Early warning information on extreme temperature events

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Abstract

Socio-economic activities in Japan as well as in other parts of East Asia are increasingly vulnerable to weather and climate variability. Timely and user-oriented weather and climate information is needed in order to prevent and mitigate adverse weather effects and produce socio-economic benefits. In order to respond further to user's needs for effective use of weather and climate information, JMA initiated providing early warning information on extreme temperature events (hereafter, called "early warning information") in March 2007. The early warning information targets forecasting of the possibility of the occurrence of significantly high/low temperature events with one-to-two-week lead time. This information aims to mitigate the impacts of the extremely high/low temperatures on the socio-economic activities such as agriculture, electric power industry, and human health.

Through dialogues with respective user communities, it became evident that the early warning information was expected to be applicable in a variety of sectors as summarized below.

Agriculture: Deep-water irrigation is one of the most effective management measures to prevent and mitigate cool weather damage to paddy rice. The management of deep-water irrigation can be adequately prepared when forecast of low temperatures is provided with certain lead time. For citrus cultivation, early provision of the prediction of low temperatures can be used for reducing frost and freeze damage by earlier harvesting.

Electric power: Scheduled maintenance of power plants are conducted through the year in order to secure stable service. Review and re-scheduling of the maintenance are necessary according to power supply outlook, which is closely related to temperature variations. Thus provision of early warning information on extreme temperature events, which may lead to soaring demand for the supply, is expected to help effectively modify the operation plan for steady electric power supply.

Health: Early warning information on extreme temperature events can be used for predicting the number of patients of the temperature-sensitive disease such as flu and heat stroke; the information helps medical institutions prepare for it and raise public awareness.

The early warning information is issued when the occurrence of an extreme temperature event based on seven-day average temperature is predicted one to two weeks in advance with the provability of occurrence 30% or more. The extreme temperature event is defined here as the temperature of which probability of climatological occurrence is 10% or less. The information consists of brief description of an expected weather situation and probabilistic forecast information as shown in Figure 1. The probabilistic prediction products derived from the extended-range ensemble forecast for 11 climatological divisions over Japan are produced twice a week, so that the information can be updated at least twice a week.

The early warning information service is operating on a trial basis until early 2008,

with limited provision to specific organizations, each of which is well experienced with utilizing probabilistic forecast information (hereafter, called "cooperative organizations"). We consider it necessary to allow some time period to adequately examine the contents of the early warning information. In the trial period, the information will be reviewed and improved according to requirements and suggestions from the cooperative organizations. After the trial, it is planned to subsequently improve the information based on feedback from users, and to develop prediction techniques for early warning on other extreme climate events associated with precipitation and sunshine duration in the near future.

Fully user-oriented weather and climate information services, where our information supports each user to judge and act properly in respective socio-economic activities, are our goals to achieve. Our challenges mentioned above are only a step toward our goals. JMA is planning to expand contents of the early warning according to emerging needs as well as based on our improved ability of weather and climate predictions.
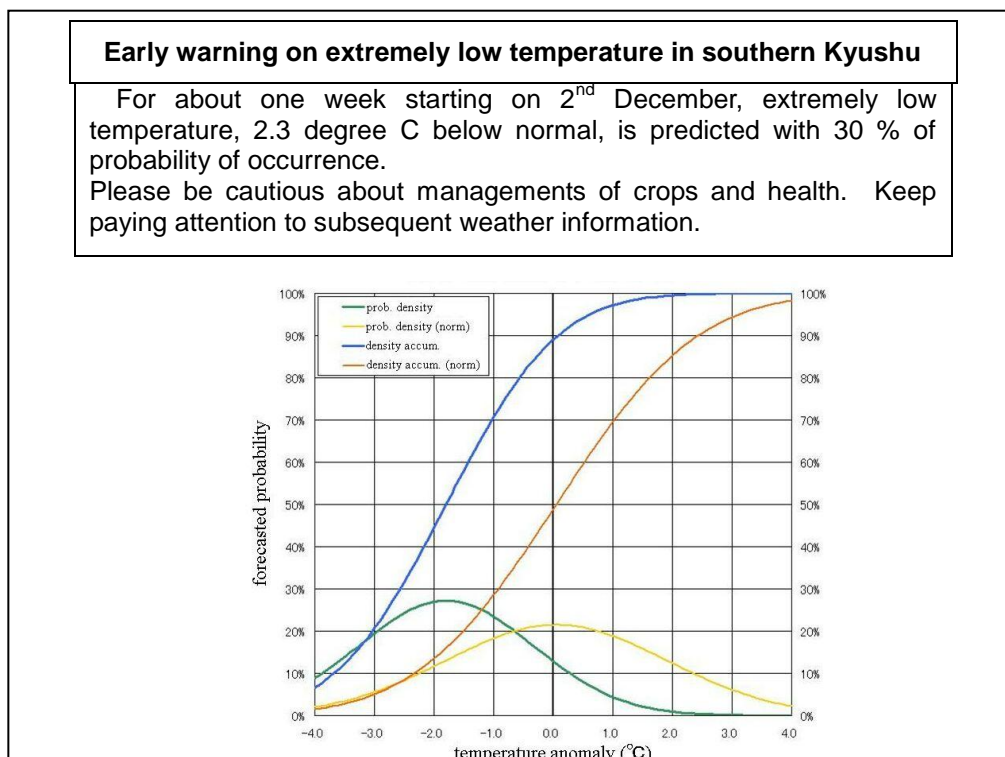

Early warning on extremely low temperature in southern Kyushu

For about one week starting on 2nd December, extremely low temperature, 2.3 degree C below normal, is predicted with 30 % of probability of occurrence.
Please be cautious about managements of crops and health. Keep paying attention to subsequent weather information.

Figure 1   Sample of the early warning information

Descriptive part is brief information on a predicted extreme event. Diagram indicates forecasted probabilities for seven-day mean temperature with one-week lead time. Green line shows probabilistic density, while blue line indicates the accumulation of the density. Yellow and orange lines are probabilistic density of climatological normal and its accumulation, respectively. For example, it is understood from this diagram that normal probability of occurrence of -2.3 degree C or below is 10 % according to orange line, while the chance of becoming -2.3 degree C or below temperature is about 35 %, over three-fold of the normal probability, according to the blue line.