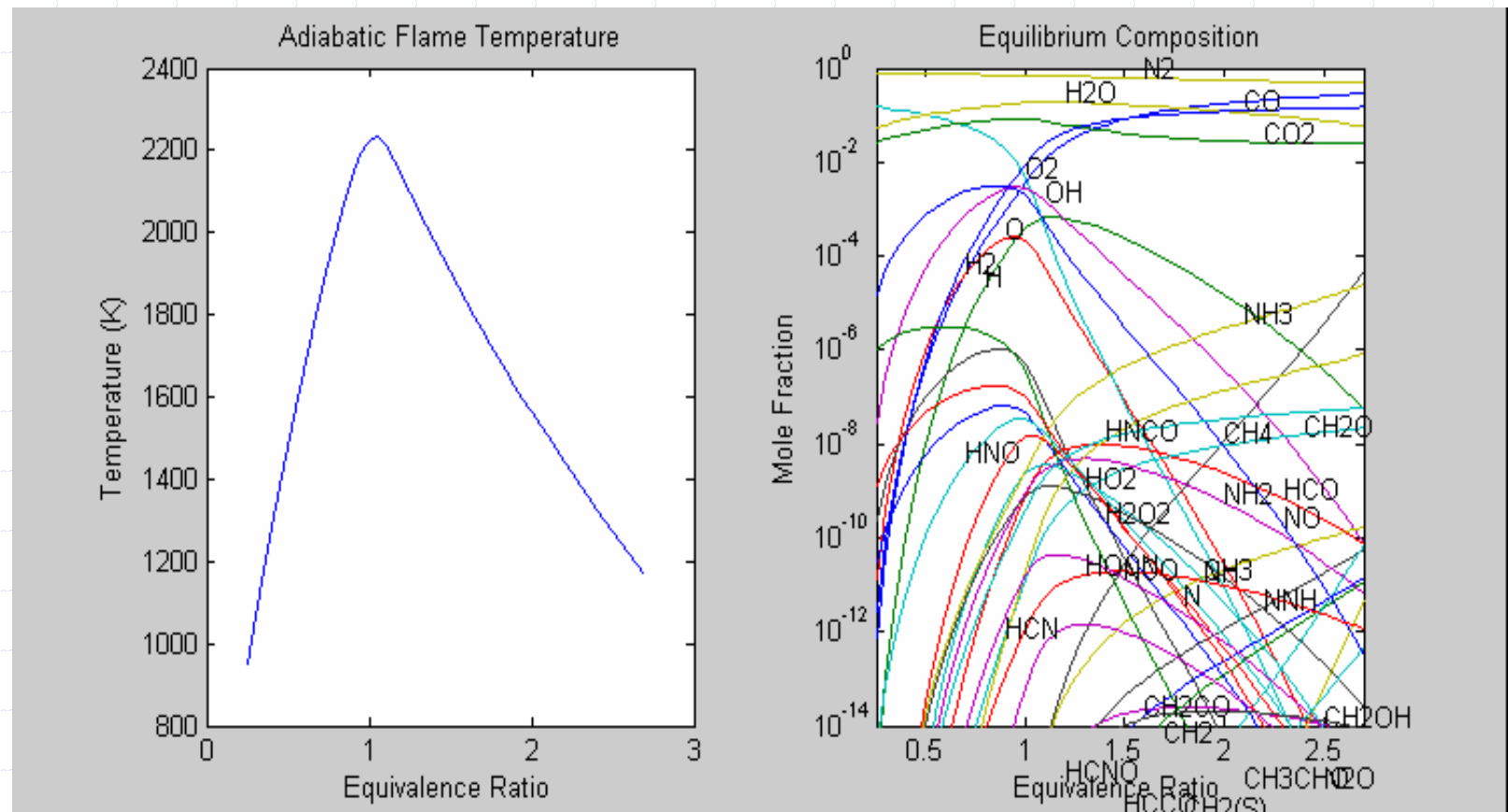


The Cantera 1.5 MATLAB Demos

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Caltech
September, 2003

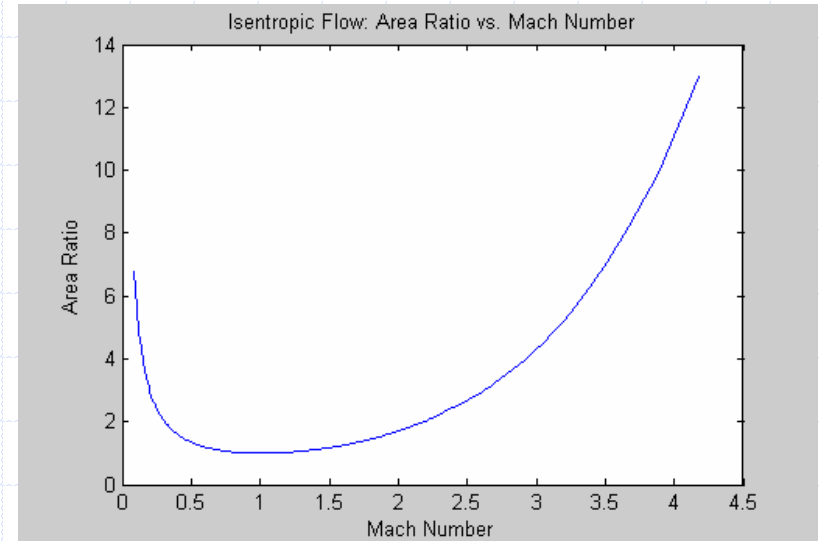
equil.m

Adiabatic flame temperature and equilibrium composition for a methane/air mixture vs. equivalence ratio.



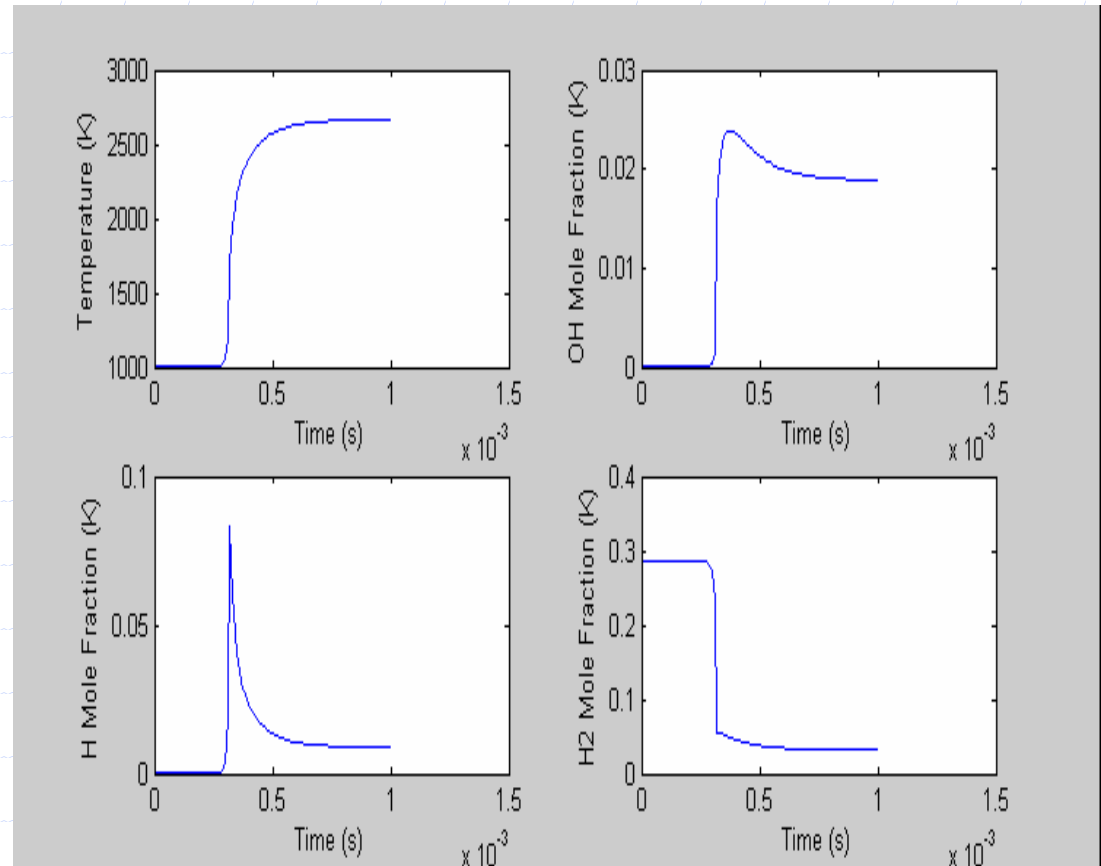
isentropic.m: Area ratio vs. Mach number for an isentropic hydrogen / nitrogen flow

- ◆ Uses Cantera's capability to set the state of a gas by specifying (S, P) to very easily compute isentropic states for different pressures
- ◆ Includes implicitly the effects of temperature-dependent c_p / c_v ; no assumption of constant specific heats is made



