Combustion Analysis Report

Input Parameters:

Fuel: Propane (C3H8)

Initial temperature (T): 800.0 K

Pressure (P): 2.0 atm

Equivalence ratio (phi): 1.0

Grid Size (NxN): 4x4

Oxidizer: Air

Calculation Statistics:

Total points calculated: 16

Total calculation time: 392.04 seconds

Outlier Compensation Settings:

Parameters used for outlier compensation:

Parameter	Threshold	Multiplier
T_ad	3500.0	3.0
ignition_delay	100000.0	3.0
flame_speed	100.0	3.0
NOx	20000.0	3.0
CO	75000.0	3.0
CO2	200000.0	3.0

Advanced Simulation Settings:

Configured parameters for simulation mechanisms:

Parameter	Value	Unit
ignition_end_time	0.1	s
ignition_temp_threshold	100	K
ignition_detection_method	max_dTdt	
ignition_detection_species	OH	
flame_width	0.05	m

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Results directory: C:\Users\warsa\Desktop\6SEM\MKWS\COMBI_BUMBI_v5 FINAL\Calc_Results

Important Notes on Physical Realism

Ignition Delay Plots:

- Extremely short or zero delay times may indicate non-ignition within simulation time
- At low temperatures or pressures, ignition may not occur, leading to reported 0.0 values
- True zero ignition delay is non-physical as there's always finite time for reactions
- Flat areas at zero likely indicate conditions outside flammability limits
- Current detection method: max_dTdt (Species: OH)

NOx Emission Plots:

- Equilibrium calculations often overpredict real-world NOx emissions
- NOx formation is kinetically limited and may not reach equilibrium in practical systems
- Factors like flame quenching limit actual NOx below equilibrium predictions

CO and CO2 Emission Plots:

- Equilibrium calculations might not reflect real emissions due to kinetic limitations
- CO may be underpredicted in rich conditions due to incomplete combustion
- CO2 may be overpredicted in systems with rapid quenching preventing full oxidation
- At extreme equivalence ratios, emissions are highly sensitive to kinetic factors

Flame Speed Plots:

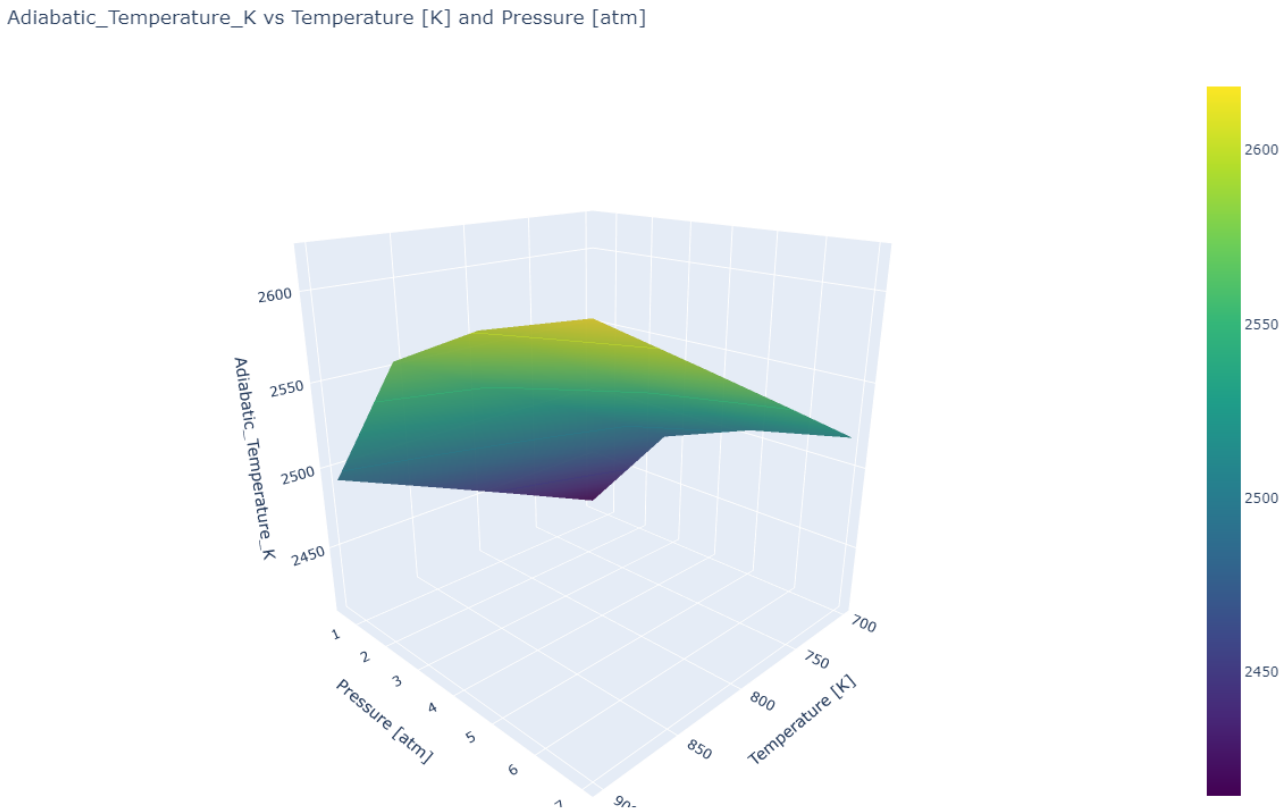
- Zero flame speeds indicate non-convergence, likely outside flammability limits
- At low temperatures or pressures, flames may be unstable or extinguish
- Abrupt changes in plots may indicate numerical boundaries of model validity
- Current flame width setting: 0.05 m

