

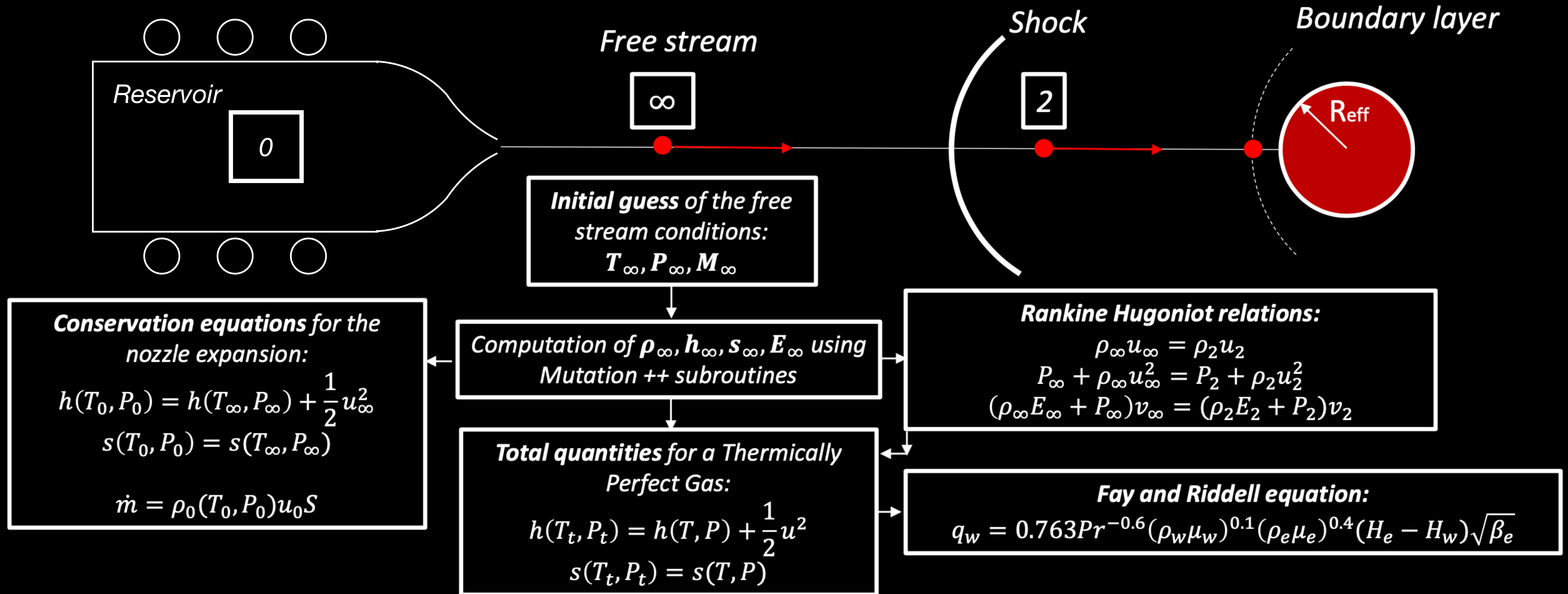
Logo by Stefano Boccelli

# >> The CABARET code

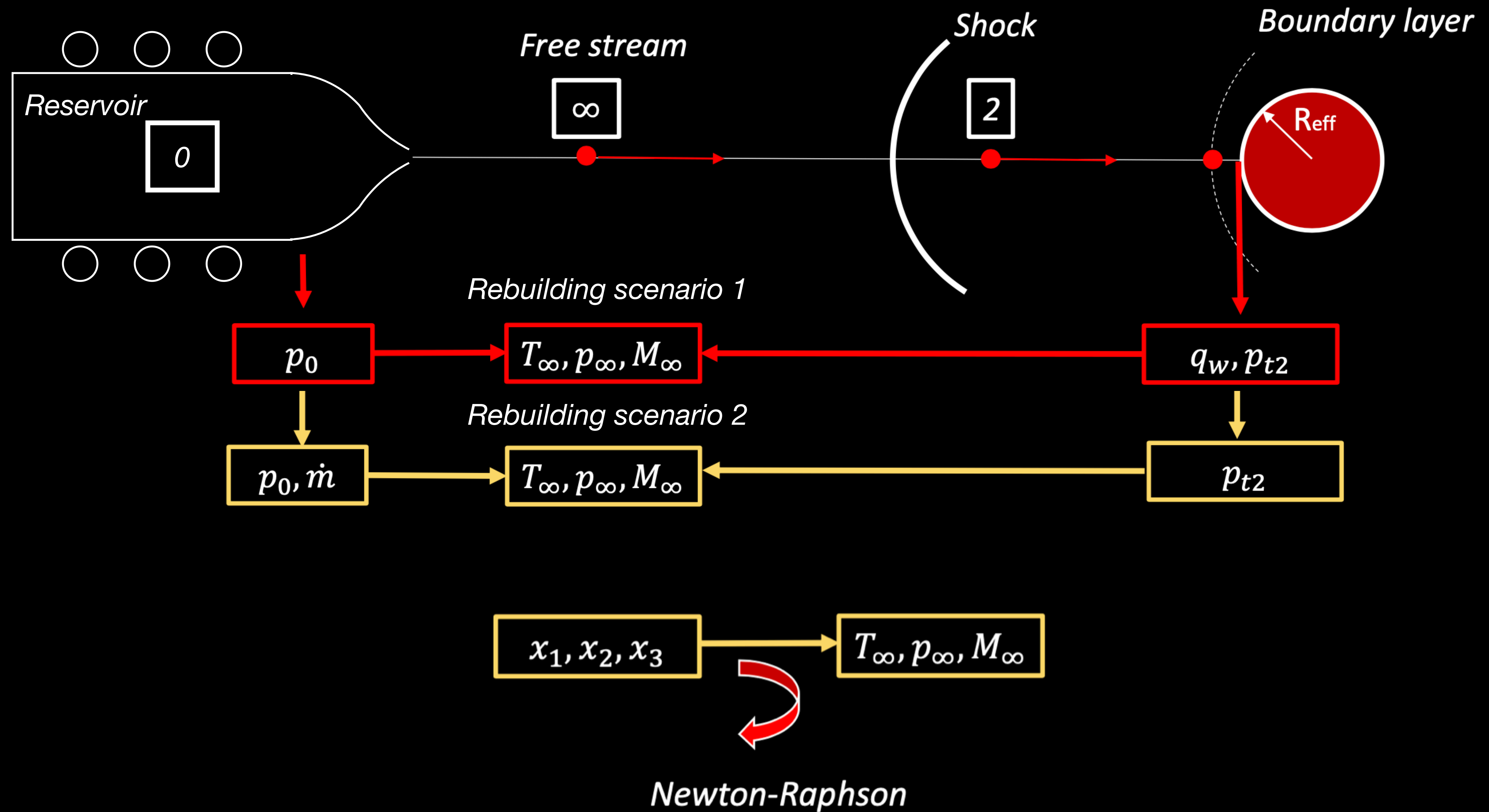
>> Rebuilding of free stream conditions in supersonic/hypersonic high enthalpy and plasma facilities

