KMA Extreme Climate Services and User-specific Applications on Energy Sector

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01 Introduction of Extreme Climate Service

02 Current status and Plan

03 Extreme Climate Service: User-Specific Applications on Energy
Introduction of Extreme Climate Service

Early Detection (monitoring) and Warning (prediction) Services for Extreme Climate based on Probabilistic Long-Range Forecast

1. More frequent and severe extreme climate/weather in recent decades
2. Large-scale impact and damage
3. Increasing demand for extreme climate/weather service

- Scientific Understanding of Extreme Climate
- Detection and Prediction Technology of Extreme Climate
Climate elements, such as temperature and rainfall are unusually (abnormally) higher or lower than climatology (yr 1981~2010)

- Over 90 percentiles
- Below 10 percentiles
For Example: 2016 Summer Extreme High Temp.

**JJA Tmax:** 29.7°C (Ranked TOP 3)

- **June Temp**: Ranked Top 7 (Top 1: yr 2010)
- **July Temp**: Ranked Top 12
- **August Temp**: Ranked Top 2 (Top 1: yr 2013, Top 2: yr 2016, Top 3: yr 1994)

**High Temp:**
- 7.21~7.30
- 8.1~25 High temp.

**KMA (45 Stations)**

*Climate Extremes Analysis and Assessment Team / KMA*
Current status and Plan

: Progress for Extreme Climate Service (since 2014)

**Early Detection and Warning Technology for Extreme Climate**
- development of characteristics analysis and application technology for extreme climate early detection using observational data
  → cases study for extremes & understanding of mechanisms
- development of technology evaluating a predictability of operational model (GloSea5) for extreme climate early warning
  → Improvement of predictability of extreme climate in GloSea5

**Operational System Development**
- development & improvement of operation system to support extreme climate services and provide early detection & warning information on extreme climate

**Services & Application**
- design & development of service and verification system of extreme climate early warning
Current status and Plan

Summery of the Extreme Climate Services

○ Trial Operation Date: ‘17.11.23~
○ Service Target: the Public and Energy-related (electricity, gas) Government

○ Way to Serve
  - public: KMA Homepage(www.kma.go.kr)
  - Energy Sector: another on-line system
    ※ User-specific application:

○ Issue Cycle & Period

<table>
<thead>
<tr>
<th>Kinds</th>
<th>Issue date</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekly Info.</td>
<td>Every Thu.</td>
<td>A Week(Mon~Sun)</td>
</tr>
<tr>
<td>Monthly Info.</td>
<td>Every 23rd</td>
<td>A month</td>
</tr>
</tbody>
</table>

  Unit                   Prediction Period (later)
  The week after next week (4 weeks)  Next month (3 months)
User-specific Application: Ex. Energy

* To investigate features of extreme climate that affect energy consumption.

.. The 90/95 percentiles may be reasonable criteria in climate system. But, How about user-specific application? → Have to use different criteria of extreme climate reflecting the features of a target.

Ex. Weekly Electric Power consumption prediction (Seoul)

[Relationship between climate elements and power]

<table>
<thead>
<tr>
<th></th>
<th>Tmean</th>
<th>Tmax</th>
<th>Tmin</th>
<th>RH</th>
<th>Cloud Amount</th>
<th>radiation</th>
<th>Wind Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yr</td>
<td>0.801*</td>
<td>0.675**</td>
<td>0.795**</td>
<td>-0.257**</td>
<td>-0.205*</td>
<td>0.213*</td>
<td>0.207**</td>
</tr>
<tr>
<td>~ 2015</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Electric Power consumption: Summer (JJA) → climate variables: mean T, min T, relative humidity

* Gas consumption: Winter (DJF) → climate variables: min T
* Forecasting information including both intensity and occurrence day of extremely hot or cold temperatures that cause maximum of electric power or gas consumption

