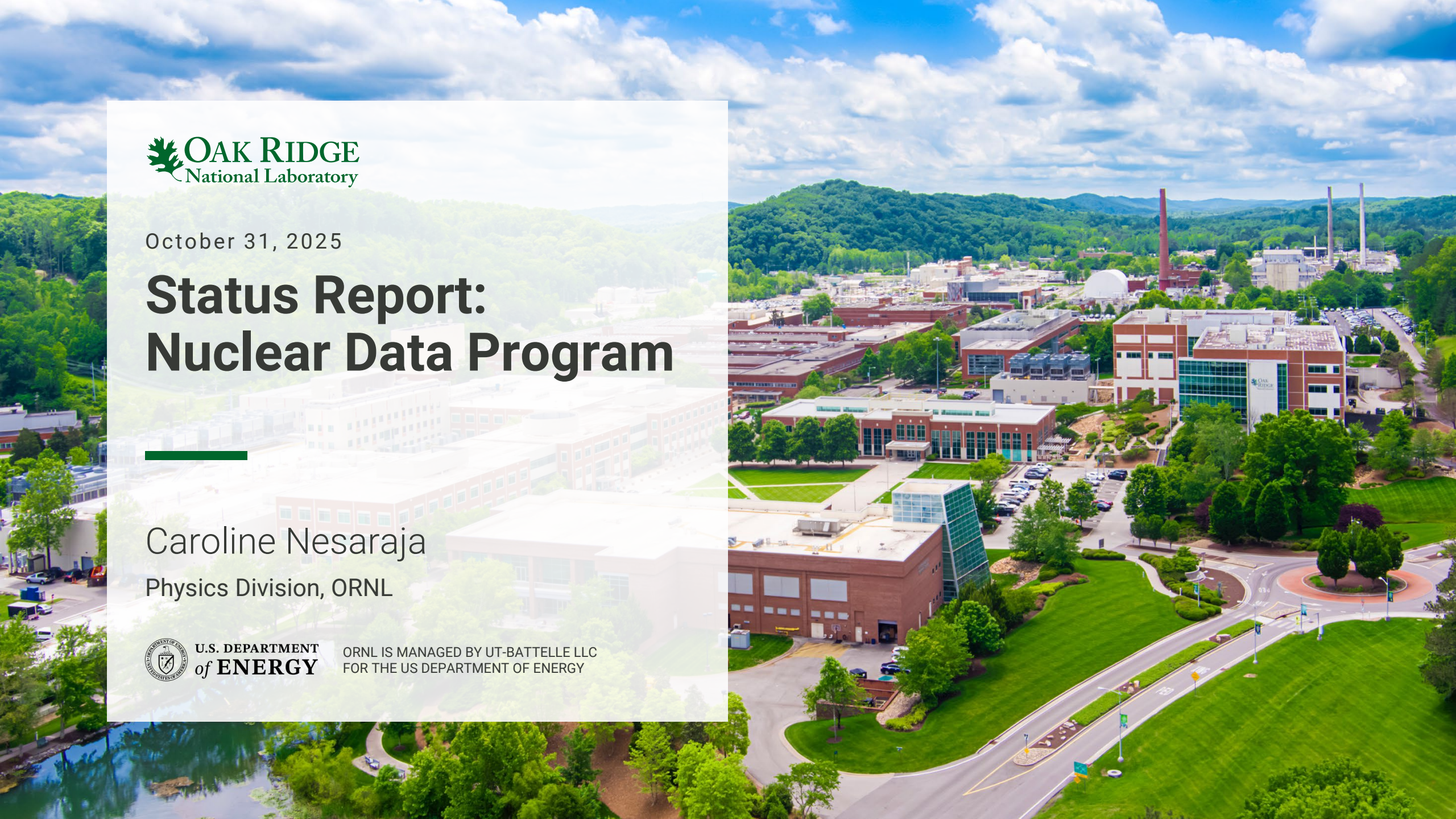

OAK RIDGE National Laboratory

October 31, 2025

Status Report: Nuclear Data Program

Caroline Nesaraja

Physics Division, ORNL

U.S. DEPARTMENT of ENERGY

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Members and Scope of Activities