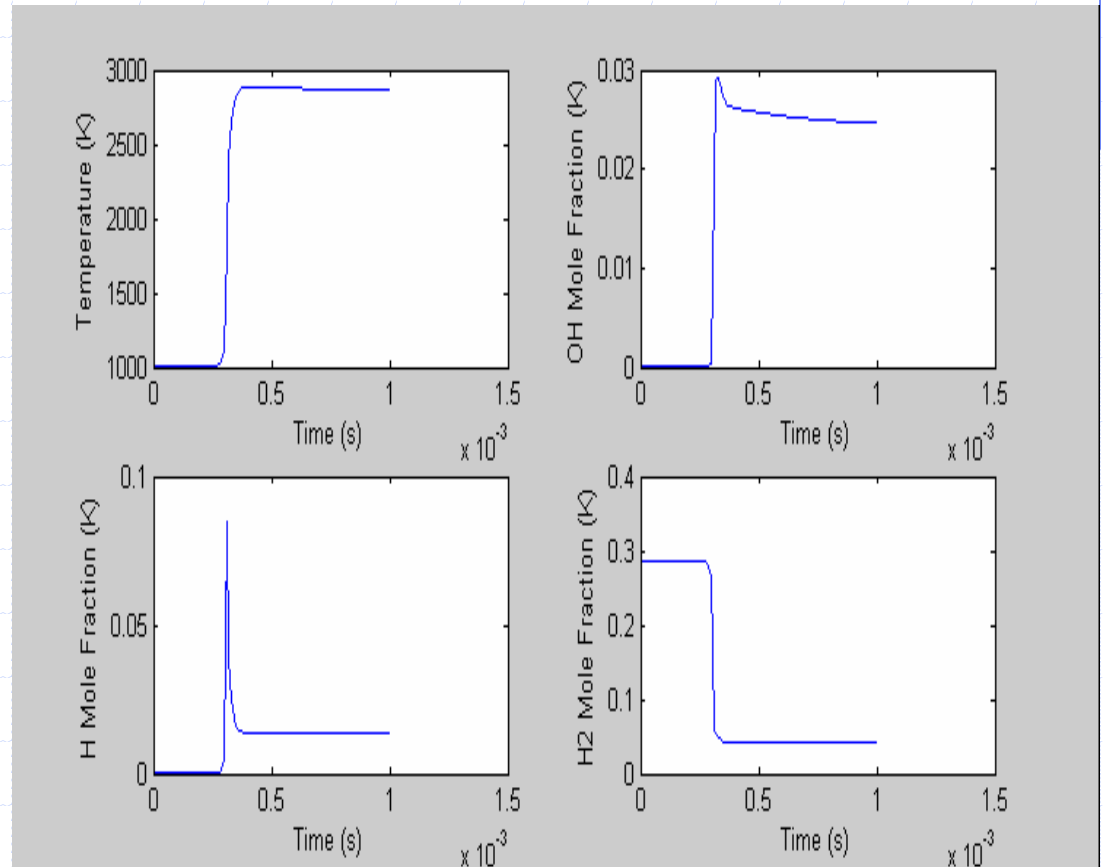
reactor1.m: A constant-pressure, adiabatic batch reactor

- ◆ Stoichiometric hydrogen/oxygen in argon at 1001 K
- ◆ GRI-Mech 3.0 reaction mechanism
- ◆ Explodes in ~ 0.3 seconds



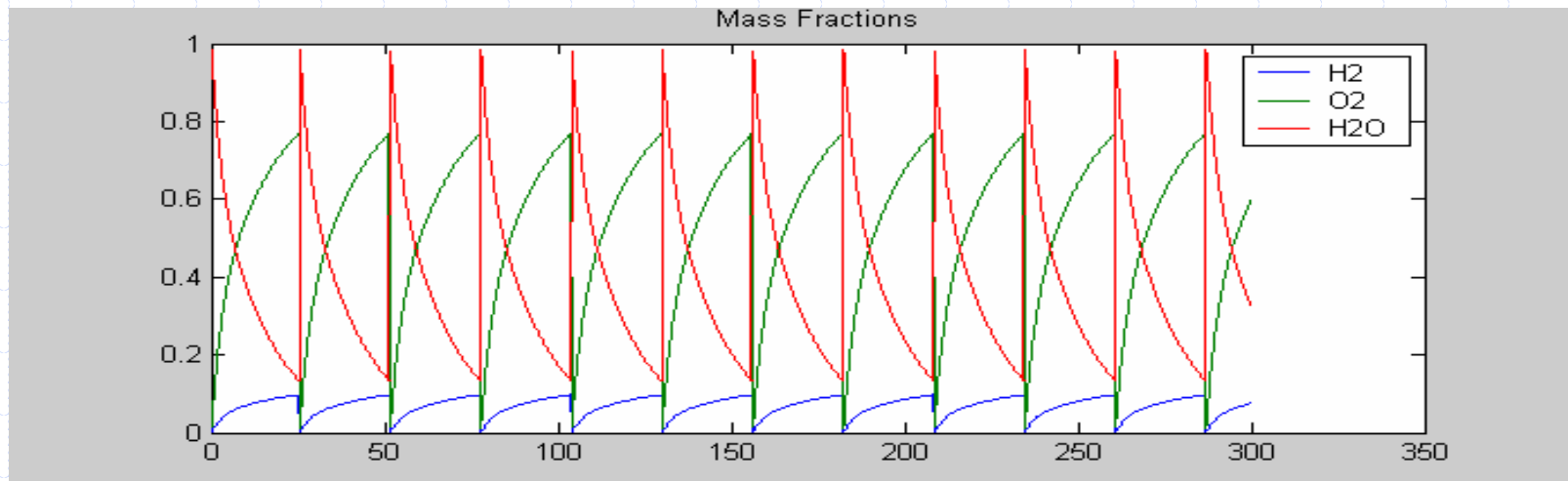
reactor2.m: A constant-volume, adiabatic batch reactor