### Summer

<table>
<thead>
<tr>
<th>Category</th>
<th>Weekly mean Energy (Electric Power) consumption (GW/day)</th>
<th>Remarks</th>
<th>Occurrence day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>165~</td>
<td>TOP 5%</td>
<td>2Days 3Days 4<del>5Days 6Days</del></td>
</tr>
<tr>
<td>Level 2</td>
<td>160~170</td>
<td>TOP 10%</td>
<td>4 3 3 2</td>
</tr>
<tr>
<td>Level 3</td>
<td>155~165</td>
<td>TOP 18%</td>
<td>3 3 2 1</td>
</tr>
<tr>
<td>Level 4</td>
<td>150~160</td>
<td>TOP 30%</td>
<td>2 2 1 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Season</th>
<th>Category</th>
<th>Weekly mean Energy (GAS) consumption (1000m³/day)</th>
<th>Remarks</th>
<th>Occurrence day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter</td>
<td>Level 1</td>
<td>2300~</td>
<td>TOP 2.5%</td>
<td>2Days 3Days 4Days 5Days~</td>
</tr>
<tr>
<td></td>
<td>Level 2</td>
<td>2100~2300</td>
<td>TOP 9%</td>
<td>4 3 3 2</td>
</tr>
<tr>
<td></td>
<td>Level 3</td>
<td>2000~2100</td>
<td>TOP 13%</td>
<td>3 3 2 1</td>
</tr>
<tr>
<td></td>
<td>Level 4</td>
<td>1900~2000</td>
<td>TOP 20%</td>
<td>2 2 1 1</td>
</tr>
</tbody>
</table>

### Expected Energy Consumption Levels

- **Level 1**: TOP 5%
- **Level 2**: TOP 10%
- **Level 3**: TOP 18%
- **Level 4**: TOP 30%
User-specific Application: Ex. Energy

- Extreme climate forecast information to predict summer electric power and winter gas consumption
- Modify based on climate prediction model

### Summer

<table>
<thead>
<tr>
<th>Tmean</th>
<th>2Days</th>
<th>3Days~</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 80%ile</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 90%ile</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Winter

<table>
<thead>
<tr>
<th>Tmin</th>
<th>2~3Days</th>
<th>4Days~</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 20%ile</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 10%ile</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Weekly specific information on energy sector,

- In summer and winter season,
  more specific information (strength, duration of Ext. high or low temp.) will be added (20/80 percentile, Not only 10/90 percentile~)
- To expect Maximum power!!

Weekly detailed forecast (ex. Summer)

<table>
<thead>
<tr>
<th>Intensity of T mean(anomaly)</th>
<th>2Days</th>
<th>3Days~</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over 80%ile (1.1~2.3°C)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Over 90%ile (1.5~3.8°C)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The probability of 2 days occurrence with **over 80 percentile** (mean temperature) is **over 50%**
이상기후 감시·예측정보
2017년 8월 10일 발표

이상기후 전망
북태평양기후의 영향을 주로 받았음
(주 최저기온) 평년과 비슷했으며, 이상저온·고온 모두 발생가능성이 낮았음
(주 최고기온) 평년보다 높은 경향을 보이겠으며, 이상고온 발생가능성이 높았음

전망기간: 2017년 8월 21일 ~ 8월 27일

[Minimum Temp.] Probability of Extreme high or low temp. occurrence is under 30%

[Maximum Temp.] Probability of Extreme high temp. occurrence is over 30%

여름철 이상고온 상세전망

<table>
<thead>
<tr>
<th>평균기온 강도 (기온편차 기준)</th>
<th>2일</th>
<th>3일 이상</th>
</tr>
</thead>
<tbody>
<tr>
<td>30%미만</td>
<td>30% 이상 50% 미만</td>
<td></td>
</tr>
<tr>
<td>30% 미만</td>
<td>30% 이상 50% 미만</td>
<td></td>
</tr>
<tr>
<td>20% 미만</td>
<td>30% 이상 50% 미만</td>
<td></td>
</tr>
<tr>
<td>30% 미만</td>
<td>30% 이상 50% 미만</td>
<td></td>
</tr>
</tbody>
</table>

※ 기온 강도별 발생일수 전망은 발생가능성(확률) 백분율로 산출하였고, 백분율은 30%와 50%로 구분하여 예측정보를 제공합니다.

참고자료

전망기간(2017. 8. 21 ~ 8. 27) 이상저온 및 이상고온 기준 분포도

지난주(2017년 7월 31일 ~ 8월 6일) 이상기후 발생 현황

출처: 기상청, 2017년 8월 기준

상하호수, 해수, 지하수, 지표수의 이상기후 발생 가능성(확률) 전망을 30% 이상 50% 미만의 백분율로 제공합니다.
이상기후 감시·예측정보
2017년 10월 25일 발표

전망기간: 2017년 11월

이상저온 발생일수
- 40% 40% 20%
- 최적: 20% 30% 50%

이상고온 발생일수
- 30% 30% 50%

시작일이 발생일수 평균(3일) 초과하나 적절함
시작일이 발생일수 평균(3일)보다 적절함

[Days of Extreme low temp. occurrence] will be same or less than normal (3days)
[Days of Extreme high temp. occurrence] will be More than normal (3days)
Thank you~

Questions to

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