



Acquisition Directorate

Research & Development Center

ICECON Update

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Unclassified | ICECON Update | RDC/D9 | Mark
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Icebreaking COE | 15 Oct 18



Agenda



- **Background**
- **Past Year**
 - Data Analysis (2017-2018)
 - Issues
 - Developments
- **Moving Ahead**
- **Demonstrations**
- **Q&A**



Background



- ★ • **Fall 2015 D9 “Ice Condition Scale” issue paper**
 - Develop scale to accurately and concisely describe ice condition severity
 - Forecast ICECON out to 72 hours
- **Nov 2015 – Jan 16 Discussions with CG-WWM-3, D9, D1, D17, NAIS, NIC, CIS, RDC, CGA, ADAC**
- ★ • **Dec 2015 NIC presented initial ICECON scale**
- **Winter 2015-2016 Light ice season; minimal data collected**
- **Nov 2016 “Council of Experts” meets in Cleveland**
- **Jan 2016 Historical AIS data obtained for analysis**
- **Winter 2016-2017 Light ice season; minimal data collected**
- ★ • **ADAC adjusts NIC algorithm; evaluates GLERL data**
- **Winter 2017-2018 Uneven ice season; good data spread**



NIC Scoring Scheme



Ice concen. <i>tenths</i>	Point score	Thickness <i>inches</i>	Point score	Air temp. °F	Point score	Wind conditions	Point score	Ice Type	Point score
< 1	0	0	0	≥32	0	0-20 kts off-ice	0	Fast ice	5
1-3	5	1 – 2	2	25 – 31	2	> 20 kts off-ice	2	Rafted ice	10
4-6	10	2 – 5	10						
7-9	20	6 – 11	15	10 – 24	5	0-20 kts on- ice	5	Brash ice	10
10	25	12 - 27	20	<10	10	> 20 kts on- ice	10	Hummocked / ridged ice	25
		≥28	25						

Note: Wind and Ice Type only scored if Ice Concentration >70%.



NIC ICECON Classification



Point Total	ICE CON	Impacts to Vessels
0		No Ice present or imminent
0-15	1	Minimum ice concentrations and thickness, Does not present hindrance to commercial navigation.
16 -30	2	Light Ice conditions present. Still open water areas. May be some hindrance to less ice-capable ships.
31 -50	3	Light-to-moderate ice conditions present. Less ice-capable ships may need icebreaker assistance for transit and/or be at risk for damage.
51 -75	4	Moderate-to-Heavy Ice conditions present. All Commercial ships may require icebreaker assistance for transit.
75+	5	Heavy-to-extreme ice conditions. All transits require icebreaker escort. Approaching or exceeds capabilities of light icebreaker assets. Increased risk of damage to vessels.



Data Analysis (2017-2018)



- **Focus: GLERL forecasted data and ICECON algorithm**
- **37 ICECON observations**
- **Tested three and four-parameter algorithm variations**
- **Need to refine further... “ice type” tough to beat**
- **Noted discrepancies in GLERL forecasted data**
 - Will evaluate limitations on ICECON algorithm





ICECON Algorithm Evaluation

- **Original parameters: Ice thickness, concentration & type; air temp; relative wind (speed and on or off ice)**
 - Accuracy (calculated vs. observed): 62%
 - Accuracy with Monte Carlo-generated values: 72%
 - Accuracy excluding “Ice Type”: 58%
- **Three parameters: Ice thickness & concentration, air temp**
 - Accuracy (observed data): 40%
 - Accuracy (GLERL data): 57%
- **Four parameters: Three plus observed ice type**
 - Accuracy (observed data): 49%
- **Four parameter: Three plus observed wind**
 - Accuracy (observed data): 45%
- **Four parameter: Three plus ice divergence (based on GLERL ice velocity)**
 - Accuracy (observed data plus ice velocity): 65%





- **Data**

- Mild winters limit the volume of data gathered
- Icebreaker ops limit the locations where data collected
 - Solution: expand observers to commercial ships (LCA)
 - Expand to Stations by using cell phone app?
- Accuracy drops without “Ice Type”

- **Human factors**

- Calculated ICECON influences observer
 - Solution: Just gather raw data and observed ICECON

- **USCG and “.mil” firewalls**

- Preventing access to ADAC developmental products
 - Solution: ??



Transition Developments



- **National Ice Center (NIC)**

- Agreed to operate ICECON for USCG (1 May 18 letter)
- Will publish daily 0hr, 24hr, 48hr, 72hr graphic products

- **ADAC**

- Developed/launched beta web visual display of ICECON for Lake Erie
- Expanded to Superior late season



