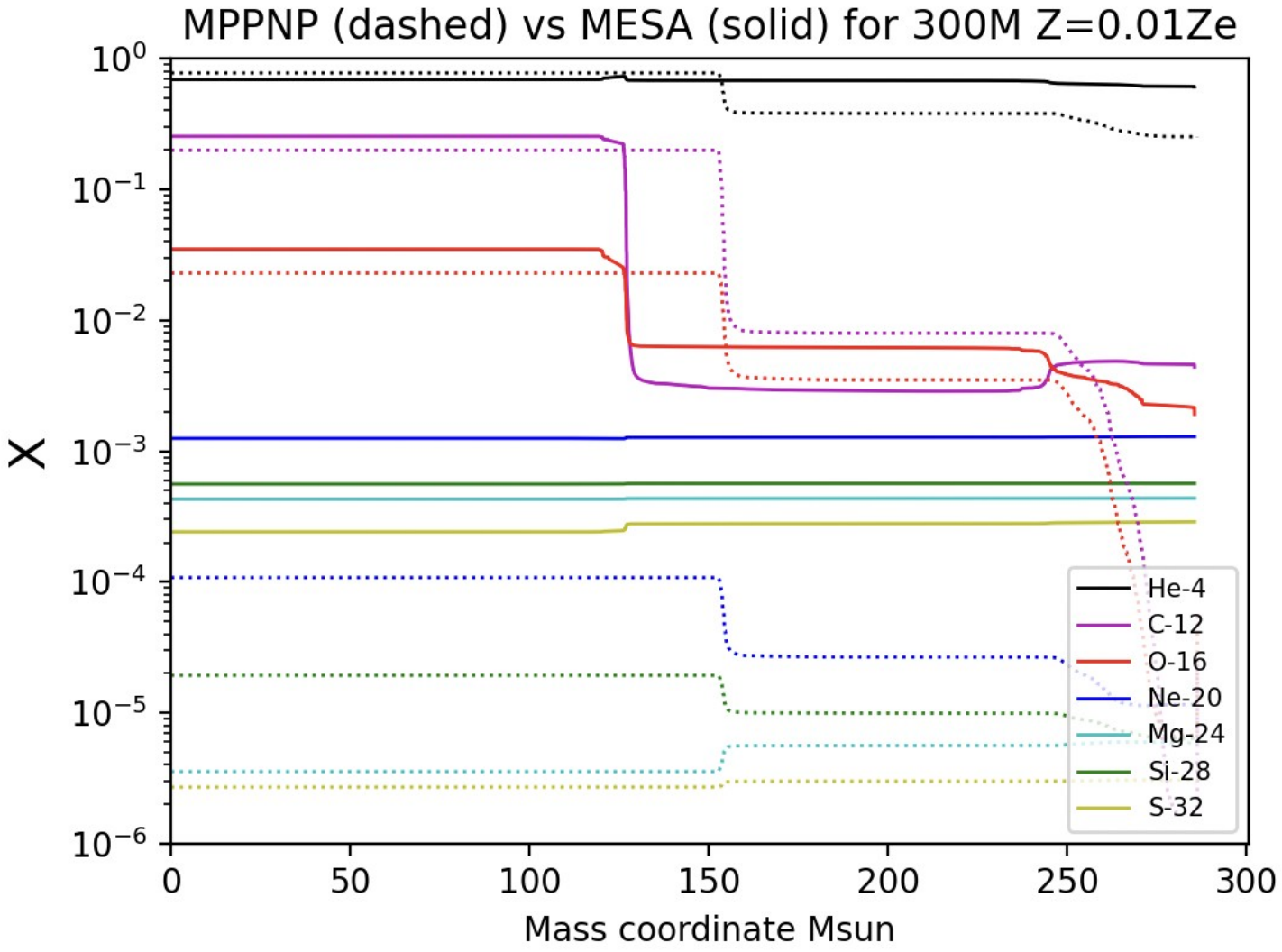


M=300Msun star, Z=0.014
Stellar model vs nucleosynthesis model
Step: Validation of the nucleosynthesis simulations – OK

@ PhD P. Fong - HPC simulations

@James's talk this afternoon!