- Augusto Macchiavelli: (0.1 FTE)

  Group Leader Nuclear Structure and Nuclear Astrophysics, PI Nuclear Data Program

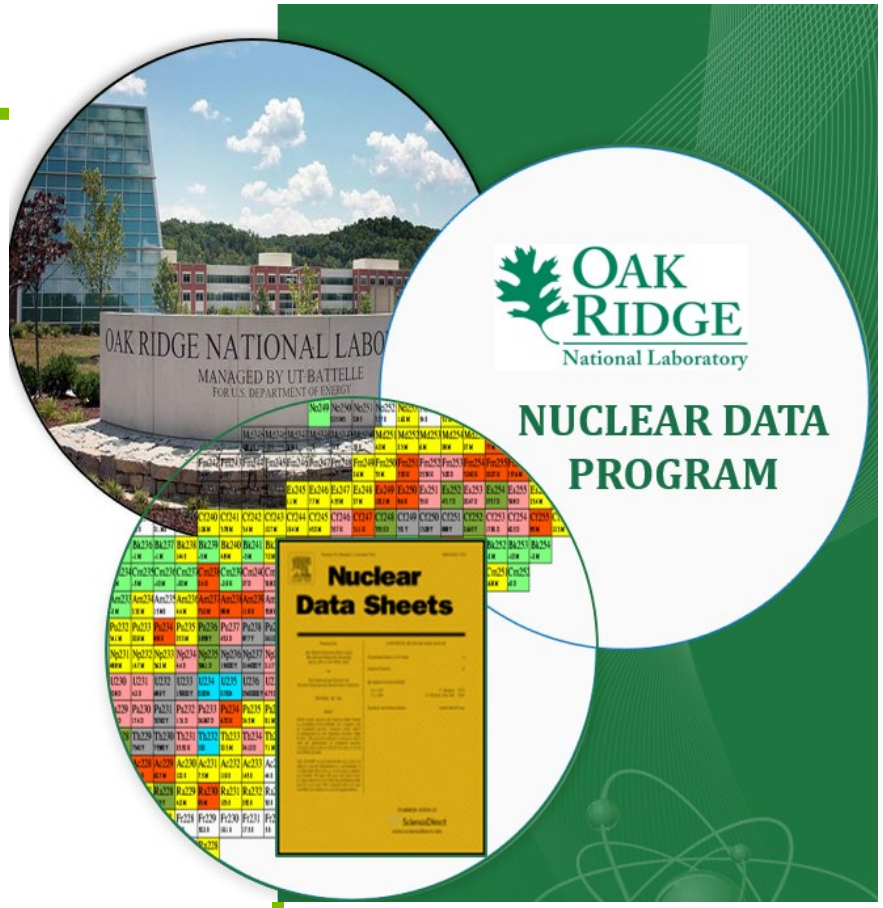
- Caroline Nesaraja: (1.0 FTE)

  Research Staff Member - ENSDF evaluator, Co-PI Nuclear Data Program

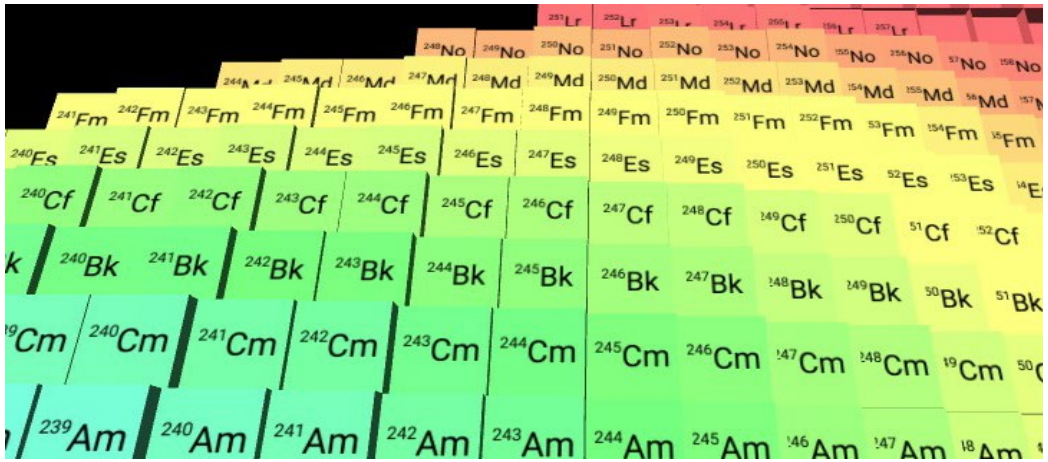
- Larry Zhang : (0.1 FTE)

