Probabilistic Global Convective Hazard Forecasts and Verification

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Severe convection can cause a range of weather hazards which are a danger to both the general public and commercial sectors such as aviation. The Met Office produce forecasts for a range of convective hazards using the Met Office Convection Diagnosis Procedure (CDP).

This work explores CDP forecasts produced using the Met Office Global Regional Ensemble Prediction System in the global configuration (MOGREPS-G).

MOGREPS-Global CDP
- 33km model resolution
- 12 ensemble members
- Produces a probability of occurrence.
- Run for 0Z and 6Z MOGREPS-G run each day only.
- Lead times of T+12, 18, 24, 30, 36, 42, 48, 60.
- Convective parameters:
  - Lightning
  - - Precipitable water
  - - CAPE (Convective Available Potential Energy)
  - - Lifted Index
  - - Hail
  - - - Potential energy

MOGREPS-Global CDP forecasts for 26/05/2013 at 6Z.

Verification: Lightning in Europe

This objective verification of the lightning diagnostic includes 1116 civil airports across Europe during the 2013 summer (June-August).

Lightning Observations
The ATDnet (Arrival Time Difference) system is an automatic lightning location network that senses lightning strokes across a geographical area. A stroke count is processed to give the number of strokes within a 50km radius of each airport over a 6 hour period.

Lightning Probability
Lightning probability is derived using the lightning index (LI) of each ensemble member at the airport. Lightning index has 3 outcomes: 0, 1 or 10 as displayed in Table 1 depending on a variety of convection parameters.

Table 1: Chance of lightning associated with each lightning index.

<table>
<thead>
<tr>
<th>LI</th>
<th>Probability of Lightning Index</th>
<th>Default Probability</th>
<th>Correct Rejections</th>
<th>False Alarms</th>
</tr>
</thead>
<tbody>
<tr>
<td>LI 0</td>
<td>Lightning unlikely</td>
<td>2.2%</td>
<td>9.8%</td>
<td></td>
</tr>
<tr>
<td>LI 1</td>
<td>Risk of lightning</td>
<td>3.0%</td>
<td>45.0%</td>
<td></td>
</tr>
<tr>
<td>LI 10</td>
<td>Deep convectively stable environment, lightning possible</td>
<td>4.0%</td>
<td>82.8%</td>
<td></td>
</tr>
</tbody>
</table>

This work includes more objective verification of the lightning diagnostic and potential additions to the forecast. Further verification research into the diagnostic will be carried out. Future work would also include more objective verification of the lightning diagnostic and potential additions to the tornado diagnostic to create a probability of supercells.

References