TASK 4.1



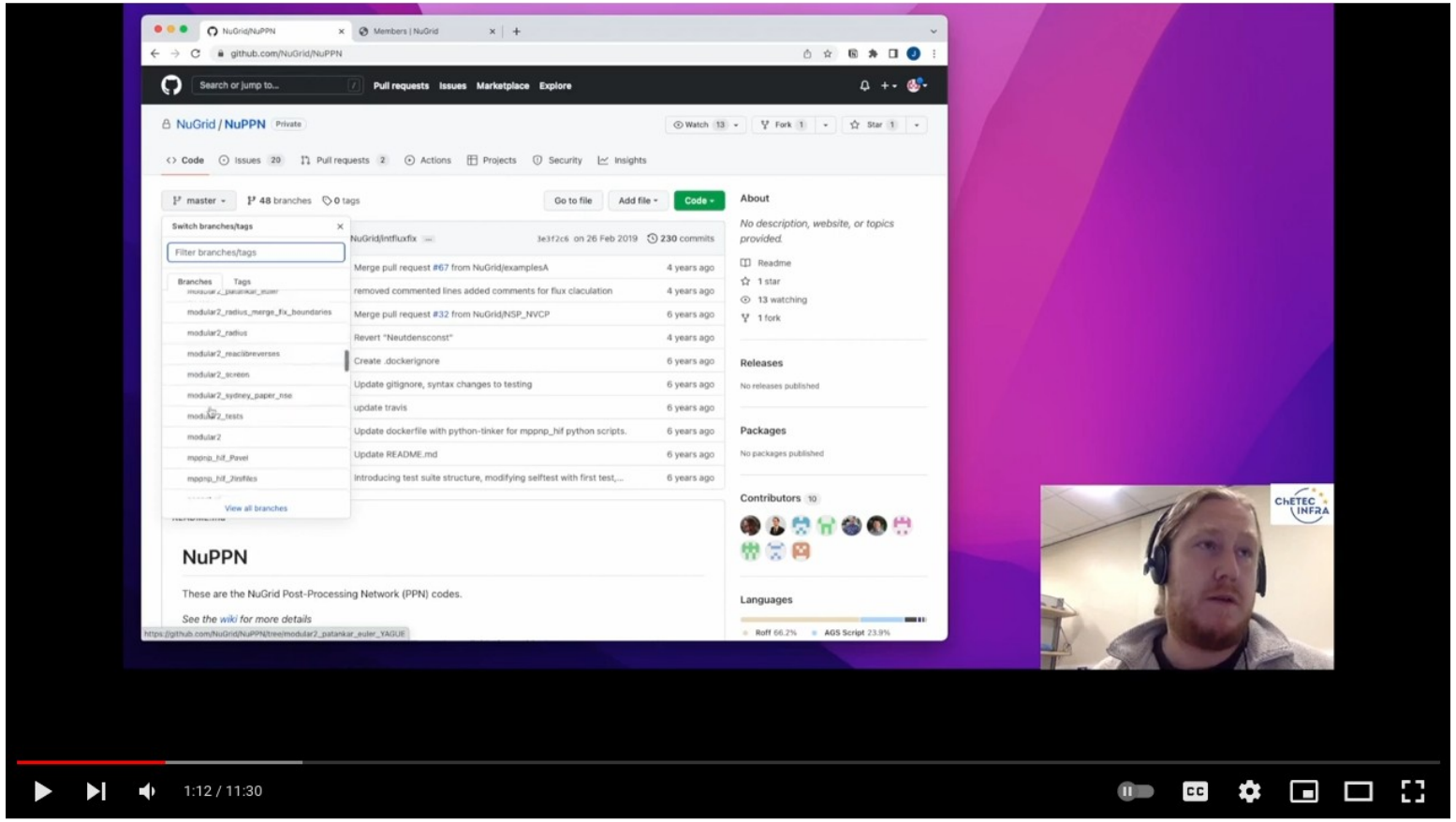
M=300Msun star, Z=0.00014
Stellar model vs nucleosynthesis model
Problem found! Find out what is the issue.

