主指導教授　加治佐　隆光

（別紙様式第６号）

学 位 論 文 要 旨

専攻名　　共生環境学

氏 名 Homayoon Ganji

Using the Error Propagation Approach and Effective Distance Relating to Reference Evapotranspiration Considering Alternative Data

（代替データを考慮した基準蒸発散量に関する誤差伝播法と実効距離の利用）

題　目

First of all, as a background to the whole research, basic calculation methods for finding the amount of irrigation water to farmland by the United Nations food agriculture organization (FAO) are sometimes proposed. What is the main component of the irrigation water volume is the evapotranspiration of standard crops and is indicated by the symbol ET_0(mm/day). For example, in Japan, it is possible to use the data of AMeDAS, which is roughly said to have one place in the section of 20 km for the measured value of weather data when ET_0 is obtained. Therefore, even if there are missing weather data when ET_0 is calculated, it is possible to refer to the weather data of the neighboring AMeDAS. However, it is difficult to use such geographically high-density weather data in other countries. To that end, an alternative proposal for missing data is also proposed by FAO.

Against this backdrop, the applicant first looked for ET_0 in the western part of Afghanistan and further examined its alternatives. As a result, the applicant first shows a case where ET_0 becomes 10 mm/day or more. This size is big enough to be seen in Japan and has a lot of unexpectedness. The opinion that the magnitude of the wind speed is a difference between the meter evaporation amount and ET_0 is stated. The contents of those are published as contents of the presentation so far, they are in the first half of the applicant's research.

The problem to be solved in the second half of the research is the applicability of the error analysis method based on the theory of error propagation and the evaluation of the magnitude of the effective range (horizontal distance) of the alternative proposal stated using them. For the latter half, 48 sites of AMeDAS data in Japan were used because it was judged necessary to consider using many observation points and long-term data for consideration.

（備考）日本語（2000 字以内）または英語（500 ワード以内）にまとめて記載してください。

氏　名　加治佐　隆光

(別紙様式第６号)

As a result, it showed that the theoretical equation of error propagation is effectively used also when substitute data is used. It was confirmed that the error RMSE (Root Mean Square Error) caused by using substitute data can be estimated within 10% even using the theoretical expression of error propagation. In other words, the error RMSE associated with the use of the above alternative can be shown as the result of the synergistic effect of the error component of the Penman-Monteith formula when ET_0 is obtained and the error component of the weather data used as an alternative Became. This is expected to be of great help in comparing and examining alternative weather data (or purchasing meteorological observation equipment that confronts it).

As meteorological data to be used as an alternative, not only those based on the proposal of FAO but also from nearby weather data may be used. The suitability of the use of the weather data in the neighborhood was examined with reference to the idea of model creation in the semi-variogram. As a result, it was shown that it is better to use the solar radiation amount data of the neighborhood than the alternative method for the solar radiation amount, but the wind speed becomes a big difference soon even in the neighboring data and the tendency opposite to the solar radiation amount , So you can use alternative methods without hesitation.

It is expected that errors of ET_0 will be brought about in the future by improving meteorological data obtained by using alternative proposals or by improving the Penman-Monteith formula. These two improvements correspond to the two components that constitute the theoretical expression of error propagation. Therefore, at that time, it is possible to effectively discuss the effect of improvement by effectively using the error propagation theoretical formula.

(備考) 日本語 (2000 字以内) または英語 (500 ワード以内) にまとめて記載してください。