Other parameters are the same as for reactor1.m



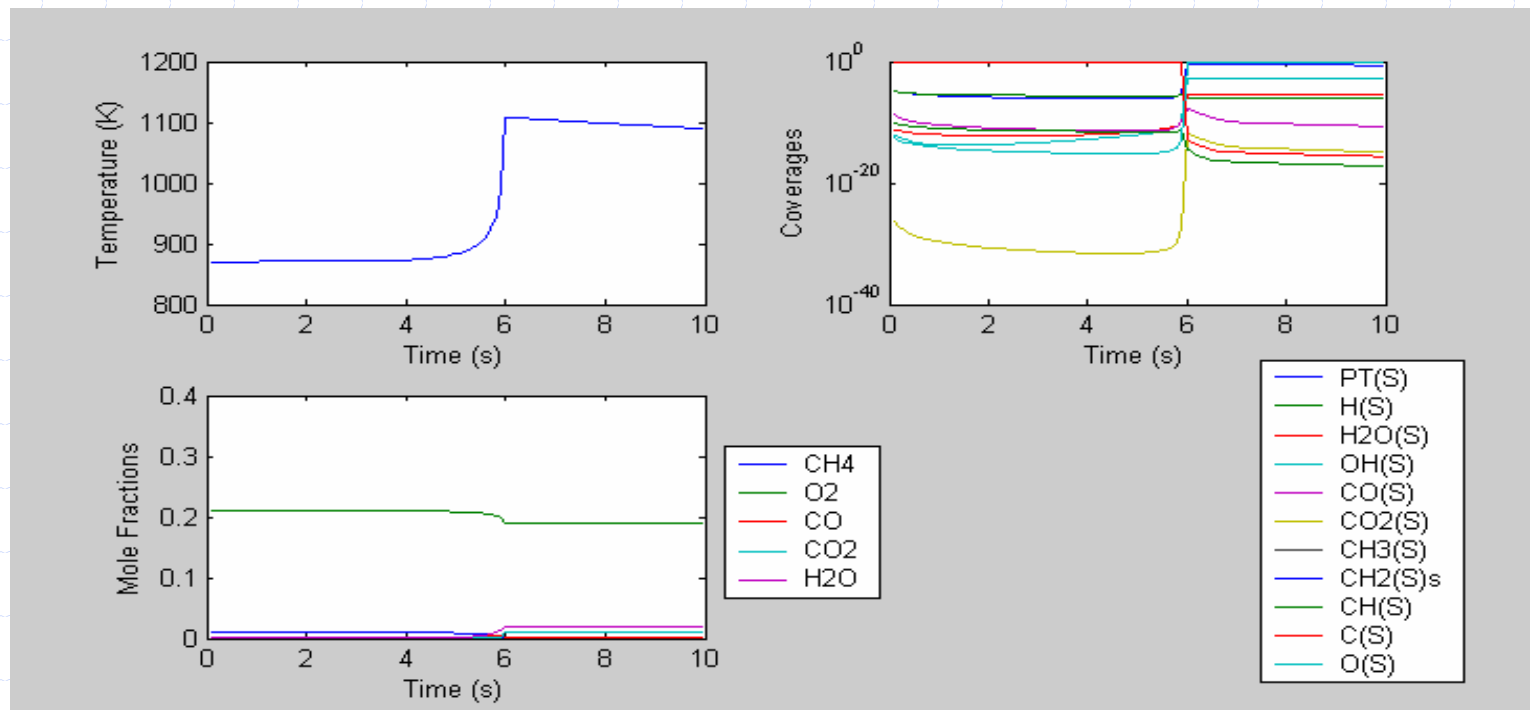
periodic_cstr.m: A continuously-stirred tank reactor with steady input but periodic output

