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ICECON Update

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UNCLAS//Public | ICECON Update| RDC/D9 | Mr. Sam Cheung
CCGDNine and Icebreaking COE | September 2019

Agenda

- **Background**
- **National Ice Center (NIC) Scoring and Classification**
- **Past Two Years**
  - Data Analysis (2017-2018)
  - ICECON Algorithm Evaluation (2017-2019)
  - Issues
  - Transition Developments
- **Beta Testing**
- **ICECON App**
- **Moving Ahead**
- **Conclusion**

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Background

- **Fall 2015 D9 "Ice Condition Scale" issue paper**
  - Develop effective scale AND Forecast ICECON out to 72 hours
- **Nov 2015 – Jan 16 Discussions with CG-WWM-3, D9, D1, D17, NAIS, NIC, CIS, RDC, CGA, and ADAC (Stakeholders)**
- **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**

Background (Cont'd)

- **ADAC analyzed winter 2017-18 data, adjusted NIC algorithm**
- **Dec 2018, "Council of Experts" meeting with CG-WWM-3, D9, RDC, USNIC, ADAC, and National Research Council Canada (NRC)**
  - USNIC does not support the current GLERL data as input to ICECON
  - NRC proposed Pressured Ice Model as ICECON input
- **ADAC and RDC evaluated NRC Pressured Ice Model**
- **June 2019, discussion with CG-WWM-3, D9, RDC, USNIC**
  - NRC Pressured Ice Model was tabled
  - USNIC proposed using Water Cycle Prediction System (WCPS) as ICECON input (see slide # 11 for details)
- **ADAC obtained 2018-19 winter ship observation data, analysis on-going**

NIC Scoring Scheme

Ice concen. tenths	Point score	Thickness inches	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						
		6 – 11	15	10 – 24	5	0-20 kts on-ice	5	Brash ice	10
7-9	20	12 - 27	20						
10	25	≥28	25	<10	10	> 20 kts on-ice	10	Hummocked / ridged ice	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

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ICECON Algorithm Evaluation

- **ADAC ICECON algorithm evaluation based on 2017-18 winter data (2018-19 winter data analysis on-going)**

Algorithm	Ice Concentration	Ice Thickness	Air Temperature	Ice Divergence	Ice Pressure	Concurrent Rate
NIC	GLERL	GLERL	GLERL	Not used	Not used	40%
ADAC	GLERL	GLERL	GLERL	Not used	Not used	57%
ADAC	GLERL	GLERL	GLERL	GLERL	Not used	65%
ADAC	GLERL	GLERL	GLERL	GLERL	GLERL	72%

Issues

- **Data collection**
  - 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 with both Android (developed) and iOS (in development) version
  - 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: send daily email update with jpeg files only

Transition Developments

- **National Ice Center (NIC)**
  - Initially agreed to operate ICECON for USCG (1 May 18 letter)
  - After further discussions, ask for ADAC to host ICECON on Axiom Data Science
  - Will publish daily 0hr, 24hr, 48hr, 72hr forecast graphic products

- **ADAC**
  - Established an beta version for all 5 Great Lakes based on GLERL data input
  - Transitioning the ICECON product to using WCPS data input, final product pending on entire WCPS data comes online in Sep/Oct 2019
  - Products will include 6 jpeg ICECON charts (5 for each lake and 1 for all lakes) and a kmz file to USCG and a shape file to USNIC through automatic daily emails