General Interpretation Guidelines:

- Flat areas at zero often indicate non-ignition or non-propagation conditions
- Uniformly low/high values may represent model limitations in extreme regimes
- Abrupt changes may indicate boundaries where solver converges/fails
- Results at extreme conditions (T<900K, P<1atm, phi<0.5 or phi>2.0) may be unreliable

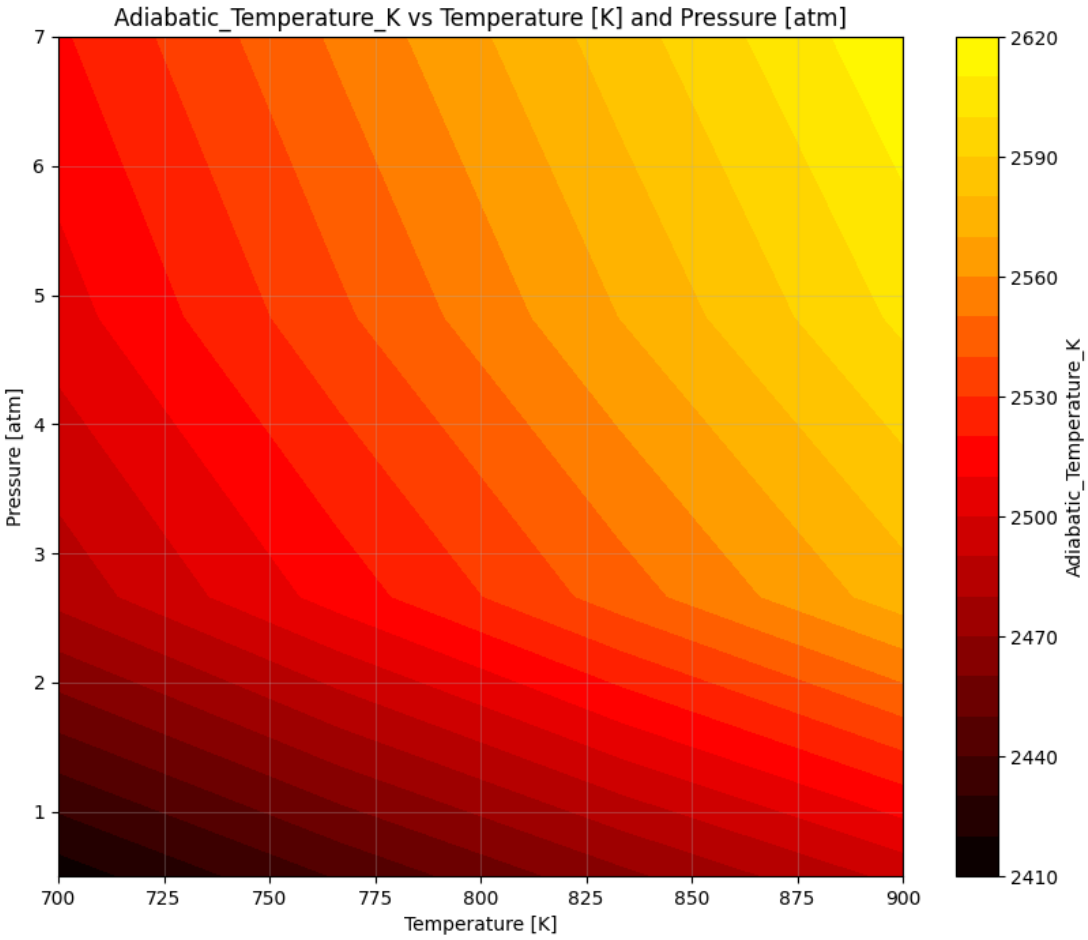
3D Plot: Adiabatic_Temperature_K

Temperature achieved during adiabatic combustion



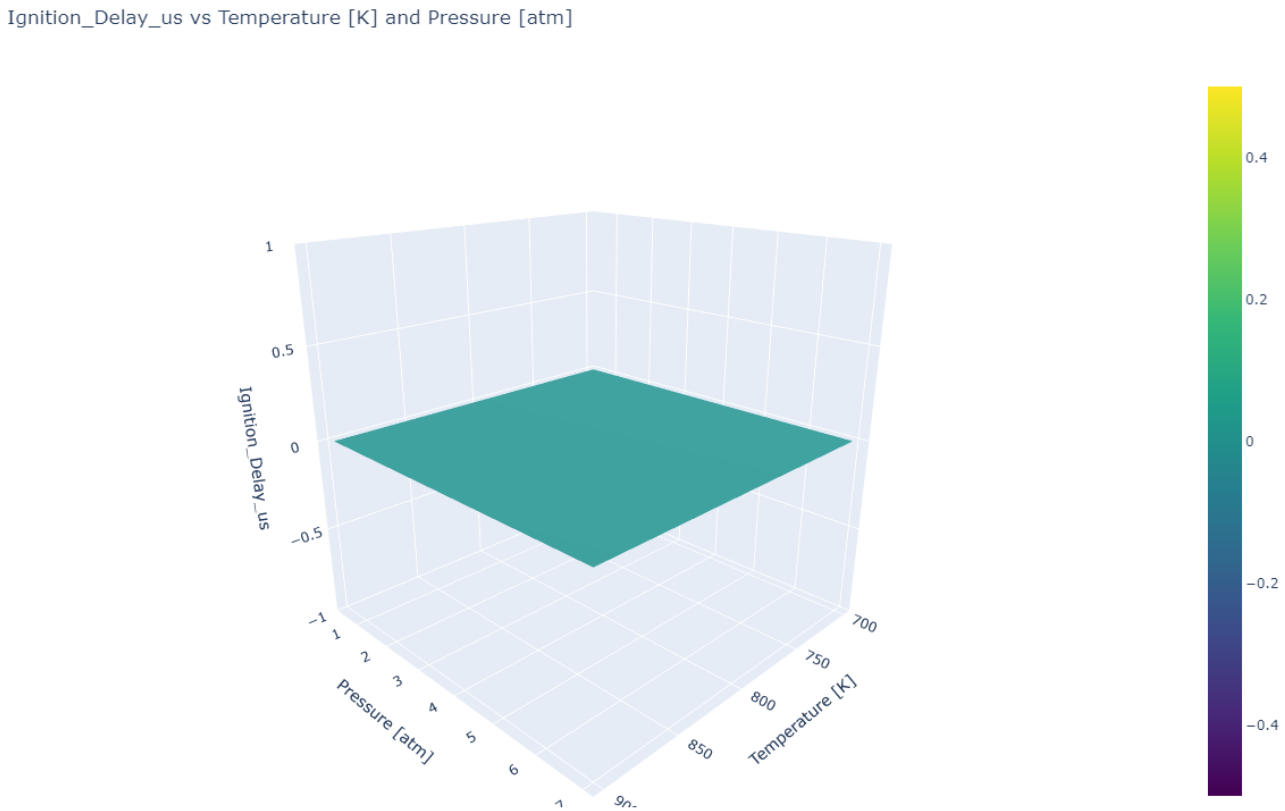
