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Direct Numerical Simulation of Flame-Wall Interaction in a Constant Volume Vessel with a Crevice YUKI MINAMOTO, Tokyo Institute of Technology, ANDREA GRUBER, SINTEF Energy Research, MAMORU TANAHASHI, Tokyo Institute of Technology — Understanding of flame-wall interaction phenomena is important for further reduction of pollutant formation and enhancement of efficiency of various combustors. Many combustion devices involve crevice regions which yields much smaller length scale than the size of a combustor. In such crevice regions, the wall heat loss and turbulent mixing could be modified due to the geometrical effect of the crevice, resulting in more complex flame-wall interaction, which is not fully understood. In this study, a DNS of turbulent methane-air flame-wall interaction in a constant volume vessel with a crevice has been performed to understand the combustion physics near the crevice region. The present DNS configuration is chosen based on a typical IC engine combustion in terms of domain and crevice sizes and turbulent combustion condition on the combustion diagram, although methane-air combustion at atmospheric pressure was considered. The visual examination of DNS results shows that the mixture in the main domain is entrained and mixed with the mixture in the crevice. On the other hand, the mixture in the crevice is cooled as thermal boundary layer develops. The DNS results also revealed several interesting thermochemical and fluid dynamic aspects relevant to near-wall crevice combustion.

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