  Student - nuclear astrophysics data

  (~2020- May 2025)



Nuclear Structure Data ENSDF Evaluations:



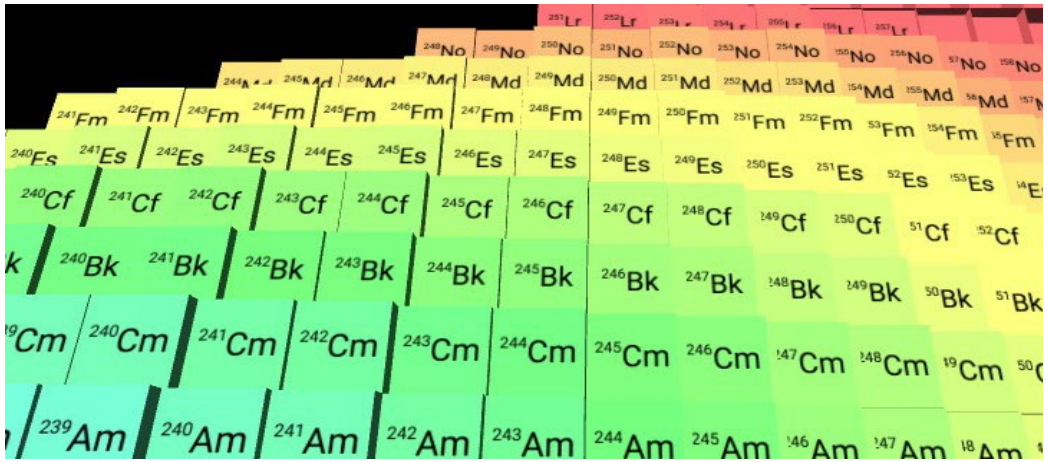
ORNL responsibility: A= 241-249
A = 69

Status of these mass chains

Mass Chain	Current ENSDF Database (from NNDC website)	
241	C.D. Nesaraja. NDS 130, 183 (2015)	(Lit cut-off Sept. 2015)
242	M.J. Martin & C.D. Nesaraja. NDS 186, 263 (2022)	(Lit cut-off Dec. 2021)
243	C.D. Nesaraja & E.A. McCutchan. NDS 121, 695 (2014)	(Lit cut-off Sept. 2013)
244	C.D. Nesaraja. NDS 146, 387 (2017)	(Lit cut-off Aug. 2017)
245	C.D. Nesaraja. NDS 189, 1 (2023)	(Lit. cut-off Feb. 2023)
246	C.D. Nesaraja. NDS 198, 449 (2024)	(Lit. cut-off Jul. 2022)
247	C.D. Nesaraja. NDS 125, 395 (2015)	(Lit. cut-off Mar. 2014)
248	C.D. Nesaraja. NDS 204, 374 (2025)	(Lit. cut-off June.2024)
249	C.D. Nesaraja. NDS 195, 718 (2024)	(Lit. cut-off Oct. 2023)
69	C.D. Nesaraja. (submitted to NNDC post editorial review)	(Lit. cut-off Apr. 2023)

Nuclear Structure Data ENSDF Evaluations:

Three mass chains were completed in various stages of the ENSDF pipeline process:



- **A=248** (C.D. Nesaraja)— 11 nuclides completed: responded to editorial comments and *published*.

