Short report of short-term JSPS research fellowship

This short-term collaborative research fellowship programme has given rise to a number of important research ideas and avenues which are listed below:

A detailed mathematical analysis has been conducted to analyse local flame propagation speed and scalar gradient statistics in multi-phase turbulent reacting flows. This analysis is important from the point of view of fundamental understanding of partially-premixed flame propagation in spray and pulverised coal combustion processes. This flame propagation statistics, in turn, will play a key role in the development of high-fidelity turbulent combustion closures. Moreover, this analysis will allow us to propose models for the contributions of evaporation for droplet flame and in principle, the same analysis can be done for coal flames as well where the extra terms appear due to devolatilisation. These analyses will lead to the identification and development of high-fidelity combustion models, which, in turn, will contribute to the design-cycle of next-generation energy-efficient and environment-friendly combustion devices (e.g. automotive engines and gas turbines).

The research activities initiated during this short-term research fellowship are expected to give rise to a number of high-quality journal papers. A follow-up plan has been drawn involving research personnel of the fellow's and host's research groups to sustain the research activities which have been initiated during the fellow's visit. It is anticipated that a couple of research articles will be ready for submission to high-impact journals by the end of this year and a few more papers will be ready for submission in 2018. Moreover, a research grant proposal will be submitted soon by the visiting fellow to the Engineering and Physical Sciences Research Council (EPSRC) of the United Kingdom (UK) where the host is a named official collaborator. A successful outcome of this research grant will also contribute to the long-term sustenance of the research collaboration between these two research groups.

This fellowship has enabled me to form a research collaboration with Prof. R. Kurose's research group based at Kyoto University. Because of the complementary skill sets of my and Prof. Kurose's research groups, I believe that this research collaboration will be mutually beneficial. During this fellowship, Prof. Kurose very kindly organized visits to JAXA, CRIEPI, Kyushu and Osaka Universities which allowed me to share my research with colleagues in the form of seminars, exchange research ideas and initiate new collaboration. This visit has not only been academically fruitful but also culturally

enlightening. I am grateful to Prof. Kurose and his team to make my visit and stay both enjoyable and fruitful. I look forward to a long-term collaboration between Prof. Kurose's and my research groups.