

Kusunoki K. and K. Ueno, 2022: Development of a nocturnal temperature inversion in a small basin associated with leaf area ratio changes on the mountain slopes in central Japan. *J. Meteor. Soc. Japan*, **100**, 913-926.

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**Plain Language Summary:** According to a three-year leaf area index observation in the mixed forest of the Sugadaira Highland (1320 m a.s.l.), Nagano Prefecture, Japan, we identified weakening of the nocturnal temperature inversion (NTI) associated with leaf expansion and strengthening after leaf fall in a small basin. Heat-budget assessment for the cold-air pool development indicated that an increase in storage heat flux of forests with leaf expansion could cancel nocturnal radiative cooling and weaken gravity currents at the forest floor.

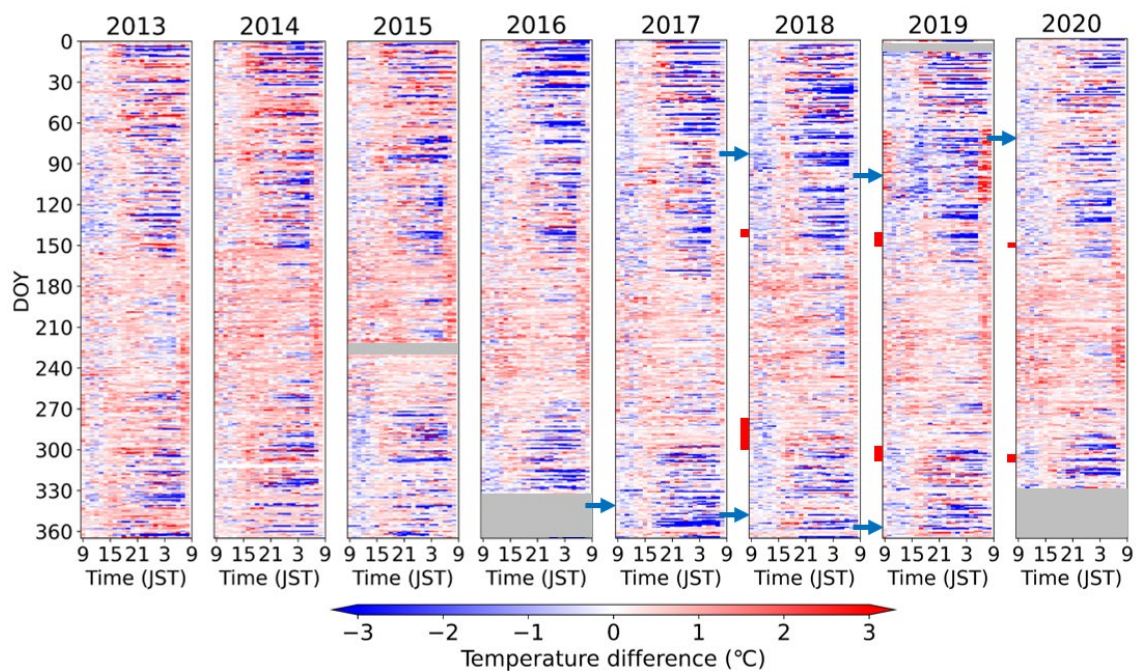


Fig. 1 Time–DOY cross sections of the hourly air temperature differences between the AME (basin bottom) and SRS1 (mountain slope) stations for eight years. Each column is composed using the time sequence as a function of DOY and local time starting at 9:00 JST. Blue (red) areas indicate cooler (warmer) temperatures at the AME than at the SRS1. Leaf expansion/fall seasons are shown as red vertical bars, and the start and end of snow-cover seasons are indicated by blue horizontal arrows. Gray areas indicate no data.

- We identified weakening of the NTI associated with leaf expansion and strengthening after leaf fall of mountain forests in a small basin of Nagano Prefecture, Japan.
- Micrometeorology observations showed that the NTI at the forest floor and downslope winds at the adjacent grassland strengthened during the dormant (leafless) season in the nighttime when the radiative cooling is strong.
- Heat-budget assessments showed that the heat loss during the cold-air pool development was  $3.8 \text{ W/m}^2$  more on average in the dormant season than the growing season, and it was less than that of storage heat flux by forests estimated in previous studies (several  $10 \text{ W/m}^2$ ).