## Arctic Climate Group 1

<table>
<thead>
<tr>
<th>Time Scale</th>
<th>Sources of Predictability</th>
<th>Observations</th>
<th>Modeling</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 days -16 days</td>
<td>Initial Value NWP (extended) Ensemble required</td>
<td>Inexpensive buoys</td>
<td>Atmospheric Processes:</td>
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<tr>
<td></td>
<td></td>
<td>- SLP, ice drift or surface currents</td>
<td>- Improve Arctic stratus</td>
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<td></td>
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<td>Instrument platform of convenience&lt;sup&gt;P&lt;/sup&gt;:</td>
<td>- Assess present operational models</td>
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<td>- Ships of opportunity/VOS</td>
<td>- Assess/further develop assimilation systems</td>
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<td>- Drilling platforms (include thermistor chains to ~200m)</td>
<td>- Employ best practices of ensemble forecasting and apply to the Arctic</td>
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<td>Product driven OSSEs/sensitivity studies</td>
<td>(reforecasting to bias correct)</td>
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<td>RAOBs (in a few locations)</td>
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<td>Use of limb sounding data</td>
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<sup>P</sup> – partners (Industry, international)
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<tr>
<td>Sub-seasonal 2-5 months</td>
<td>Upper ocean:</td>
<td>Satellite &amp; Aircraft remote sensing for</td>
<td>Fully coupled models&lt;br&gt;Mine NMME: maintain and develop&lt;br&gt;-Arctic forecast products</td>
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<tr>
<td></td>
<td>- Temperature</td>
<td>- sea ice concentration &amp; thickness</td>
<td>- Improve land surface hydrology</td>
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<td></td>
<td>- Salinity</td>
<td>- albedo</td>
<td>Improve polar physics:&lt;br&gt;- Boundary layer resolution and parameterization</td>
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<td></td>
<td>Sea ice:</td>
<td>Soil moisture active/passive (SMAP)</td>
<td>- Clouds</td>
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<td>- thickness</td>
<td>Thermistor strings</td>
<td>Waves and potential interactions with ice</td>
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<td></td>
<td>- surface conditions (melt ponds)</td>
<td>Salinity measurements</td>
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<td>Land conditions:</td>
<td>Gliders</td>
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<td></td>
<td>- soil moisture</td>
<td>Argo-like floats (further development under ice)</td>
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<td></td>
<td>- snow cover</td>
<td>Process level observations (clouds, boundary layer, surface fluxes)</td>
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<td></td>
<td>- vegetation</td>
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<td>Atmospheric teleconnections</td>
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| Seasonal to interannual | Subseasonal + Horizontal ocean heat transport  
Studies of sources of predictability, e.g. AMO, ENSO | See subseasonal       | See subseasonal     |
Action Items (planning)

• Develop action plan for NOAA’s engagement and support of Year of Polar Prediction (YOPP)
• NOAA should advocate for a polar Regional Climate Center RCC – for pan Arctic products
• Prioritize Arctic observations build-out plan
• Develop pipeline for interagency data (e.g. NASA) for albedo (MODIS), sea ice thickness (ice sat 2), soil moisture (SMAP)
• Assimilate data into models – agreements to obtain data from other agencies (e.g. NASA)
• Develop a plan to acquire necessary Arctic observations and the means to assimilate them into NOAA models
  – “new” – could build off past efforts at other prediction centers
Action Items

• Assign Resources to field programs:
  – Understand the emerging Arctic (e.g. lots of this ice)
    MOSAIC (to gain process understanding of cloud topped bounday layer)
  – ICECAPS

• Expand Arctic Voluntary Observation Ship (VOS) program

• Thermistors on industry platforms

• Assess current predictive skill for key products
  – NWS 8-16 day
  – CPC & OAR longer term
  – (probablistic) skill for extreme events

• Employ user based metrics for Arctic Test bed

• Develop AMPS (Antarctic Mesoscale Prediction Systems) for Arctic region

• Improve Stratus clouds (From yesterday)

• NMME framework
Top Three

Easy
• Take advantage of existing observations
  – Immediate use
• Mine NMME and support its frame work and development
• Leverage partnerships
  – NOAA-industry data sharing
  – Quick enhancement of key observations

Hard
• Invest resources in getting clouds and boundary layers correct
• Assess what observations and assimilation techniques are needed to improve predictive skill of key products
  – OSSEs
  – Prediction Limits
• Assess predictability (and vulnerability) of high impact weather events
The Source

Thanks to Amy Holman (notes)
Marika Holland group

**Subseasonal to Seasonal**

**Sources of Predictability**
- Upper Ocean - Heat
  - Salinity
- Lower Atmosphere Heat + Moisture
  - Content (persistent patterns)
  - Surface Albedo (Black Carbon)
  - Stratosphere
- Sea Ice Thickness Distribution
- Surface Ice Conditions (melt ponds)
  - Soil moisture, snow cover, vegetation
- Teleconnections

**Observations**
- Satellite + Aircraft remote sensing for sea ice thickness/albedo + other ice characteristics
- Soil moisture active/passive SSMAP
- Thermister Strings + Salinity in the upper ocean (including gliders)
- Process level observations to improve (e.g. clouds... boundary layer) models

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