- ◆ The oscillation is a kinetic effect, due to the large efficiency of H_2O in the three-body chain-terminating reaction $\text{H} + \text{O}_2 + \text{M} = \text{HO}_2 + \text{M}$
- ◆ The hydrogen/oxygen mixture reacts, producing water, which shuts off combustion, which causes the water concentration to drop, which allows reaction to proceed again, which produces water, ad infinitum...
- ◆ Oscillation only seen in a narrow parameter window

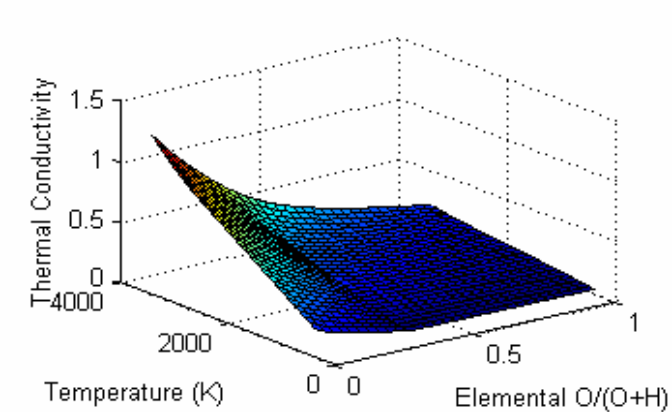
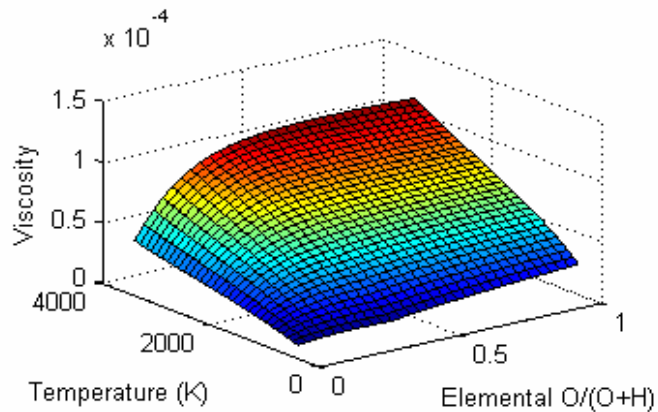
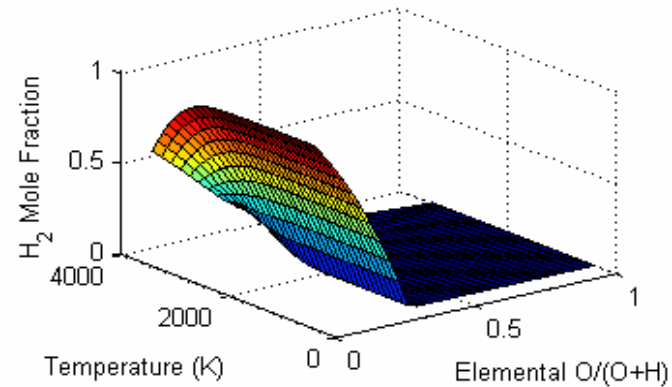
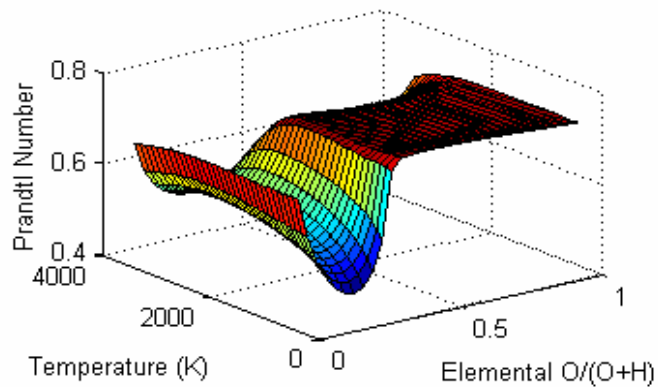


