Early Warning Information on Extreme Temperature Events in Japan
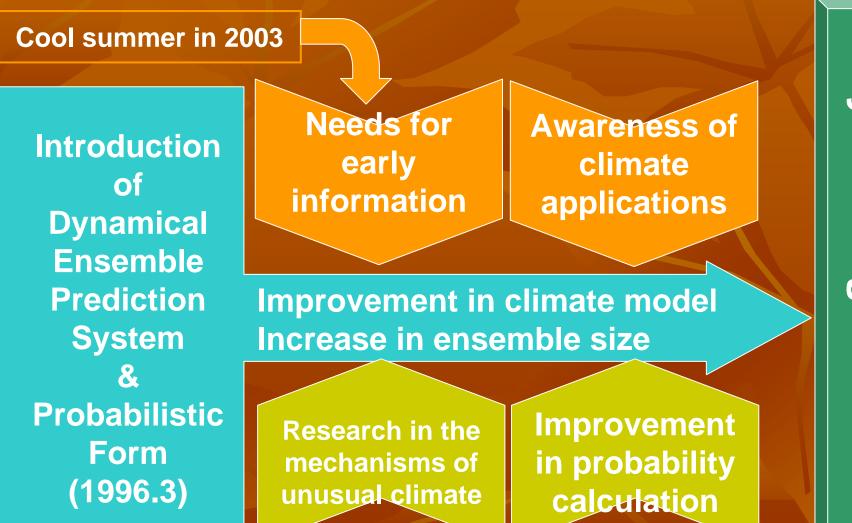
JMA is going to start experimentally issuing the "Early Warning Information" targeting at extremely high/low temperature events beyond a week up to two weeks ahead.

Contents

● Backgrounds

● Expected users / actions

● Contents of the information

Shunji Takahashi
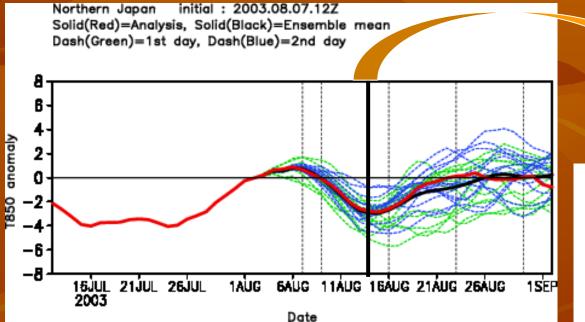
Climate Prediction Division

JMA

Background

Cool summer in 2003

Introduction of Dynamical Ensemble Prediction System & Probabilistic Form (1996.3)

Needs for early information

Awareness of climate applications

Improvement in climate model Increase in ensemble size

Research in the mechanisms of unusual climate

Improvement in probability calculation

Early Warning Information

ensemble prediction and probability

Chaotic nature of Atmosphere
⇒ Probabilistic information

Northern Japan   initial : 2003.08.07.12Z
Solid(Red)=Analysis, Solid(Black)=Ensemble mean
Dash(Green)=1st day, Dash(Blue)=2nd day

distribution of predicted surface temperatures

7日平均気温ヒストグラム

Regional mean temperature anomaly
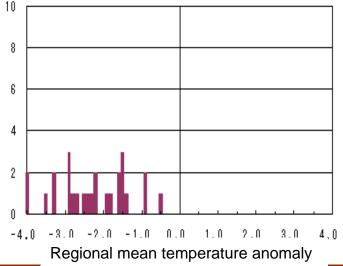
● daily prediction is impossible

● Reduce noise by spatial/temporal average

● Probabilistic information beyond a week

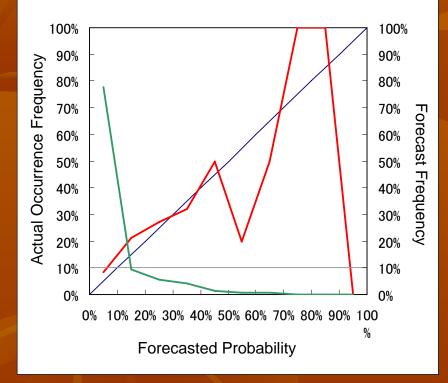# Verification of probabilistic prediction of extreme temperature beyond a week

Reliability Diagram of extremely high/low temperature with climatological occurrence probability of 10%

Hit rate of warning by different thresholds（Blue:20%, Yellow: 30%, Red:40%）

Expected Usage in Agricultural Sector

Crop	Weather Damage		Necessary Action
Paddy Rice	Low temp.	⇒	Deep-water Irrigation
Fruit tree	Cold, Frost	⇒	Fuel burning

Deep-water irrigation is one of the most effective management measures to prevent and mitigate cool weather damage to paddy rice. It can be adequately prepared when information is provided with certain lead time.