ICECON (beta version based on GLERL)
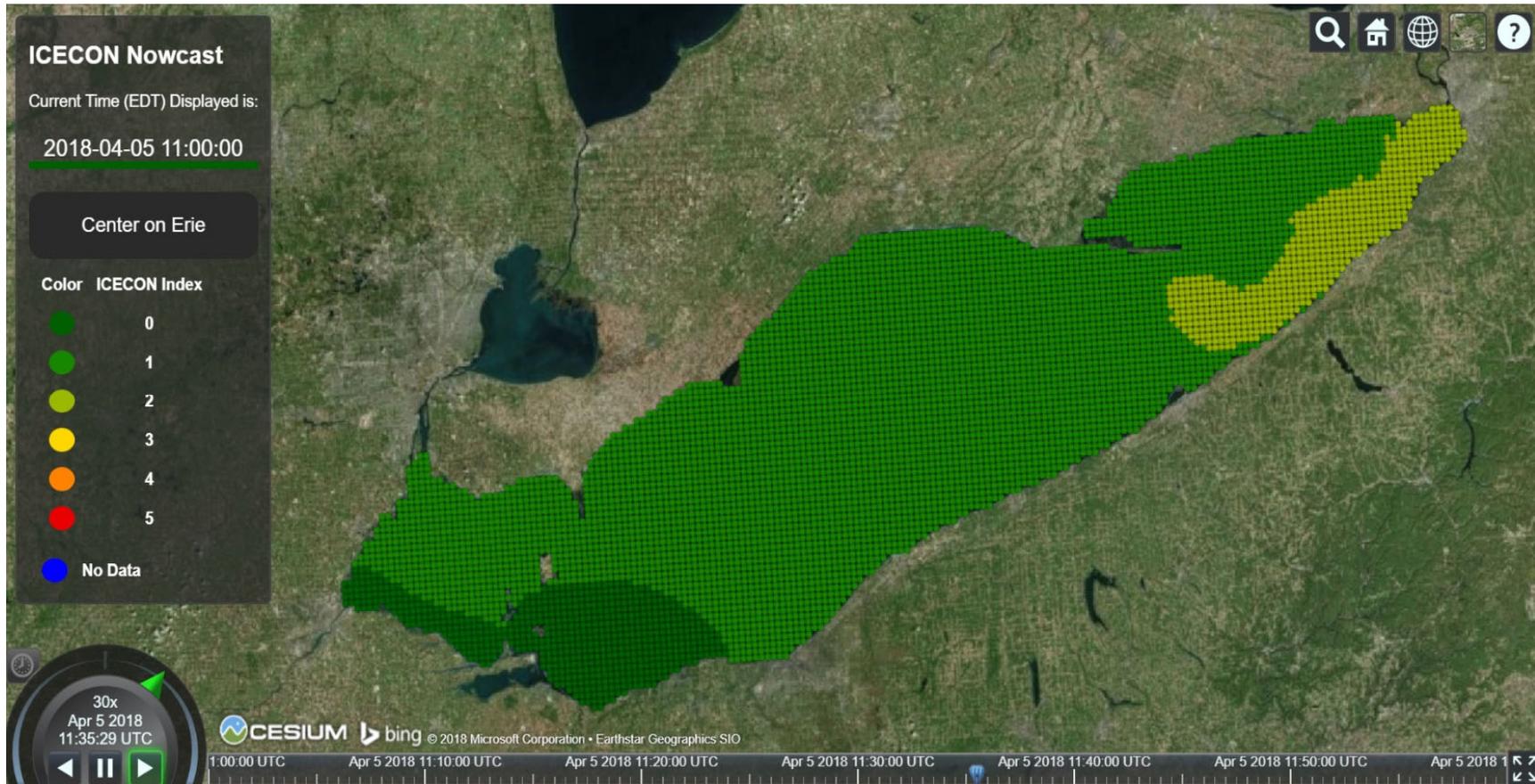
# Current Focus: WCPS as ICECON Input

- Water Cycle Prediction System (WCPS) developed by Environment and Climate Change Canada (ECCC)
- An operational model with 72 hour forecast at 2km spatial resolution
- WCPS couples Global Environmental Multiscale (GEM) model; the surface and soil model Interactions between Soil, Biosphere, and Atmosphere (ISBA); the lake/ocean model NEMO; the Los Alamos Sea Ice Model (CICE); the river-routing model WATROUTE; and the Coordinated Great Lakes Regulation and Routing Model (CGLRRM)
- It includes all parameters required for the ICECON calculation
- WCPS data will be available in Sep/Oct 2019, according to ECCC
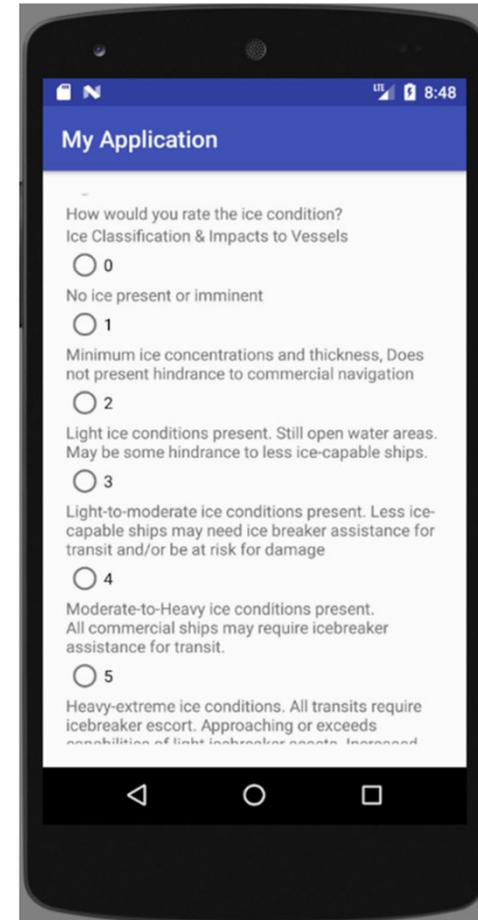
ICECON App