surfreactor.m: A zero-dimensional reactor with surface chemistry

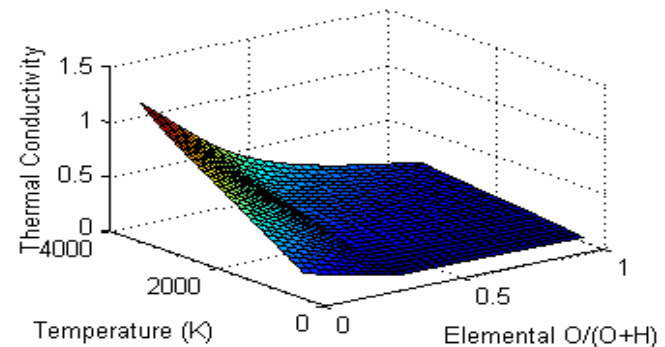
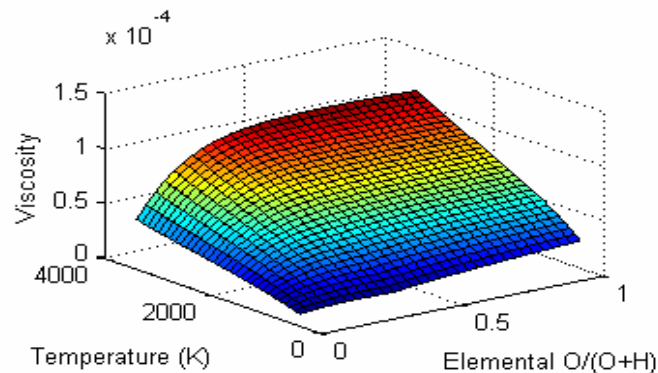
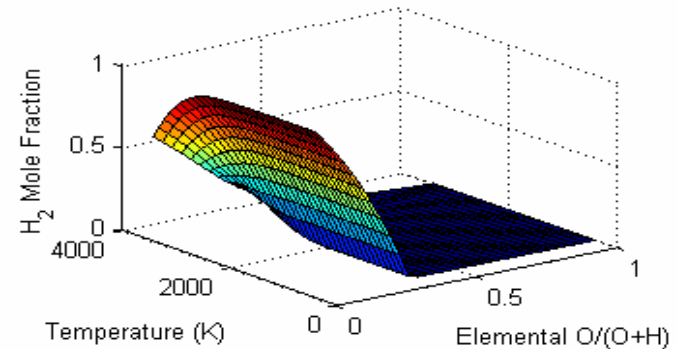
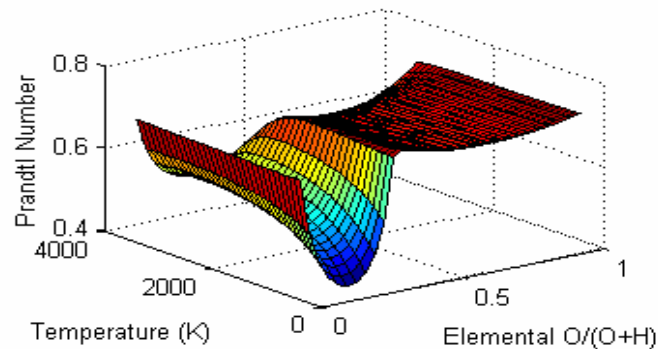
- ◆ Transient ultra-lean combustion of methane on platinum in a zero-D batch reactor
- ◆ Pt surface reaction mechanism of Deutschman et al., 26th Symp. (Intl.) on Combustion, 1996



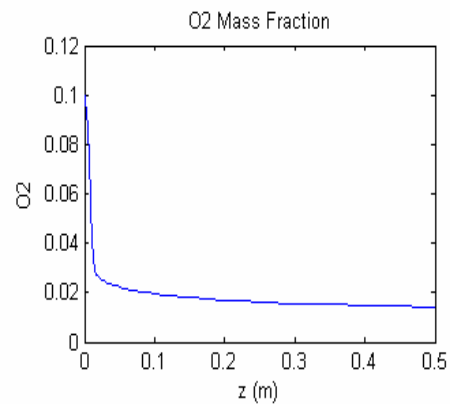
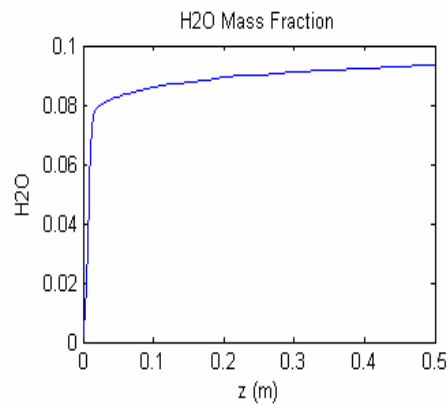
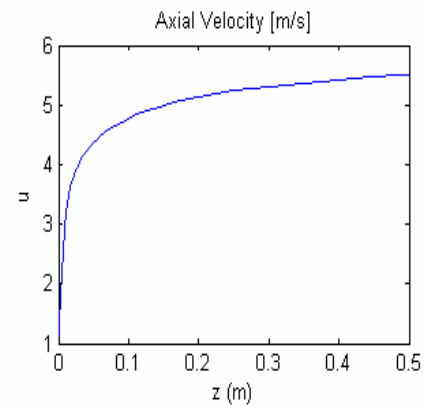
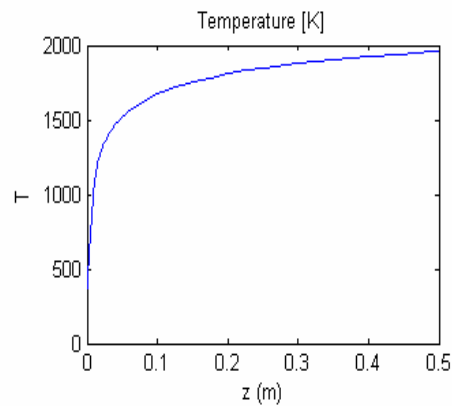
prandtl1.m: Mixture-averaged transport properties for an equilibrium hydrogen/oxygen mixture