Anabel del Val (from home), ATC REG, 8 February 2021

# >> Conservation Balance equation code for Atmospheric Entry



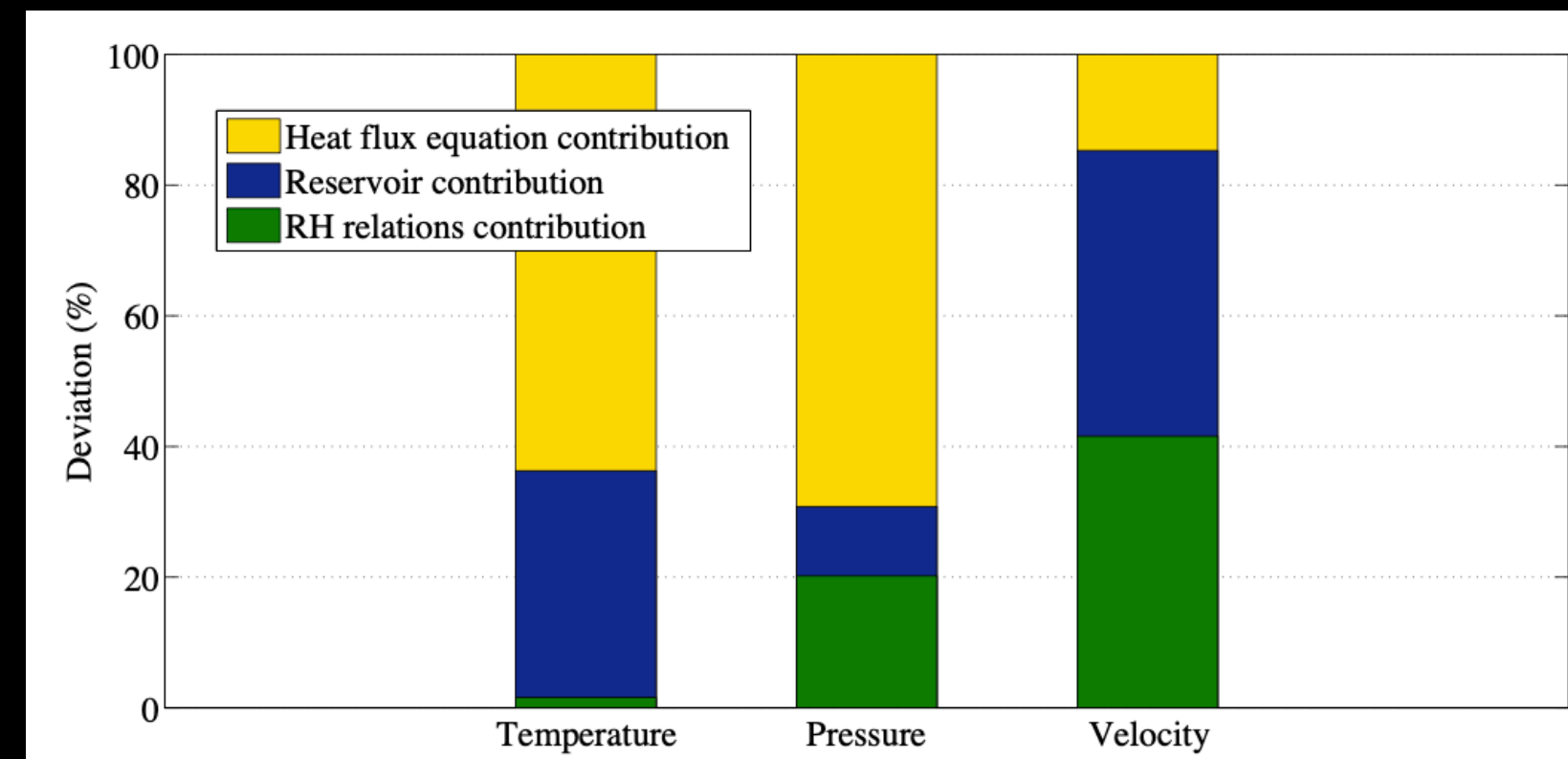
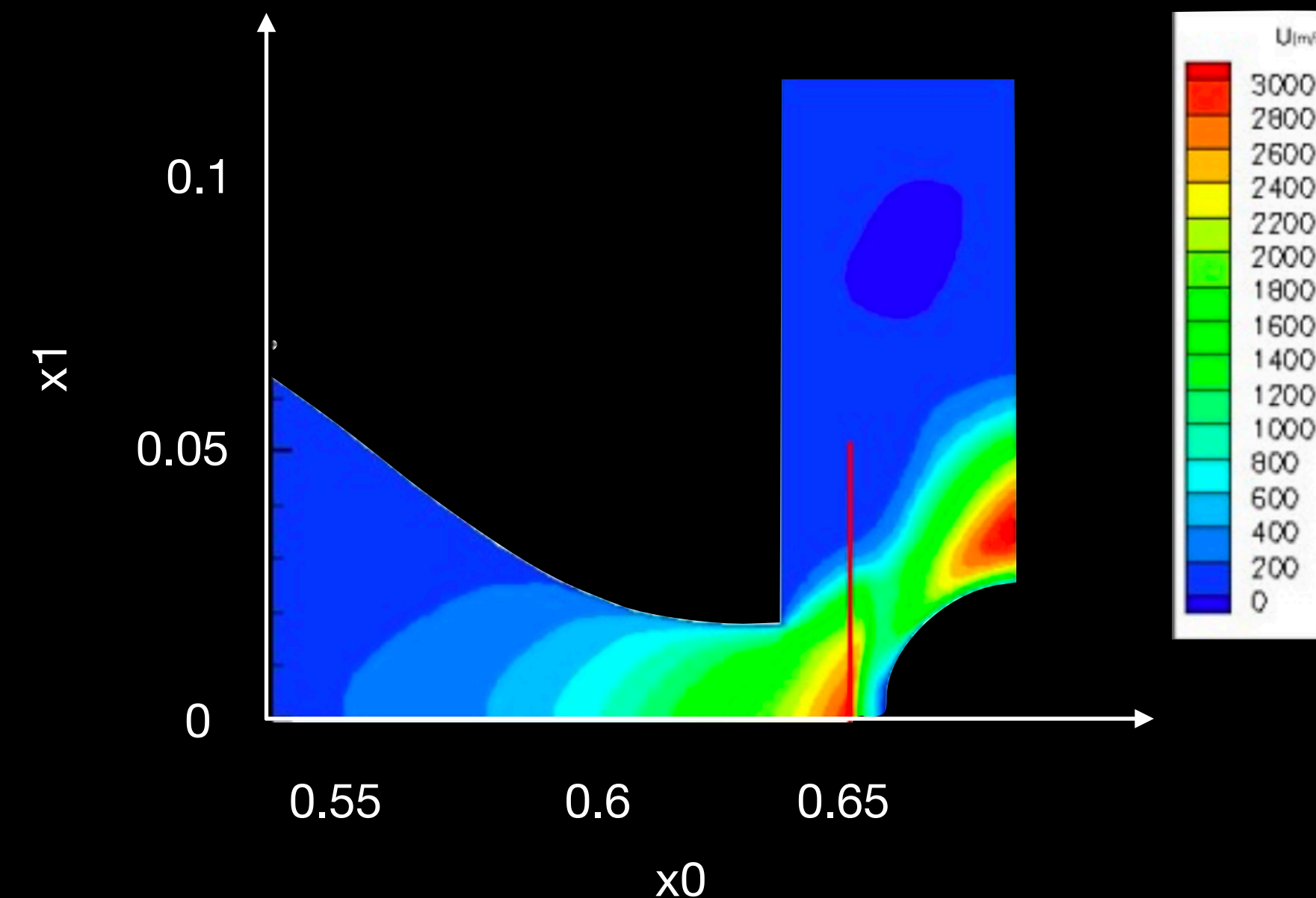
## >> Rebuilding procedure