- **A=69** (C.D. Nesaraja) — 13 nuclides completed: responded to reviewer and editorial comments and submitted to NNDC.

- **A=58** (B. Singh , C.D. Nesaraja) — 13 nuclides submitted to NNDC as a new mass chain

- **Updated ^{249}No** (communication with co-author of Eur. Phys.J. A 58, 52 (2022) for the ^{253}Rf α decay)

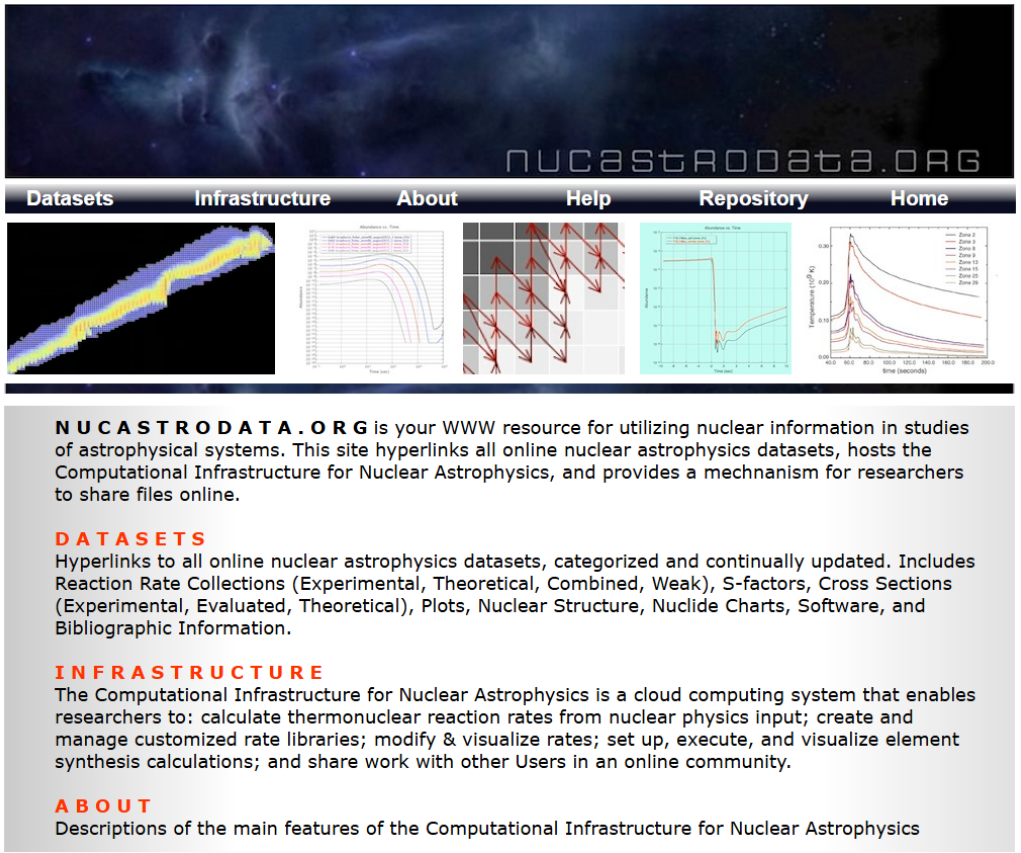
- **Reviewed** one mass chain -16 nuclides

Computational Infrastructure for Nuclear Astrophysics Data

- *Pipeline for processing nuclear physics results into astrophysical models*
- *Users in over 150 institutions in 38 countries:*

Algeria, Argentina, Australia, Austria, Canada, Chile, China, Croatia, Cyprus, Denmark, Finland, France, Germany, Ghana, Greece, Hungary, India, Israel, Italy, Japan, Jordan, Malaysia, Mexico, Nepal, Poland, Romania, Serbia, Slovakia, South Africa, South Korea, Spain, Sweden, Switzerland, The Netherlands, Turkey, United Kingdom, United States, Venezuela