@ PhD P. Fong - HPC simulations

Problem solved!

Marco Pignatari, Konkoly Observatory/CSFK, marco.pignatari@csfk.org, chetec-infra.eu

TASK 4.1



Tutorials!

https://www.youtube.com/channel/UCB2SFPWEpNFeWZURED8PXZw/videos

Marco Pignatari, Konkoly Observatory/CSFK, marco.pignatari@csfk.org, chetec-infra.eu

TASK 4.2

Platform for the Exchange of Nuclear Astrophysics Data - ChANUREPS

GOAL: share and distribute new published nuclear reaction rates as open source and with the same simple format.

Tool: Wordpress software; hosted by Frankfurt Uni.

Activity:
- New nuclear rates available: 24+
- Link to major nuclear reaction libraries
- Portal: http://chanureps.chetec-infra.eu/

ChANUREPS

ChETEC AstroNUclear REPositorieS

How to use ChANUREPS?

Create your reaction rate file

Click below to download your template and fill it up with your data. Add as many rows as you want (temperature in GK, lower and upper limit rate at the level of 1 sigma, and median rate in $cm^3\ mol^{-1}\ s^{-1}$), just keep the same, standard, format. Please, if your reaction rate is of one of the nuclear reactions listed here, consider uploading your rate also in the MESA format.

Download "template"
rate_template-3.txt – Downloaded 58 times – 294.00 B

Upload your reaction rate

Use the contact form in the "Contact" section to contact the webmaster and request permission to have your rate uploaded. Please, do include the link to your published paper and any additional relevant information.

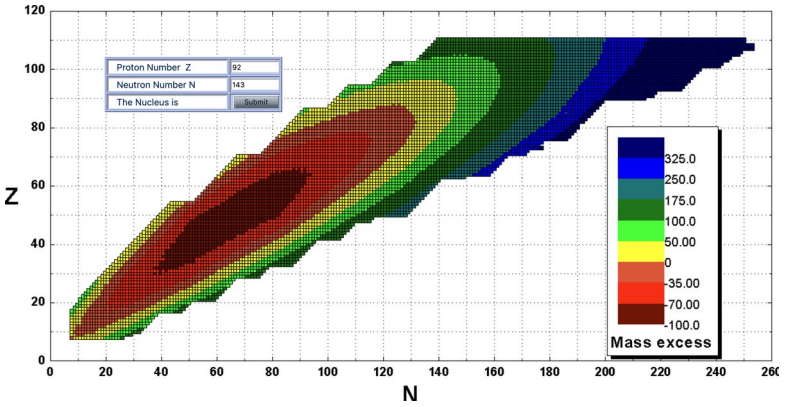
Download a reaction rate

Use the search engine below to find the rate you want, or click on the relevant category to browse by reaction type (e.g., click on 'p_g' to get a list of published (p,gamma) reactions).

Marco Pignatari, Konkoly Observatory/CSFK, marco.pignatari@csfk.org, chetec-infra.eu

TASK 4.2

The Brussels BRUSLIB nuclear library and the nuclear network generator NETGEN (ULB)



GOAL: Provide to the community an extended library of computed data of astrophysics relevance and a user-friendly nuclear network generator including experimental and theoretical rates

Activity:

- Update the sets of experimental nuclear reaction rates
- Update the theoretical library on the basis of state-of-the-art microscopic models
- Improve the website design
- Portal: http://www.astro.ulb.ac.be/pmwiki/IAA/NuclearData