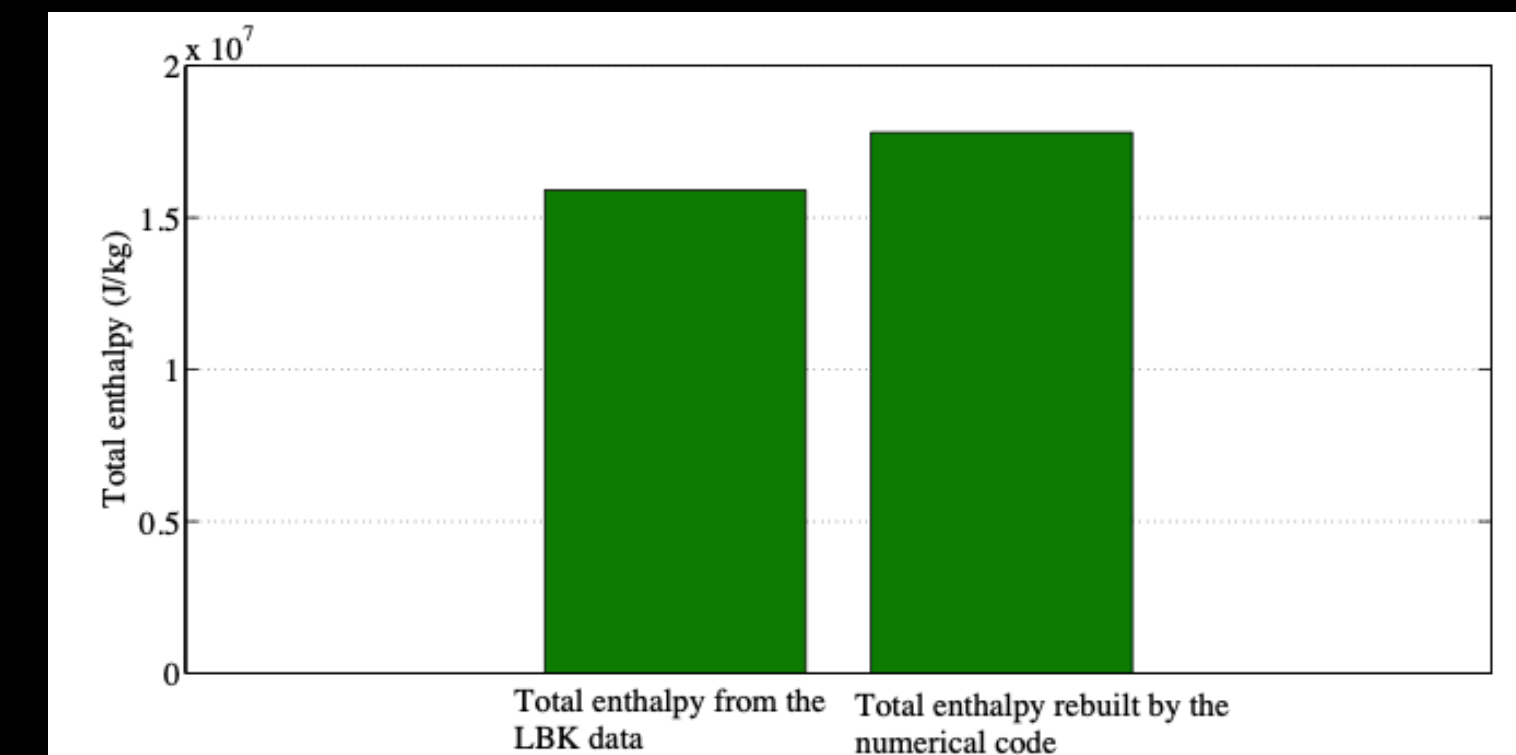
>> Works that used CABARET

>> Characterization of Ground Testing Conditions in High Enthalpy and Plasma Wind Tunnels for Aerospace Missions (MSc with UPM)

