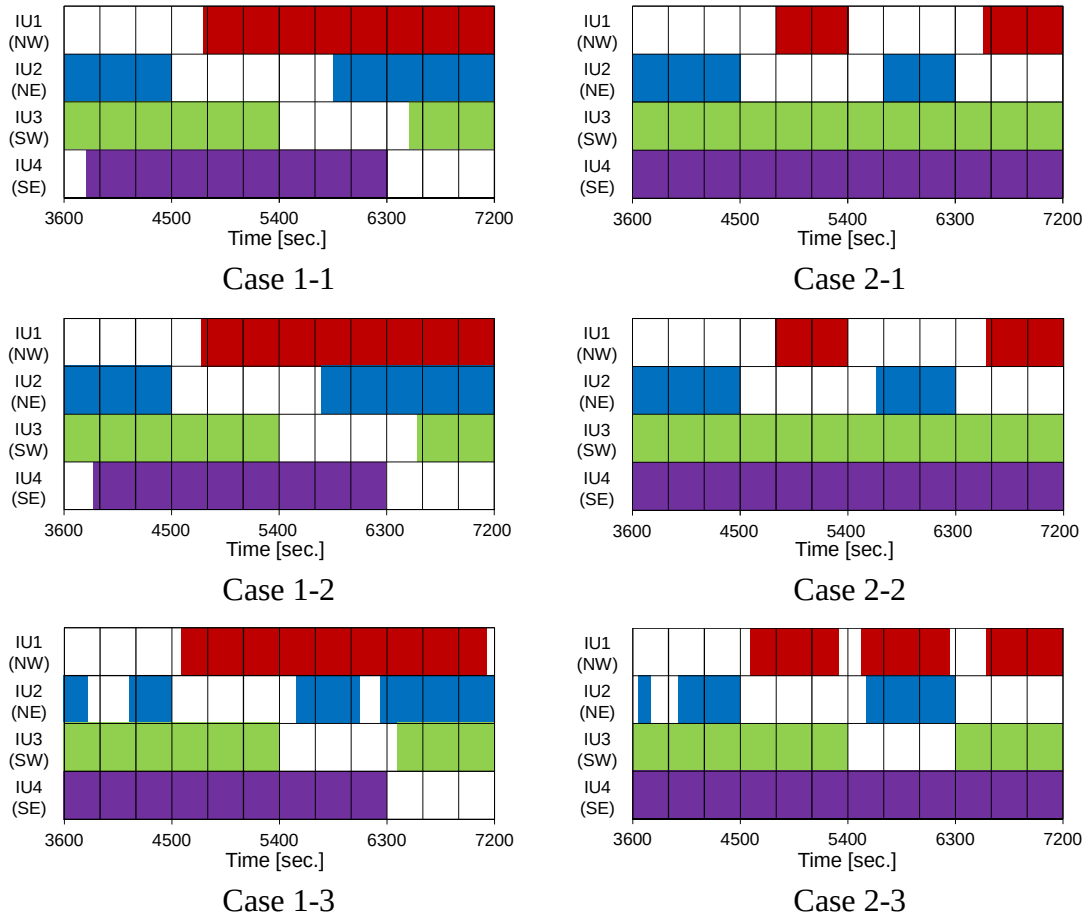

Figure 5. *Time histories of the operation modes for the IUs (colors: cooling mode, white: fan mode)*

In the regular rotation control (Case 1-1), the differences in the temporal fluctuations of the four reference temperatures become larger over time, especially in the second half of the analysis time. In the lowest reference temperature control (Case 2-1), the differences among the four reference temperatures are small. Namely, the lowest reference temperature control (Case 2-1) is better for creating a more uniform thermal environment than the regular rotation control (Case 1-1). This can be also confirmed in Figure 7. On the other hand, when the four reference points are located in the vicinity of the walls or at the suction openings of the IUs, there is little difference in the temporal and horizontal spatial fluctuations of air temperature between the regular rotation control (Case 1-2 or Case 1-3) and the lowest reference temperature control (Case 2-2 or Case 2-3).

CONCLUSIONS

In this study, a numerical investigation on the effect of operation control of a multi-split air-conditioning system in an office on the indoor thermal environment during a power-saving period in summer was performed by a coupled analysis of CFD and HVAC system simulations.