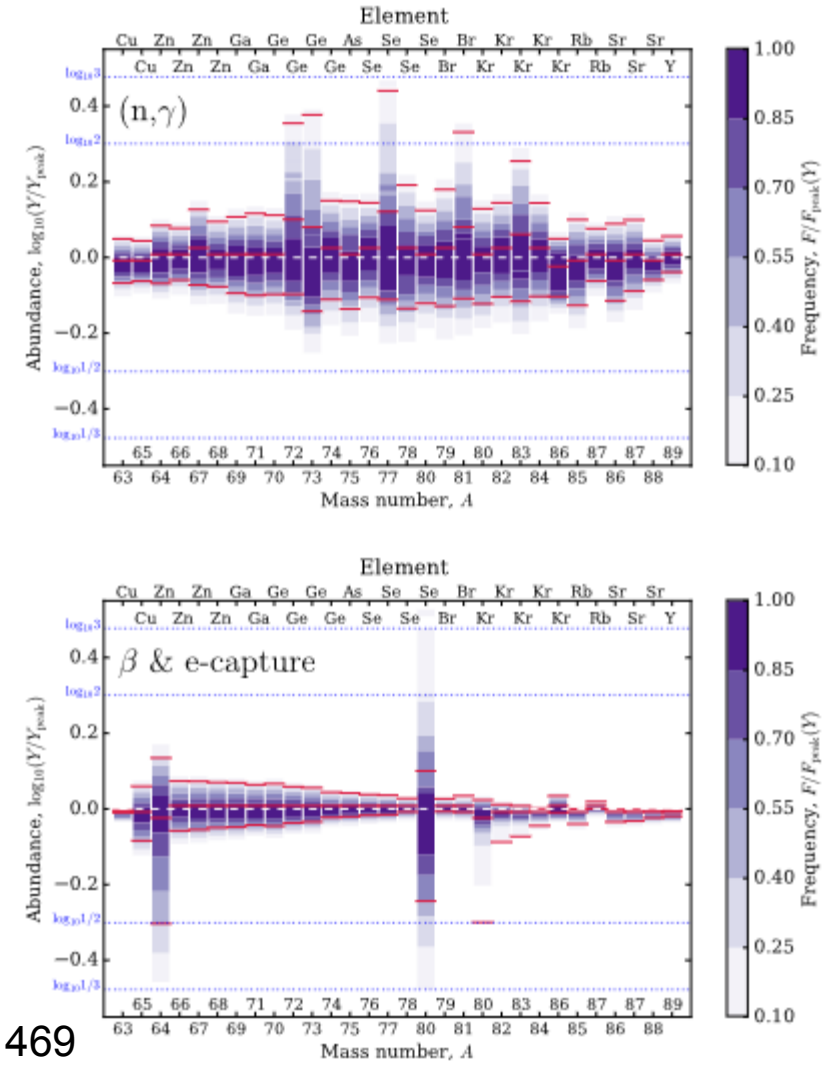
Sébastien's talk this afternoon!

TASK 4.2

Stellar Trajectories - ORChESTRA

GOAL: publish fully documented library of verified trajectories for nuclear astrophysics simulations, covering a wide range of stellar conditions.

Activity:
- Portal: https://zenodo.org/communities/chetec-infra-wp4
- Preliminary version with 4 published trajectories
- The nucleosynthesis for the s-process and Novae is covered
- More trajectories on preparation – coming soon