ICP code



DLR arc-jet data



Radius: 25 mm, plasma power: 100kW, mass flow: 5 g/s, res. pressure: 13170 Pa

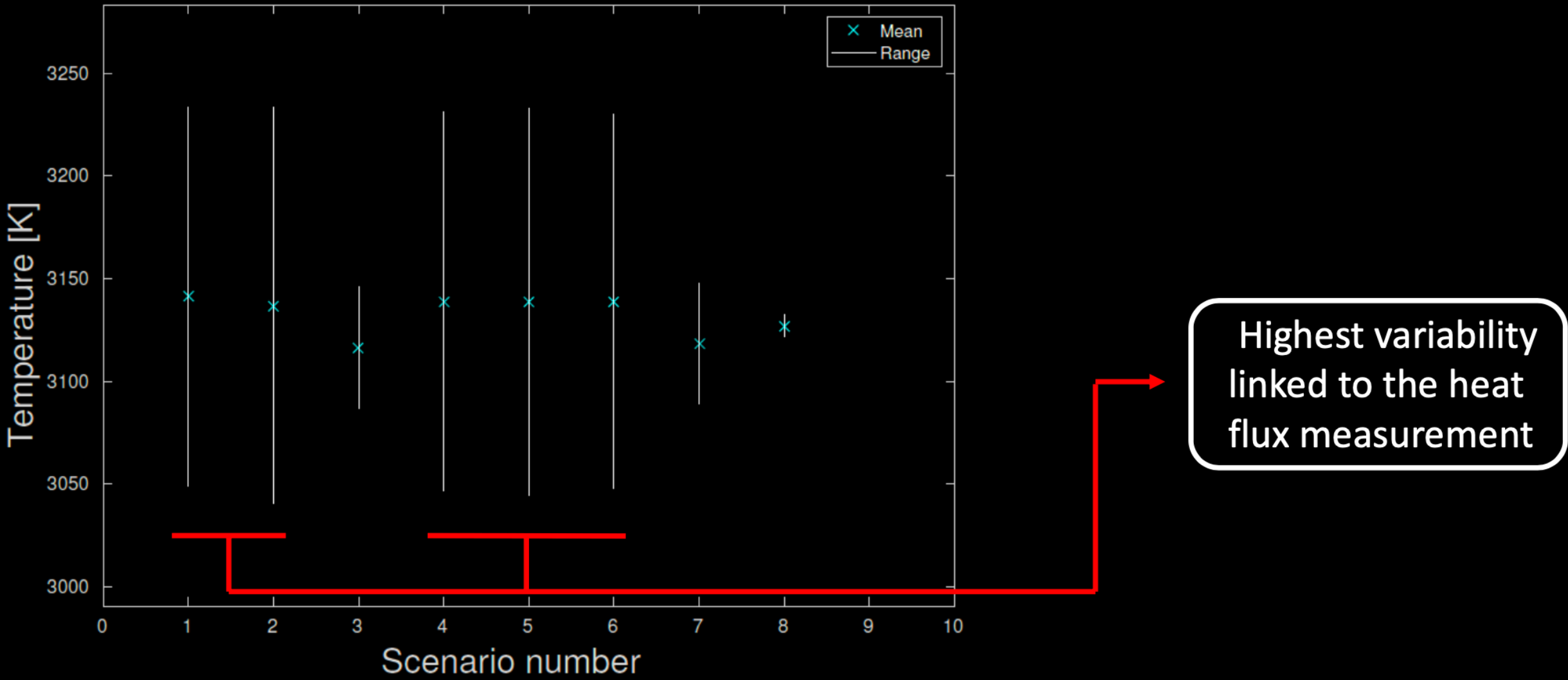
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>> Uncertainty Assessment on the Characterization of Testing Conditions in Arc-jet Facilities (ESA TRP CHEF)

N	Scenario	P-S temp [K]	$H_t$ [MJ/kg]
1	$q_w, p_{t2}, p_0$	5767	14.1
2	$q_w, p_0, T_0$	5923	15.75
3	$p_{t2}, p_0, T_0$	5981	15.74
4	$q_w, p_{t2}, \dot{m}$	5768	14.02
5	$q_w, T_0, \dot{m}$	5924	15.76
6	$q_w, p_0, \dot{m}$	5947	16.05
7	$p_{t2}, T_0, \dot{m}$	5982	15.76
8	$p_{t2}, p_0, \dot{m}$	6016	16.06

N	Scenario
1	$q_w, p_{t2}, p_0$
2	$q_w, p_0, T_0$
3	$p_{t2}, p_0, T_0$
4	$q_w, p_{t2}, \dot{m}$
5	$q_w, T_0, \dot{m}$
6	$q_w, p_0, \dot{m}$
7	$p_{t2}, T_0, \dot{m}$
8	$p_{t2}, p_0, \dot{m}$





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>> Several STP students working on: UQ, supersonic Plasmatron rebuilding, Longshot rebuilding, QARMAN testing conditions extrapolation

>> Used as tool to teach basic UQ propagation problems as well as basic rebuilding theory

>> Ideas for improvements/extensions

>> Migrate it to Python: vast access to readily available libraries for solving inverse problems, Bayesian Inference etc



>> Use of the Nelder-Mead algorithm instead of Newton-Raphson for robust computation of free stream

>> Update Fay and Riddell heat flux correlation with coefficients derived from stagline simulations

>> Implement thermal non-equilibrium conditions through Mutation++

<https://sync.vki.ac.be/high-temperature-codes/cabaret.git>