A Space Weather forecast service for high latitudes and Arctic navigation

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Summary

• What is SW (Space Weather)?
• What are the impacts for polar navigation?
• Why is polar navigation more vulnerable to SW?
• Which services for mariners?
What is Space Weather (SW)?
Sun activities affecting human activities
SW impacts on polar navigation?
Communications perturbations

Signal fades, scintillations
Radio blackout (worst)

HF, VHF-UHF
L-Band (Iridium, Inmarsat)
GNSS perturbations

- Signal fades
- Amplitude/phase scintillations

- Positioning errors
- Service disruptions

- Natural GPS, DGPS, SBAS...
Why is polar navigation more vulnerable to SW?

Worse conditions (weather, ice...)  
Limited infrastructure (Comm, SAR...)  
Opening Arctic routes (non expert)
Which SW services for mariners?

**Nowcast:**
*What level of confidence on my GNSS & Telecom’?*

**Forecast:**
*How high is the risk of perturbations occurring? Which area? How long?*
### IMO minimum maritime user requirements

**Res. A.915(22)**

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<thead>
<tr>
<th></th>
<th>Absolute Accuracy</th>
<th>Integrity</th>
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<tbody>
<tr>
<td></td>
<td>Horizontal (metres)</td>
<td>Alert limit (metres)</td>
</tr>
<tr>
<td>Ocean</td>
<td>10 (100)(^1)</td>
<td>25</td>
</tr>
<tr>
<td>Coastal</td>
<td>10</td>
<td>25</td>
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<td>Port approach and restricted waters</td>
<td>10</td>
<td>25</td>
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<tr>
<td>Port</td>
<td>1</td>
<td>2.5</td>
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\(^1\) Indicates higher accuracy required.
SW campaign at sea (duration: a few months)

Multi-band & multi-systems onboard

AIS
GPS
Iridium
Argos

➢ To test systems response to SW events (unique!)