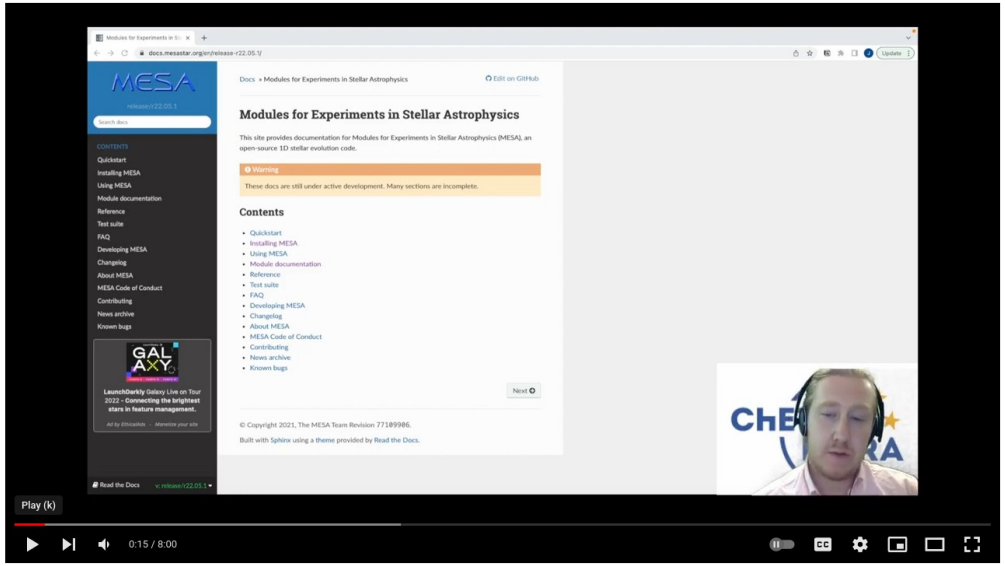
Nishimura+2017 MNRAS 469

TASK 4.3

Online Training Course: star and stellar explosion codes

GOAL: provide series of courses/video tutorials for stellar evolution simulations and hydrodynamics simulations for stellar explosions

Activity:
- 2 tutorials published for the stellar code **MESA**:
  - Massive stars
  - How to write output suitable for post-processing
- 3 tutorials in preparation:
  - low mass AGB and data handling (**MESA**)
  - setting up the **FLASH** code.
- coming soon: more tutorials using **SPHINX** and **FLASH**
- training on the **ChETEC-INFRA YouTube channel**



https://www.youtube.com/channel/UCB2SFPWEpNFeWZURED8PXZw/videos

Marco Pignatari, Konkoly Observatory/CSFK, marco.pignatari@csfk.org, chetec-infra.eu

Deliverable status

- **D4.1: First online training course on the use of stellar evolution and explosion codes and software tools for data anaAlysis active on ChETEC-INFRA web page (12 months, UKEELE). [Deliverable ready & submitted on time]**
- **D4.2: Platform where nuclear astrophysics data can be exchanged online on the ChETEC-INFRA web page (12 months, UHULL). [Deliverable ready & submitted on time]**
- **D4.3: Publication online of the first version of the library of stellar trajectories as github repository, and make available the list of nuclear reactions identified with high priority for the community (12 months, UHULL/UPC). [Deliverable ready & submitted on time]**
- **D4.4: Review simulations done in the first two years, and report on project web page the list of simulations made and resulting publications (24 months, UKEELE) [Deliverable ready & submitted a week late]**
- **D4.5: User forum active for support and Q&A (24 months, UHULL) [Deliverable ready & submitted on time].**
- **D4.6: Review stellar simulations, and report on project web page the list of simulations made and resulting publications (36 months, UKEELE).**
- **D4.7: Report on sustainability of web platforms beyond the end of the project (42 months, UKEELE)**
- **D4.8: Review simulations done in years 3-4, and report on project web page the list of simulations made and resulting publications (48 months, UKEELE).**

Marco Pignatari, Konkoly Observatory/CSFK, marco.pignatari@csfk.org, chetec-infra.eu

Outlook

- About 30 refereed publications related to WP4 activities carry the ChETEC-INFRA acknowldegements;
- Person-power covered by ChETEC-INFRA until the end of year 3, a PhD running for the all duration of the project;
- D4.6 (and possibly D4.8) should not be a problem;
- Potential issue with D4.7: no source of funding identified so far in the long-term to support the open-source tools developed/supported within WP4. Not included in SpaceSciRI.

Marco Pignatari, Konkoly Observatory/CSFK, marco.pignatari@csfk.org, chetec-infra.eu