Contour Plot: Adiabatic_Temperature_K

Temperature achieved during adiabatic combustion



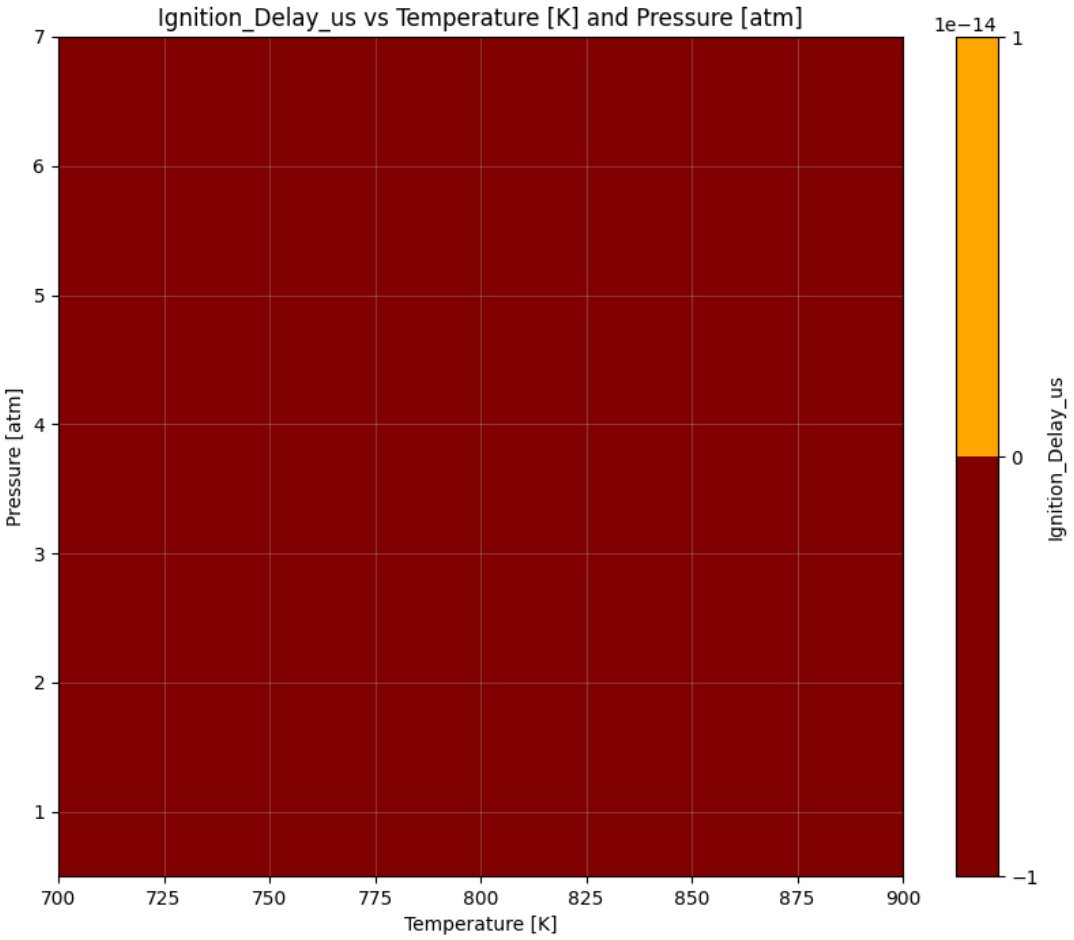
3D Plot: Ignition_Delay_us

Time required for autoignition after heating



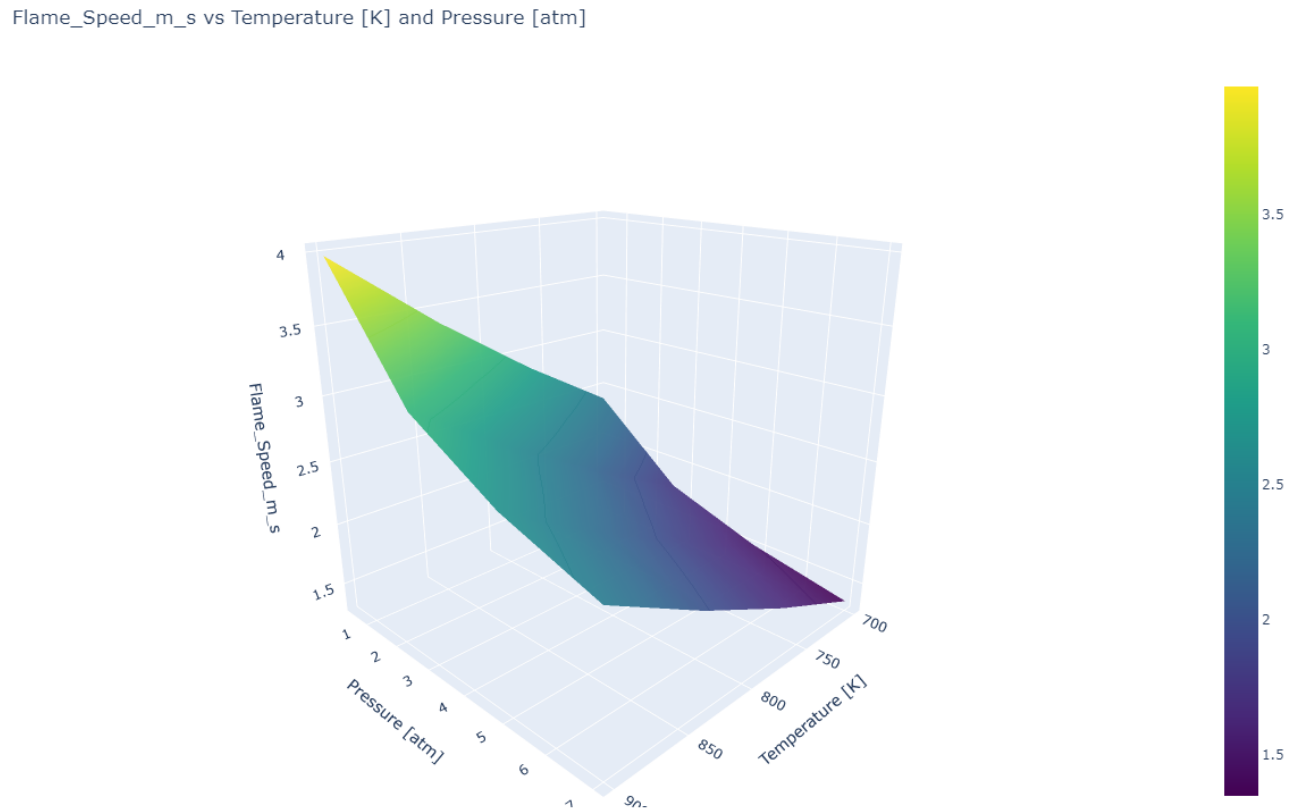
Contour Plot: Ignition_Delay_us