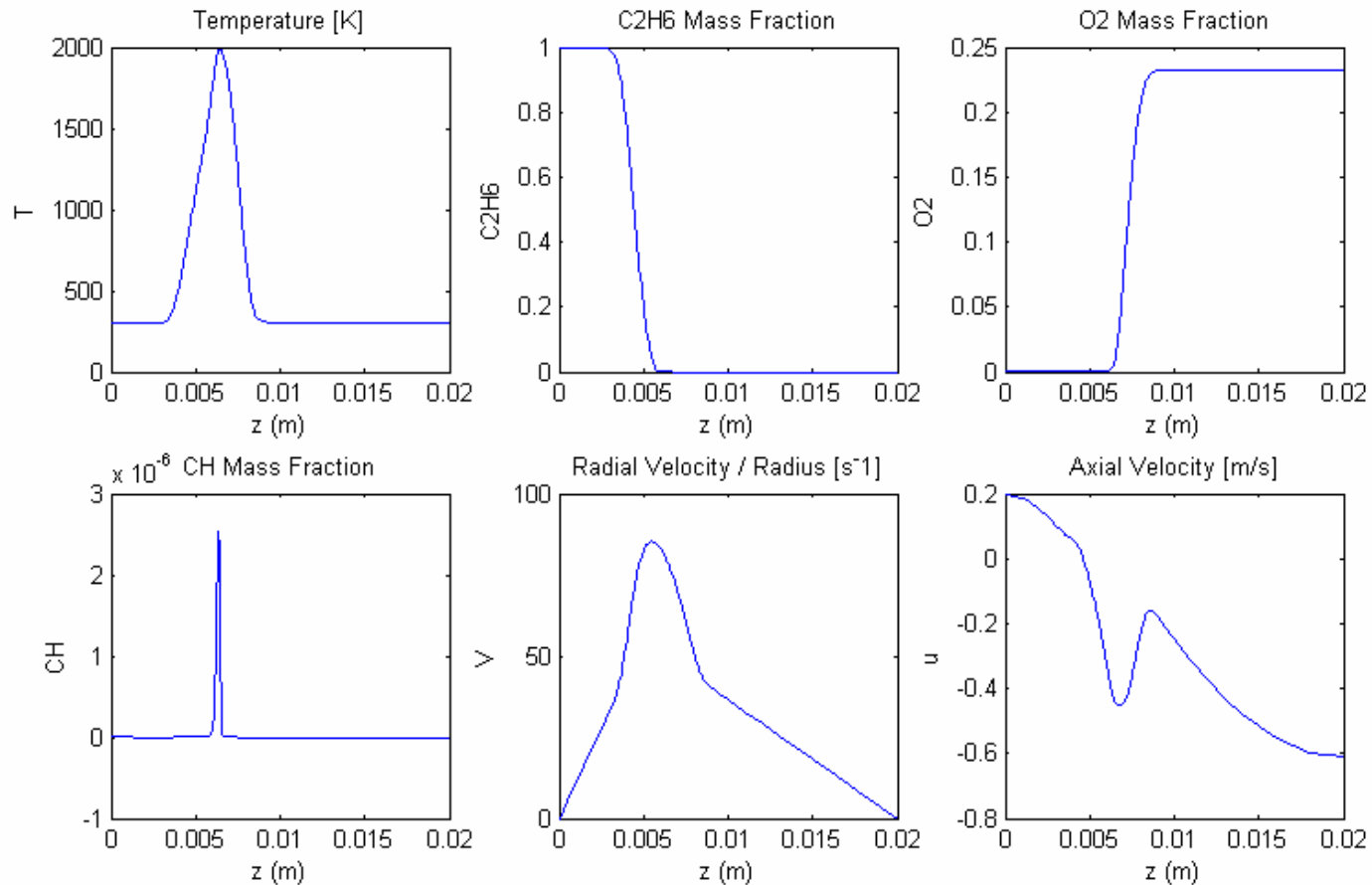
prandtl2.m: Multicomponent transport properties for an equilibrium hydrogen/oxygen mixture