- *Used for guiding future experiments via sensitivity studies, estimates of impacts for experimental proposals, determining impact of measurements, uncertainty quantification …*
- *Future of CINA : Still under discussion!!!*



Monte Carlo Routines for Quantifying Nova Nucleosynthesis Sensitivity to Hydrodynamic and Nuclear Rate Uncertainties

Motivation

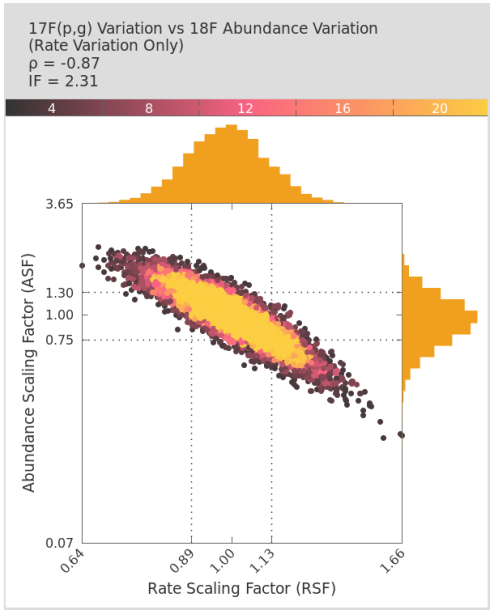
- Many studies exist where *either* hydrodynamics *or* nuclear rate parameters are treated as the inputs of interest for nova nucleosynthesis uncertainty quantification.
- This leads to potential cases where a nuclear rate parameter change that looks impactful, might be less so when a broader (but still realistic) range of hydrodynamic scenarios are considered (or vice-versa).
- Motivate new research by providing guidance as to which nuclear measurements might have the most impact for nova simulations

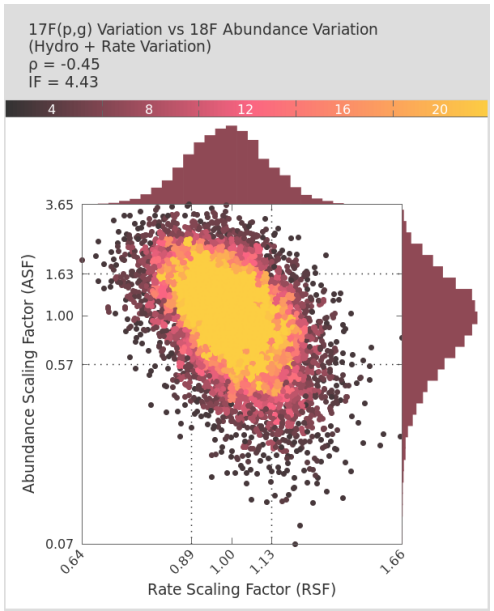
Goals

- Develop robust, realistic methods to parametrize hydrodynamic profiles and nuclear reaction rates for nova nucleosynthesis Monte Carlo simulations.
- Run large batches (10k) of simulations to determine effects of varying these parameters on radioisotope production.
- Use known metrics/create new metrics to quantify impact and correlations between various hydrodynamic/nuclear rate variations and isotope final abundance.

Results

- First-of-its-type MC routine that combines both types of variations, for more accurate quantification
- Updated list of nuclear reactions that are considered impactful for production of key radioisotopes
- Use metrics to determine effects of reducing *any* given nuclear rate uncertainty for nova nucleosynthesis simulations, accounting for hydrodynamic uncertainty





OAK RIDGE National Laboratory

Publications

1. C.D. Nesaraja

Nucl.Data Sheets 204, 374 (2025)

Nuclear Data Sheets for A=248

2. Stepaniuk, M., *et. al*.

Phys.Rev. C 110, 054321 (2024)

Decay studies of the β-delayed neutron emitters ^{87}Br and ^{88}Br measured by means of the Modular Total Absorption Spectrometer at ORNL HRIBF

3. C.D. Nesaraja

Nucl.Data Sheets 198, 449 (2024)

Nuclear Data Sheets for A=246