For citrus cultivation, they reduce frost and freeze damage by earlier harvesting and fuel burning. Our information is expected to be available to modify harvesting plan and prepare burning materials.

Expected Usage in Energy Sector

Weather Risk   Necessary Action

temperature fluctuation

⇒ rapid change in demand   Operation Planning

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

Expected Usage in Health Sector

Disease   Weather Risk   Necessary Action

Heat stroke   Hot Temp.

Public Awareness/Preparedness

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

What is the Early Warning Information?

● **Arbitrary 7-day mean temperature anomaly**
    up to two weeks ahead

● **Thresholds for "extremely high/low"**
    = Climatological occurrence probability of 10%

●**Issuing the Information as the probability over 20%**

●**11 regional forecasting centers issuing for each region.**

● **information is updated twice a week**
    (every Tuesday and Friday)

● **Detailed Probabilistic Products are provided to**
    cooperative institutions through the Website
    with verification data

Text of Early Warning Information

[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 % probability of occurrence.

Please be cautious about managements of crops and health. Keep paying attention to subsequent weather information.

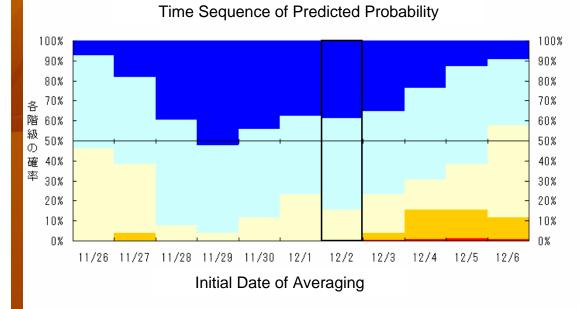**Please refer to detailed products at [URL].**

An example of Basic Products
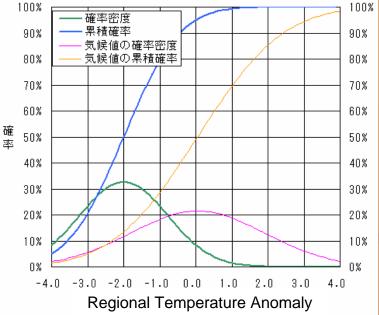
対象地域： 九州南部　　　　　　　予報発表日：　2005年11月25日
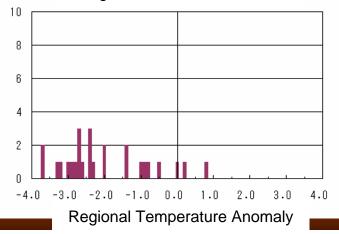
予報期間：　　12月2日　～　　　12月8日　◀ ▮ ▶

Time Sequence of Predicted Probability

各階級の確率

100% 90% 80% 70% 60% 50% 40% 30% 20% 10% 0%

11/26　11/27　11/28　11/29　11/30　12/1　12/2　12/3　12/4　12/5　12/6

Initial Date of Averaging

Probability Density & Cumulative Probability

確率密度
累積確率
気候値の確率密度
気候値の累積確率

確率

Regional Temperature Anomaly

Extremely Low　　　　　　　　　**Extremely High**

　　　　　　Near Normal

かなり低い確率：　　39%　　　　　　　　かなり高い確率：　　0%

低い確率：　　85%　Low　　平年並確率：　15%　High　高い確率：　　0%

1.6 ℃以下の確率：　　100%　　　　　1.2 ℃以上の確率：　　0%

Histogram of Ensemble Members

Regional Temperature Anomaly

Future improvement of early warning information

● Expansion of forecasted elements

⇒precipitation amounts, sunshine duration

⇒ maximum/minimum temperature

⇒Station-to-station forecast

● Information suitable for all users
⇒examine the threshold, content of information
through experimental issuing

Thank you