Time required for autoignition after heating



3D Plot: Flame_Speed_m_s

Flame propagation speed in laminar conditions



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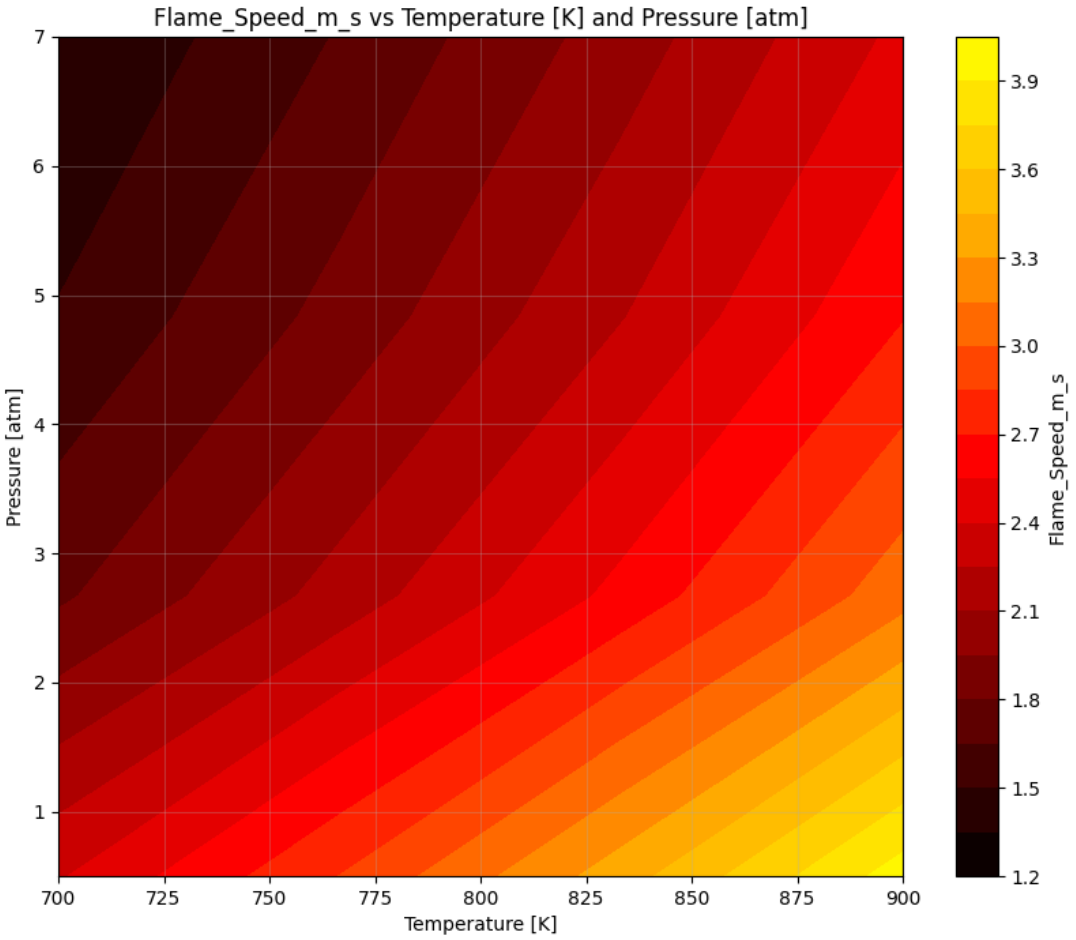
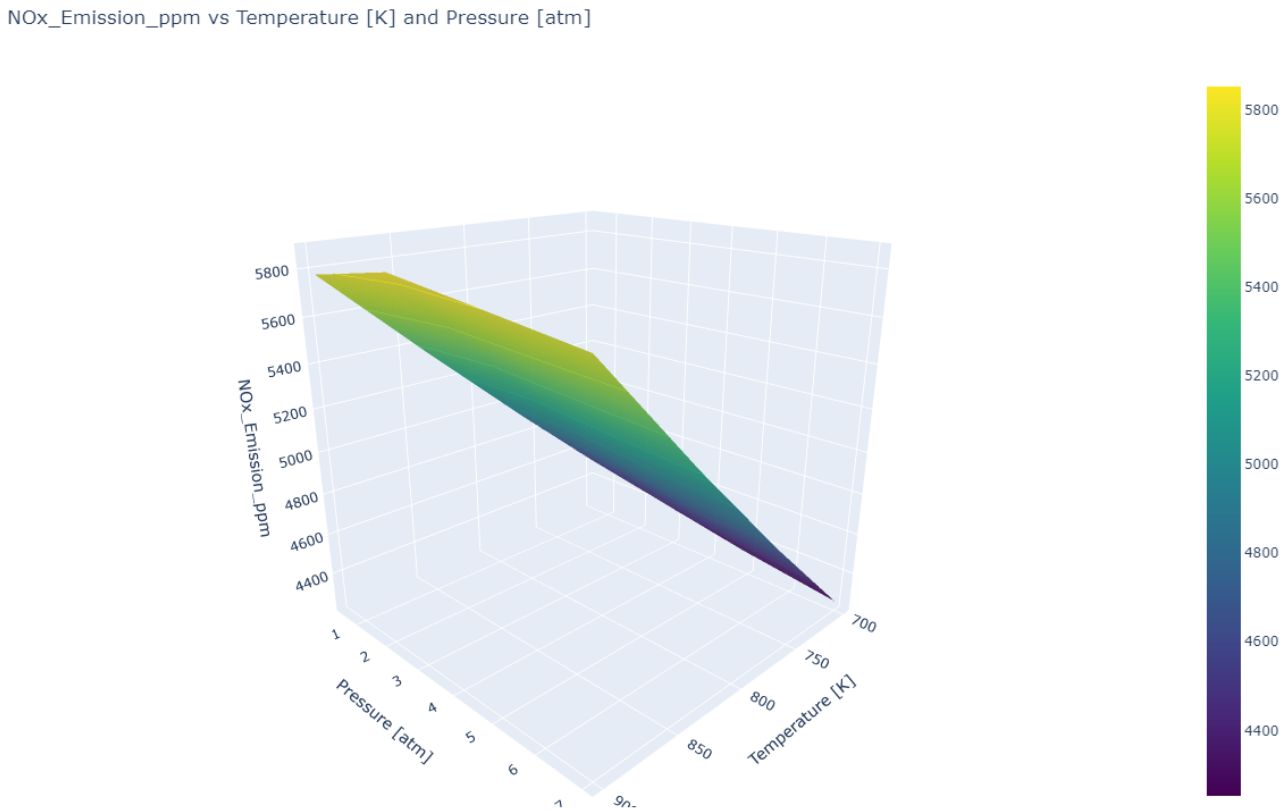