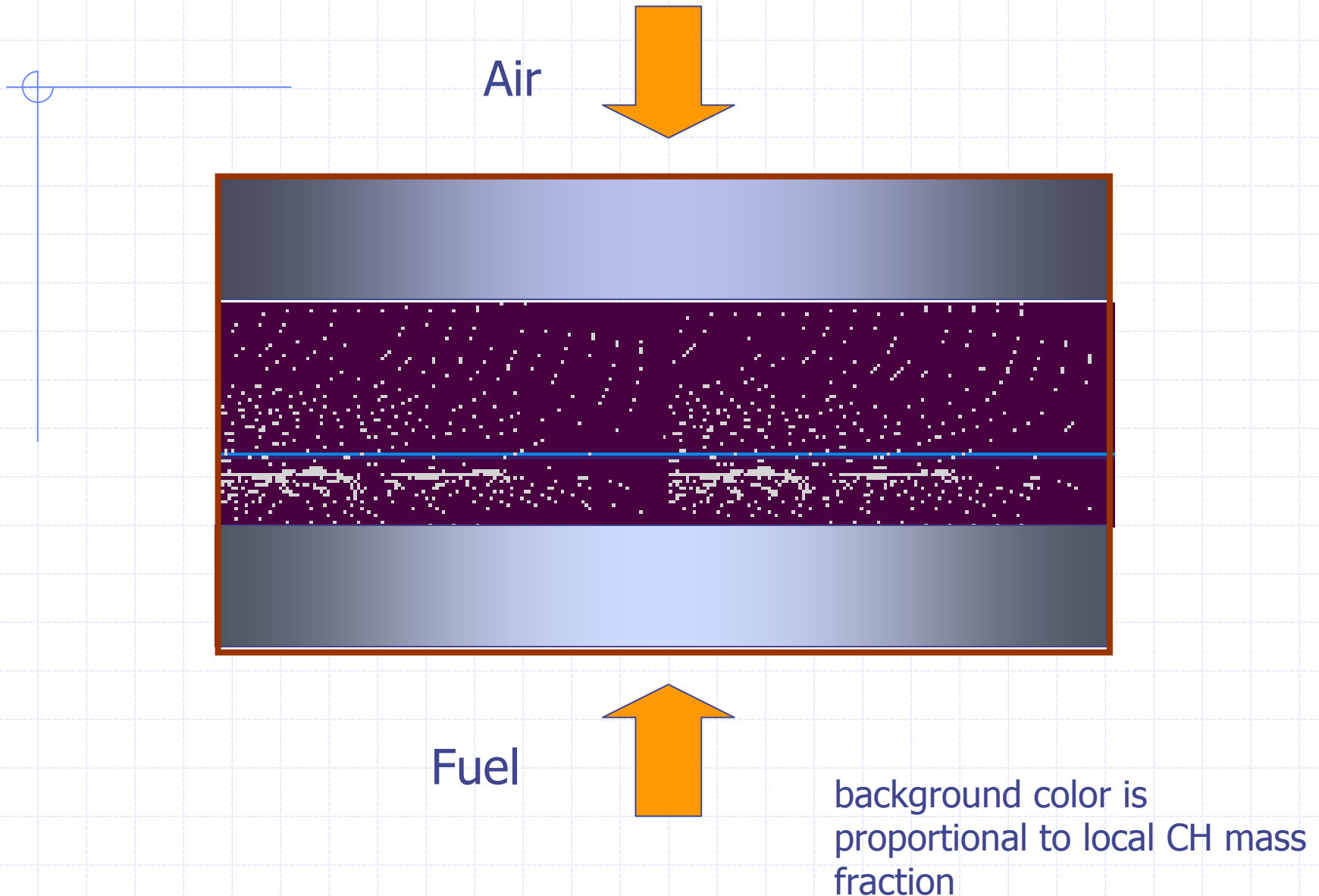
flame1.m: A low-pressure, burner-stabilized hydrogen-oxygen flame



diffflame.m: An atmospheric-pressure, non-pre-mixed ethane/air counterflow flame.



diffflame.m: Streamlines and flame location



catcomb.m: Catalytic combustion in a stagnation flow over platinum

◆ Pt surface reaction mechanism of Deutschman et al., 26th Symp. (Intl.) on Combustion, 1996

◆ 9.5% methane in air
◆ surface at 900 K
◆ 1 atm

