NOAA Next-Gen Global Prediction System
Sea Ice Modeling Workshop
Boulder, CO - February 05, 2016

Next Steps
Draft elements for open discussion

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Topics for discussion

1. Summarize NGGPS deliverables, timeline, etc.
2. Discuss coordination opportunities and needs
3. Develop specific comparisons/testing projects and participants
4. Capture gaps and desired evolution pathway over next few years to meet needs
5. Discuss/finalize workshop recommendations/output

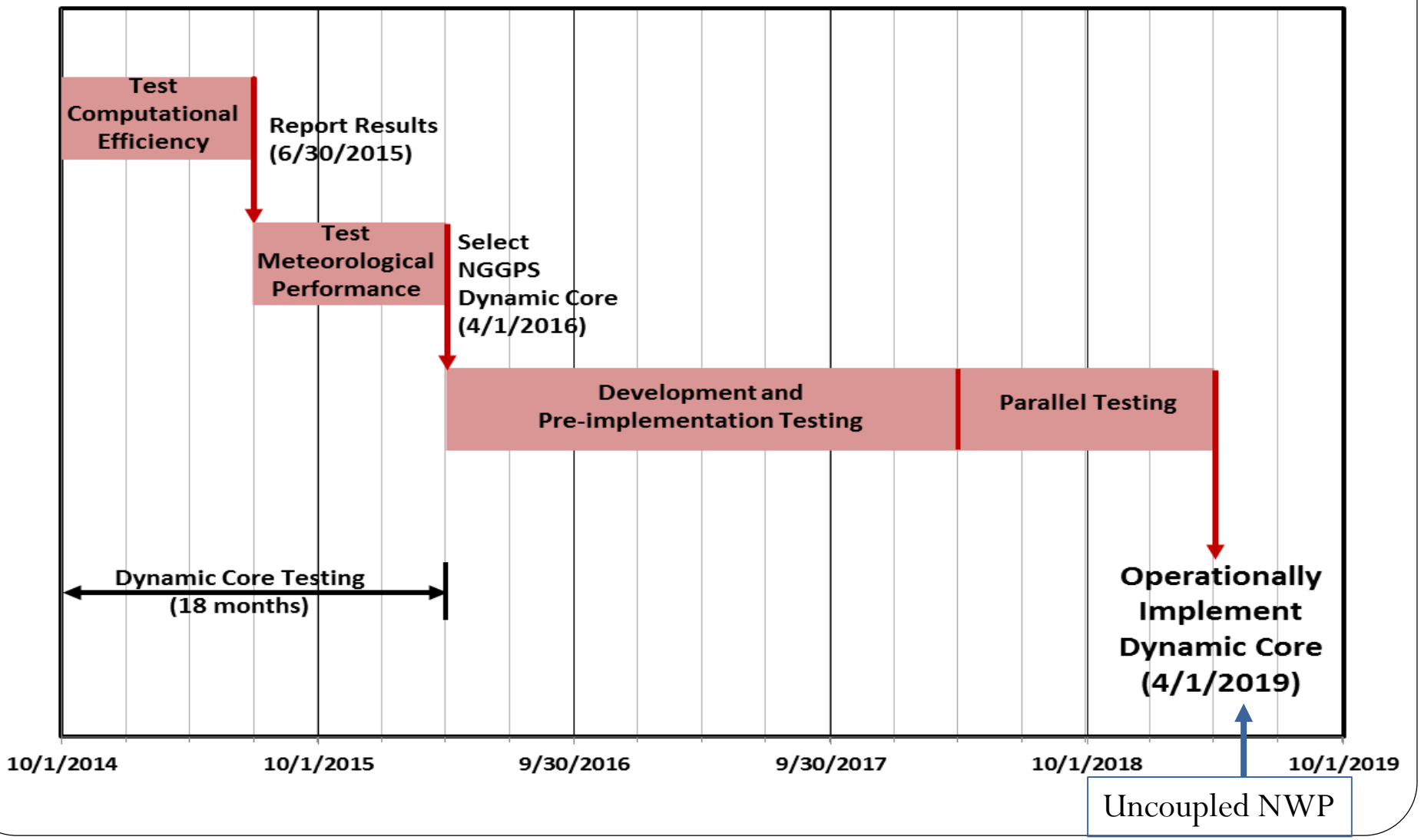
Summarize NGGPS deliverables, timeline, etc.

