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SIMULATION OF NO FORMATION  
IN THE TURBULENT REACTIVE FLOW  
BY JOINT VELOCITY–SCALAR PDF METHOD

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A joint velocity–scalar probability density function (JVS–PDF) method has been applied for estimating nitrogen oxide (NO) emission indices in the turbulent flow reactor resembling a gas-turbine combustor operating on natural gas. The distinctive features of the method are the adequate treatment of the local velocity field and direct account of turbulence–chemistry interaction. The former allows one to follow fluid volume trajectories in the turbulent flow field, thus providing information on the realistic residence times in the reactor. The latter allows one to operate with true local instantaneous reaction rates, thus providing information on the realistic mean rates of chemical transformation. The NO emission indices predicted by the JVS–PDF method were shown to differ considerably from the predictions provided by a standard reactor model utilizing the data on residence times and reaction rates based on the mean-flow solution. It has been shown that at combustor residence times on the order of 10–15 ms, the dominant mechanism of NO formation is the prompt mechanism.