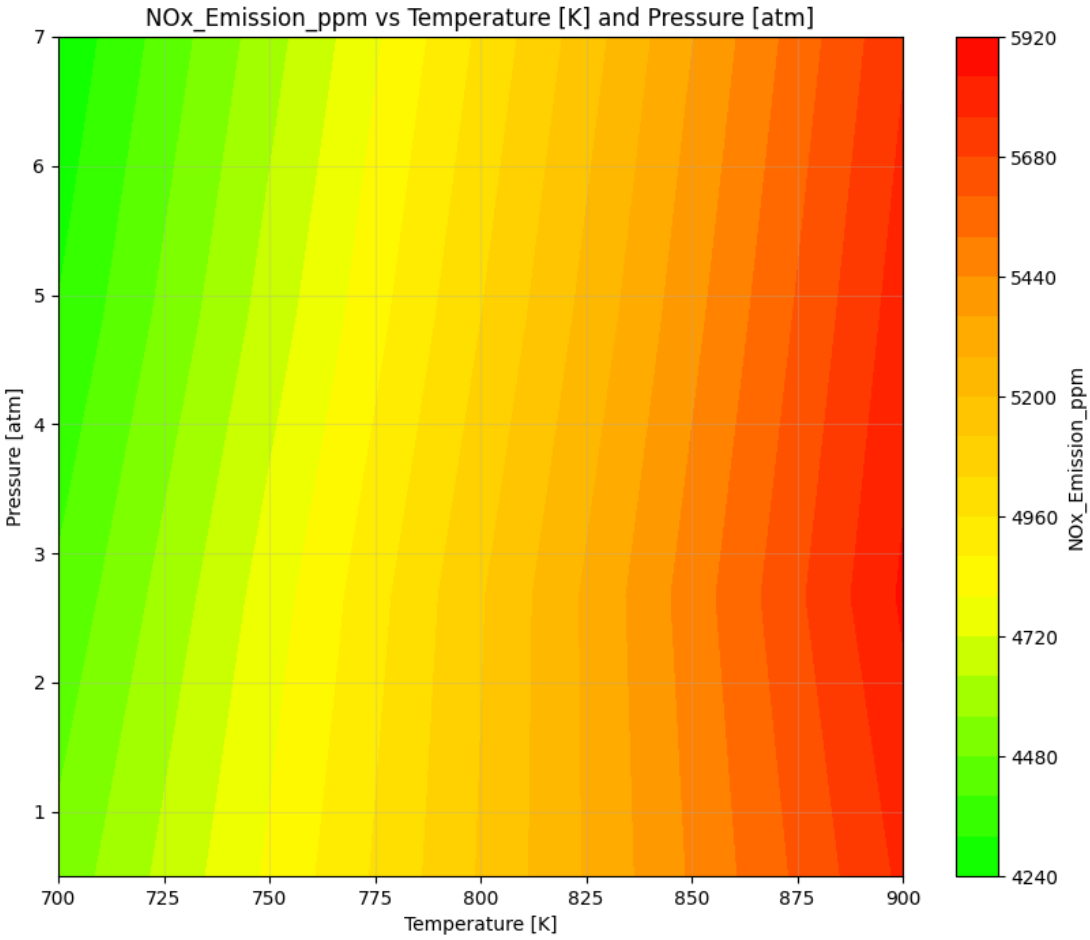
3D Plot: NOx_Emission_ppm

NOx emissions (ppm)