NGGPS deliverables

- **Sea ice model for a variety of time and spatial scales**
  - 5, 16, 30 days + beyond
  - O (1km) – O (25 km)
- **Number of sea-ice and ocean models at NCEP**
  - Hendrik: NCEP/UMAC supporting streamlining production suite. Unification of models IF it makes sense (could retain more than one model)
- **Seeking a fully coupled system**
  - Atmosphere, ocean, sea ice, waves etc.
- **Operationally stable**
  - No blow ups in middle night

Courtesy: H. Tolman

NGGPS – IOC - uncoupled



Timeline aspects

- **<u>Need decision on sea-ice model by end of FY16 (Sep 2016) – 6 months</u>** (Grumbine)
  - Do not close the door to down-selected models – further test in coupled mode may bring more information
- **Ongoing efforts**
  - UCGS v0.1: 5-day forecast MOM-CICE-GSM ready Aug 2015
  - UCGS v0.2: 15- day forecasts – coming up
  - Regional artic project (NEMS+NMMB+KISS)

This project complements NGGPS

Courtesy: H. Tolman

Arctic prototype model plan

Feb 2016

<table>
<tr><th>Months</th><th colspan="3">Activities</th></tr>
<tr><td>1-2</td><td rowspan="2">Set up NMMB, HYCOM, static ice “solo” in NEMS.</td><td rowspan="2">archive based flux biases</td><td rowspan="3">Ice in ESMF</td></tr>
<tr><td>3-4</td></tr>
<tr><td>5-6</td><td rowspan="4">Build and validate deterministic coupled system with flux bias correction for 5-7 day forecast</td><td rowspan="3">Validation metrics</td></tr>
<tr><td>7-8</td><td rowspan="3">KISS v2</td></tr>
<tr><td>9-10</td></tr>
<tr><td>11-12</td><td></td></tr>
<tr><td>13-14</td><td colspan="3" rowspan="2">Setup ensemble system</td></tr>
<tr><td>15-16</td></tr>
<tr><td>17-18</td><td colspan="3" rowspan="3">Test, validate and calibrate ensemble system</td></tr>
<tr><td>19-20</td></tr>
<tr><td>21-22</td></tr>
<tr><td>23-24</td><td colspan="3">Coupled demonstration system, (→ day 10+ ?)</td></tr>
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Coordination: opportunities & needs

Community is larger than model development – science and process studies
Sea ice development together with ocean – need process studies

NOAA/Community interactions

- **There is a strong community that NOAA can benefit from**
  - Very productive workshop
  - Community modelING more critical that community model
- **Lots for NOAA to learn from**
  - NRL's experience
  - CFS/CPO/CPTs
  - CICE's and CESM's has large community around it –
  - SIS, which uses elements (physics) from CICE
  - Etc.
  - Many synergistic efforts (SIPN, ONR, GLRL, UKMO, etc.)
- **Community model**
  - Takes resources (see investment of NCAR/NSF on WRF, CESM)
  - Consortium –Starting point; governance and collaboration protocols for NGGPS model
- **How can we continue fostering community modelING?**

Develop specific comparisons/testing projects and participants

Ice Models and Modeling Systems

Ice Models

Simplified physics

- **NWS Drift & KISS Models-** B. Grumbine (NWS NCEP)

Sophisticated physics

- **LANL CICE** – A.Turner (LANL)
- **UW PIOMAS** – A.Schweiger (UW)
- **GFDL SIS2** – M. Bushuk (NOAA GFDL) (uses some CICE physics)

Modeling Systems

- **U.S. Navy ACNFS/GOFS 3.1** – P. Posey (NRL) [MOM+CICE + offline atmos]
- **NCEP CFS v2** – X. Wu (NCEP) [GSM+MOM4+SIS]
- **NCEP -CFS v3** - D. Bailey (NCAR)[NEMS+GSM+MOM+CICE]
- **Canadian RIOPS** - Fred DuPont (EC) [NEMO+CICE]

Criteria to determine path forward

- Comparison among results from various models?
- Existence of community, documentation, support, etc.
  - Some of the sea ice models are so similar that the criteria for decision should be other than head-to-head comparison?
- Keep timeline in mind

Testing possibilities

- Focus on science and leave software/performance for next steps
  - Connection to NEMS only necessary after selection
- 1) Canned forcing for atmosphere and ocean; 2) coupled
- Multi-year testing + case studies of important events
- Metrics and observations were outlined on BOGs
  - For next 6 months, may need to stick to basics
  - Keep user/products in mind (better model and/or better forecast)
  - Must beat persistence/climo
- Roles/Responsibilities
  - Do modeling groups have the resources needed to participate?
  - DTC: provide forcing, collect outputs, run vx?

Gaps and desired evolution pathway over next few years to meet needs

Longer term (> 6 months)

- **NOAA becomes a full partner in understanding & dev**
- **Continue testing and evaluation**
- **Observations for vx and DA**: expand use
- **DA:** critical for improving short-term NWP
- **More sophisticated vx/diag** metrics that provide feedback to model developers (processes) and end users
- **Ensembles**
- **Artic Testbed**
- **Others?**
- **Other model developments that NGGPS can benefit from in long term - strategies**

Discuss/finalize workshop recommendations/output

Potential outcomes

- Report (workshop committee + contributors)
- Focus group for deciding testing protocols, plans, community involvement