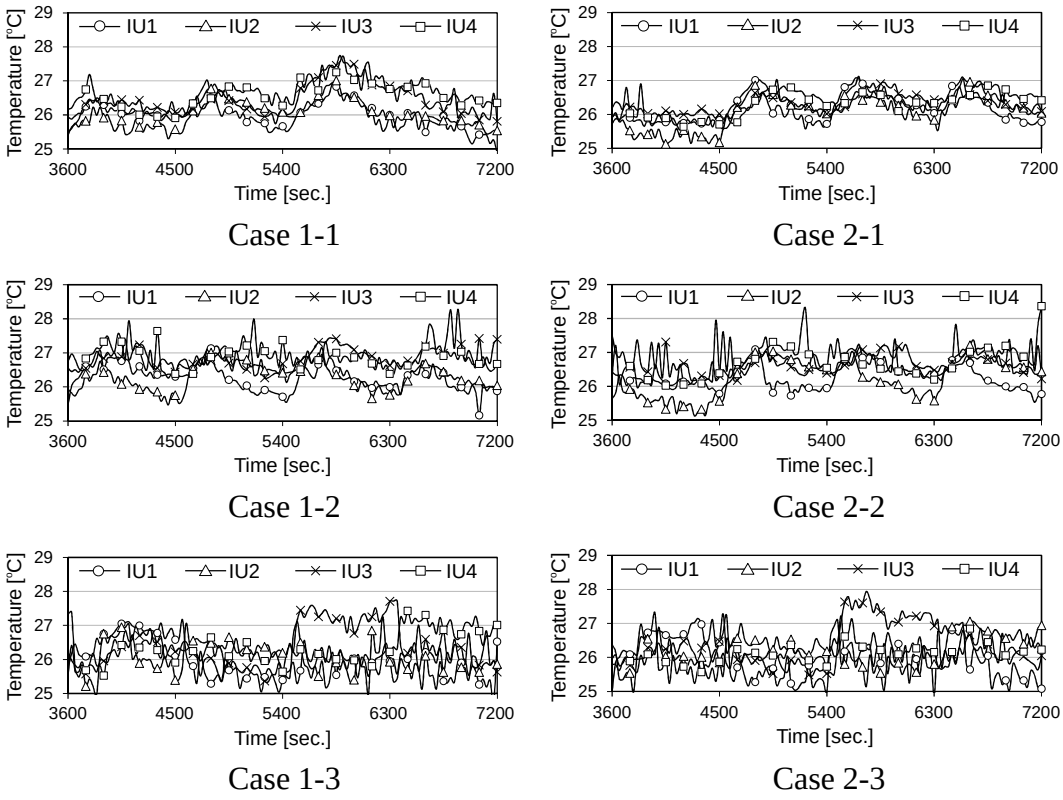

Figure 6. *Time histories of the reference temperatures for IUs 1 to 4*

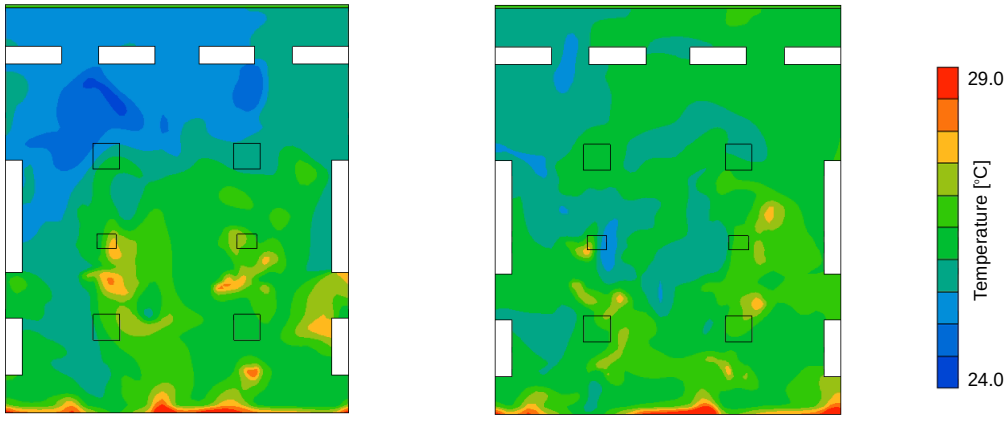

Figure 7. *Horizontal distributions of the air temperature in Cases 1-1 and 2-1 (7,200 seconds, z = 1.5 m)*

In particular, the effect of different forced operation controls (regular rotation control and lowest reference temperature controls) for the indoor units (IUs) on the indoor thermal environment was investigated.

The lowest reference temperature control, by which one of the IUs was changed from a cooling mode to a fan mode, was better for creating a more uniform thermal environment in the target office room than the regular rotation control, especially when the reference temperature points were located in the occupied zone.