

## Study the spatial distribution of the thermal belts for the whole Japan using NOAA AVHRR

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The thermal belt is known as relatively warm region of surface boundary layer that develops in the mid-slope of a mountain, especially facing a plain or a basin. Many researches of thermal belt have been done, especially, in the field of agricultural meteorology and local climates (e.g., Yoshino, 1968). Furthermore, there are many examples of using the warm regions caused by thermal belt phenomenon for growing crops. For example, the mandarin orange cultivation is managed in the hill of Mt. Tsukuba since old ages. Moreover, tea is grown at the slope of mountains in Shizuoka district. There are various factors cause the formation of the thermal belt such as the ground surface inversion, the nocturnal cold air drainage, and the existence of cold air lakes. The observation of the nocturnal cold air drainage is difficult because it is fluid. Therefore, there is a research which tries to catch the nocturnal cold air drainage by understanding the formation of thermal belt areas. The ground surface inversion is formed by the radiative cooling of the ground surface, and it is generated easily at night-time of a fine day. Inanaga et al (1997) explained that there was a factor that the thermal belt appears also in vegetation, and clarified that the forest was getting a high temperature compared with other land use/cover areas over the south slope of Mt. Akagi.

Recently, the thermal belt has been studied using remote sensing techniques due to the spread of the satellite data. Kondoh et al (1992) analyzed the thermal belt that appears at the slope of mountainous district around Kanto plains using TM band 6 (heat infrared) of LANDSAT image. This study will use satellite data in order to investigate the distribution of surface temperature regionally covering the whole scale of Japan, which has been not been studied yet. Consequently, the thermal belt can be observed on the same time for the whole country of Japan.

Channel 4 and 5 of NOAA AVHRR satellite data have been used to study the thermal belt for the whole scale of Japan. The one scene of NOAA AVHRR covers an area of 2700 km, and its spatial resolution is about 1.1 km. NOAA AVHRR has been obtained from Center for Environmental Remote Sensing, Chiba University. 565 scenes in total of NOAA AVHRR covering the whole Japan was obtained during the period from April, 1997 to March, 1999. The satellite data were geometrically corrected WGS84 projection. To confirm whether the thermal belt is formed for the whole region of Japan at the same time or not, the relation between the ground surface temperature and the altitude was examined and extracted for eight regions (Hokkaido, Tohoku, Kanto, Tyubu, Kinki, Tyugoku, Shikoku and Kyushu).

The results confirmed that the thermal belt that had been seen in local scales was occurred also for the whole Japan scale. Moreover, the study confirmed that the appearance of thermal belt was recognized mainly during the autumn and winter seasons. The results also showed that during the month of October, especially, there were many days at which the thermal belt has been formed in all the eight regions.

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Yoshino, Masatoshi (1968) : Surface Inversion at night in Japan, *Journal of Agricultural Meteorology of Japan*, Vol.23, 186-188.