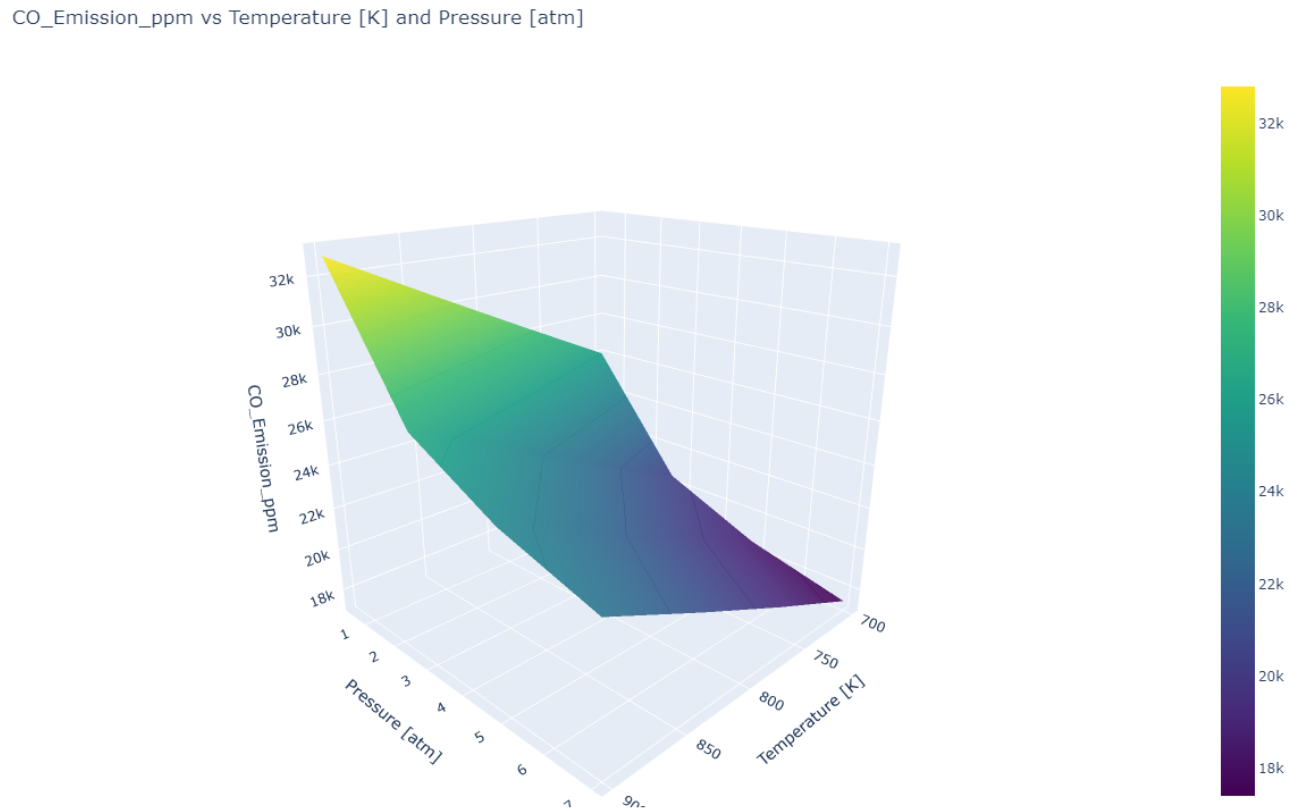
Contour Plot: NOx_Emission_ppm

NOx emissions (ppm)



3D Plot: CO_Emission_ppm

Carbon monoxide (CO) emissions (ppm)