- **ADAC Developed mobile apps to easily collect ship-based ice observation data**

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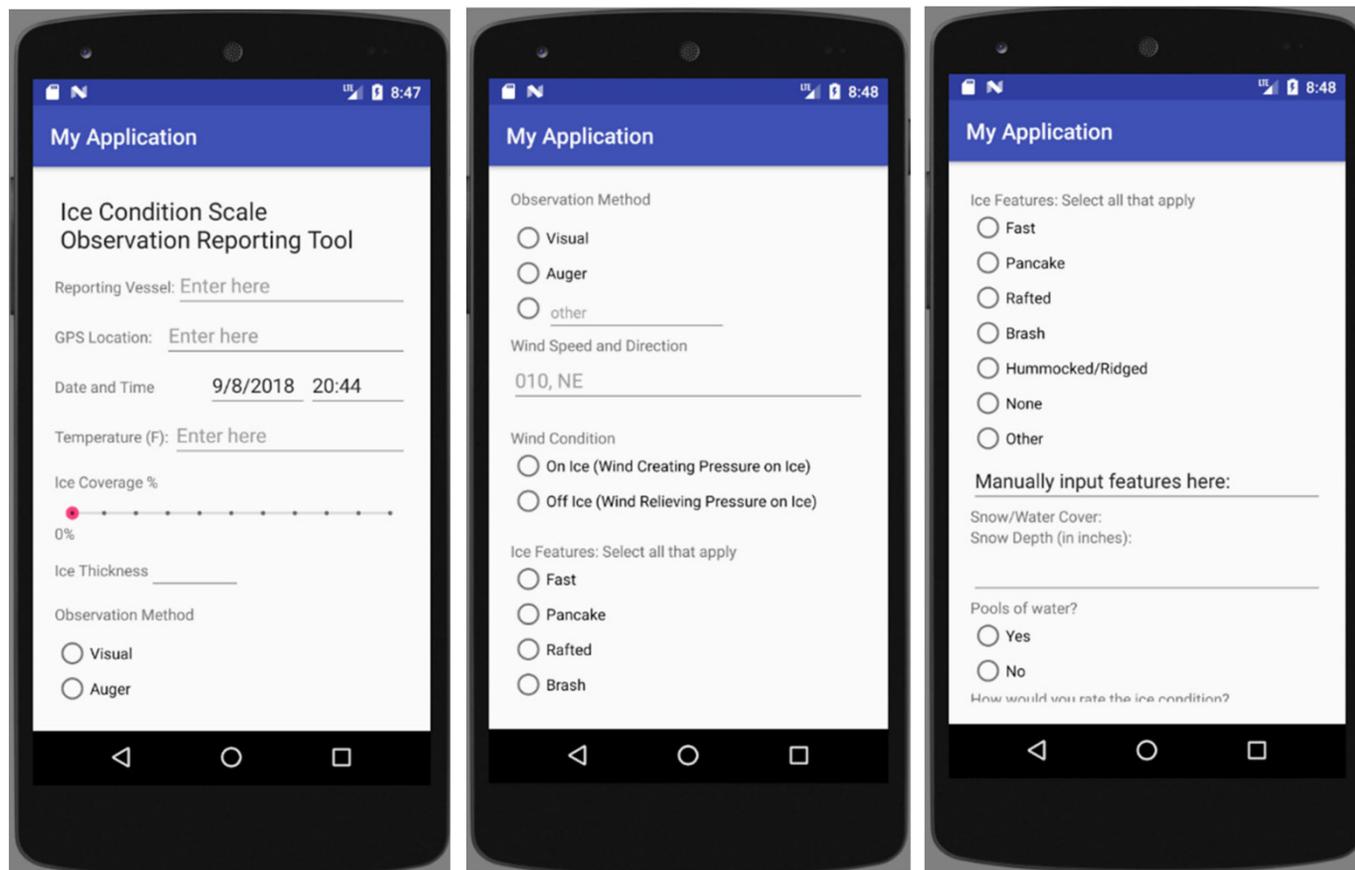
Current Focus: Improve the Data Collection App

- USCG D9 requested iOS version of the app
- Improve the data collection app to include input of vessel and cruising data intended for general mariner to use

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

Questions?

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