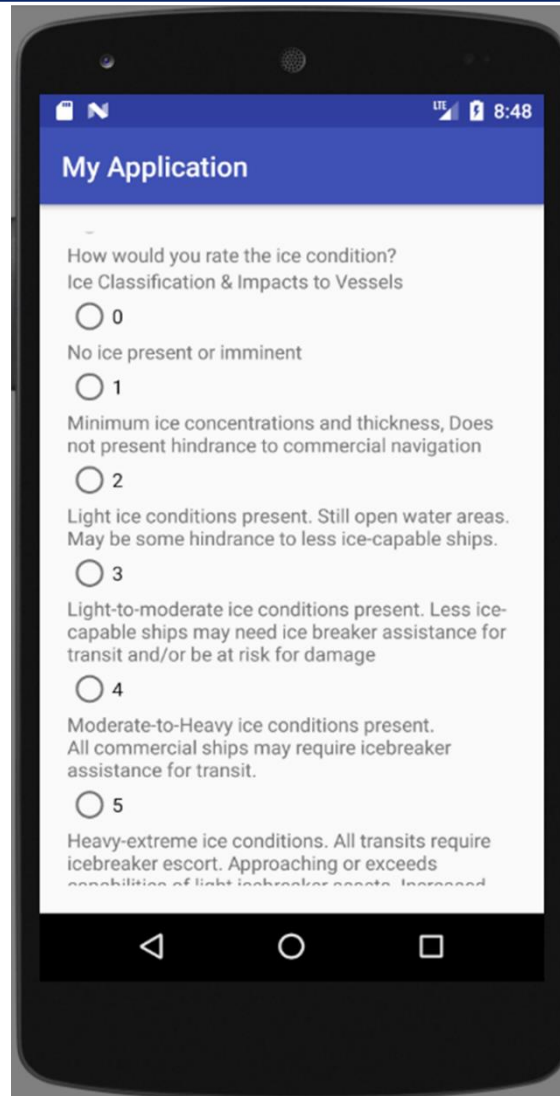
Moving Ahead



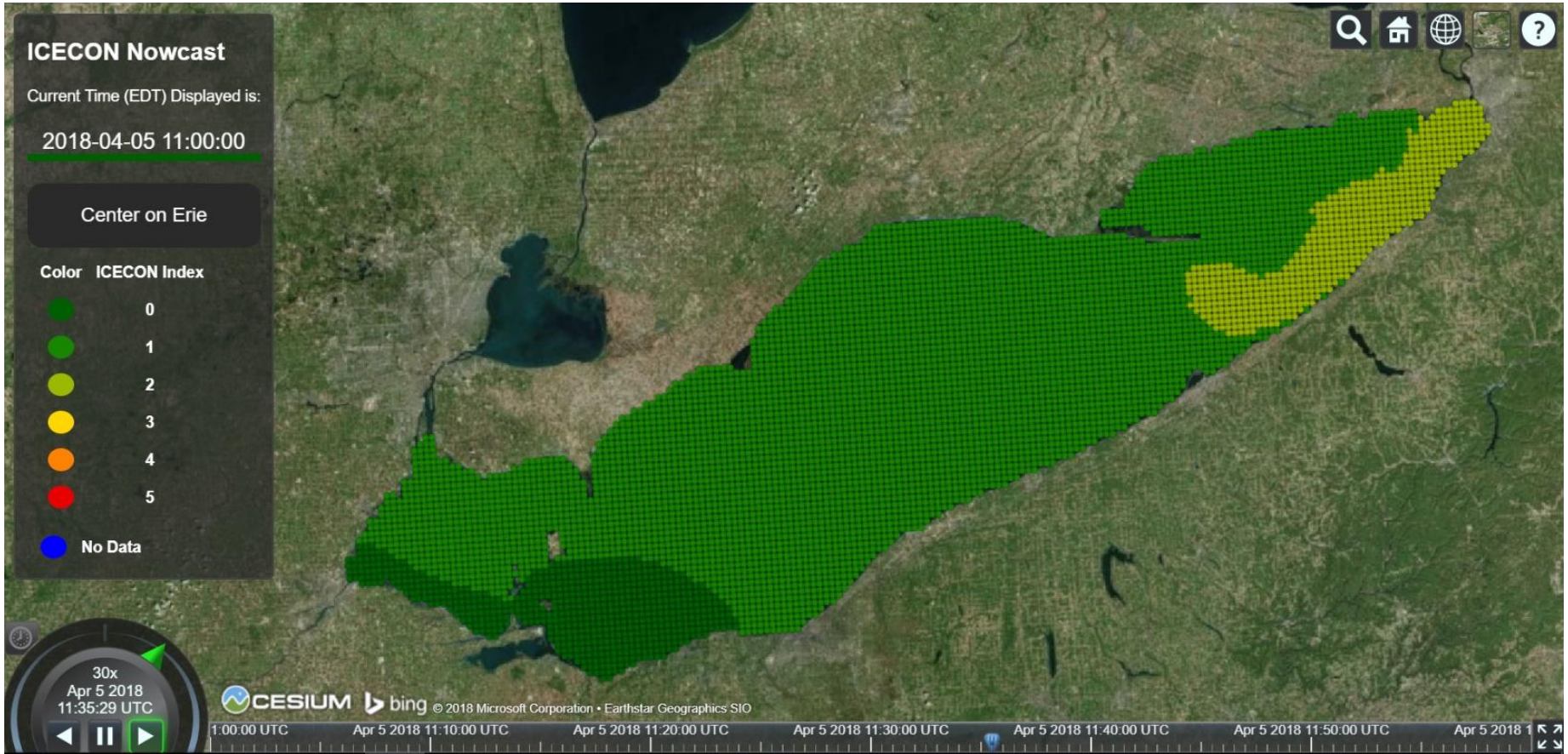
- **Simplify data gathering**
 - Streamline collection spreadsheet
 - ADAC developing cell phone app for data collection
- **Expand collection agents**
 - Engage LCA
 - Consider Stations, others
- **Expand/modify for D17**
 - Arctic scoping exercise included in 2018-19 ADAC work plan



ICECON App



ICECON on the Web (beta stage)





Questions?





Backup slides



Data Analysis (2016-2017)

- NIC algorithm concurrence rate of 62.5% (45 out of 72 cases)
- Monte Carlo optimization improved rate to 72.2%
- Excluding “Ice Type” reduces concurrence to 58%