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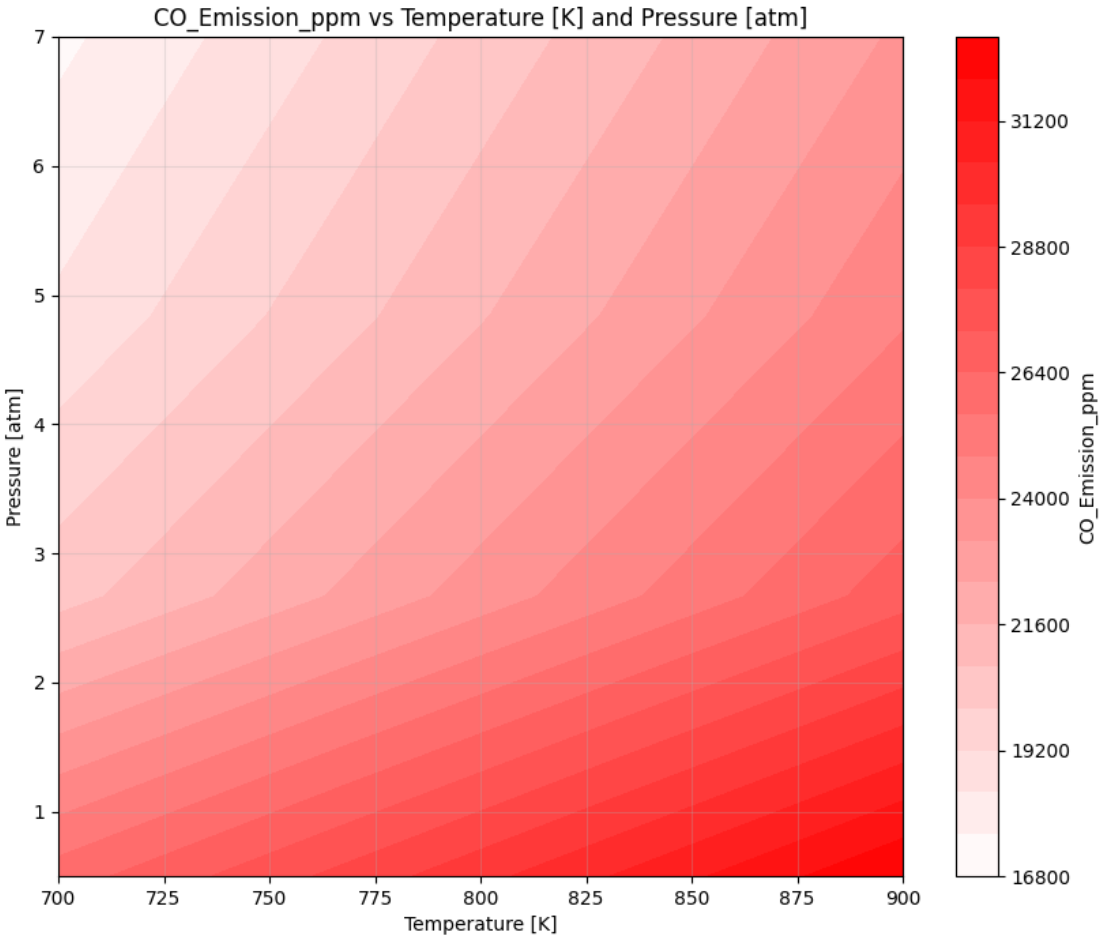
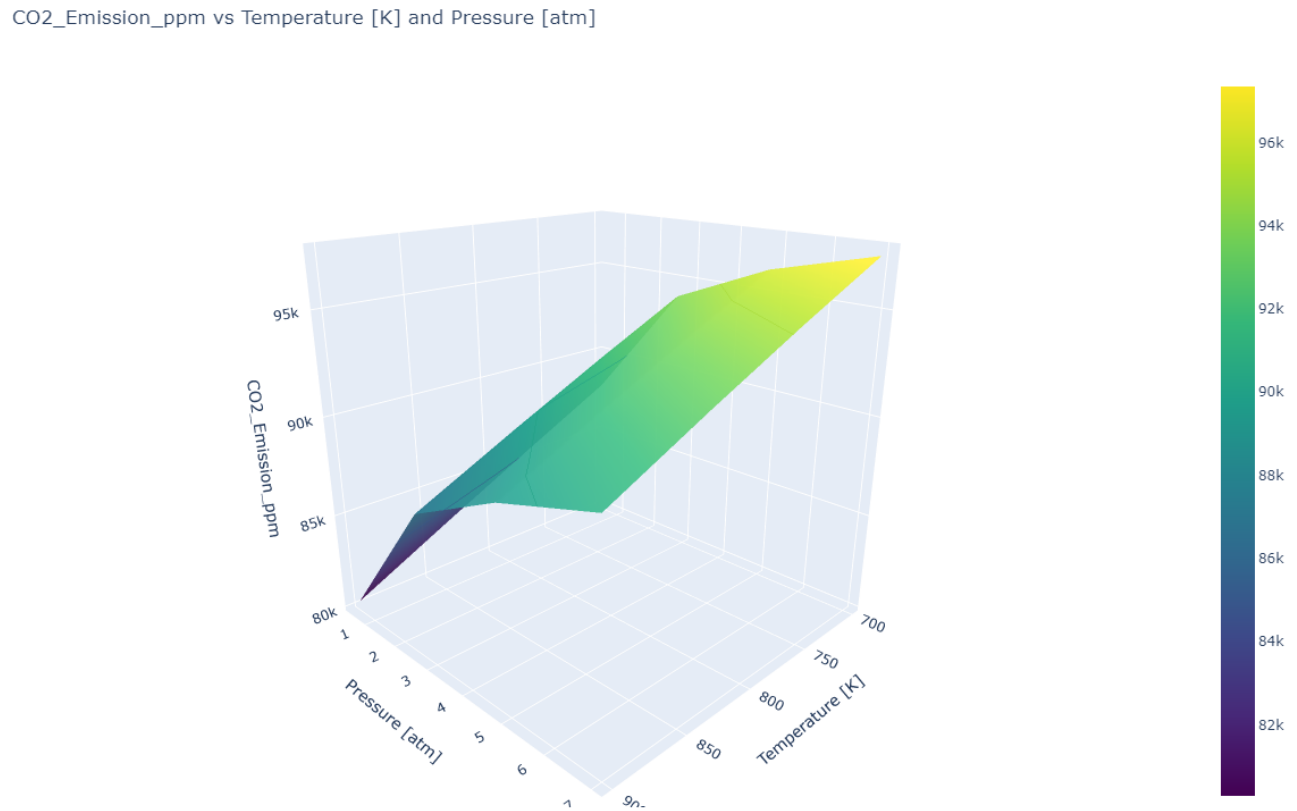


3D Plot: CO2_Emission_ppm

Carbon dioxide (CO2) emissions (ppm)



Contour Plot: CO2_Emission_ppm

Carbon dioxide (CO2) emissions (ppm)