Potential research activities toward the SSPs

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YOPP consolidation phase

Preparation Phase 2013 to mid-2017
- Community engagement
- Alignment with other planned activities
- Development of Implementation Plan
- Preparatory research
- Summer school Workshops
- Fundraising & Resource mobilization

Core Phase mid-2017 to mid-2019
- Intensive observing periods & satellite snapshot
- Dedicated model experiments
- Coupled data assimilation
- Research into use & value of forecasts
- Intensive verification effort
- Summer school Workshops

Consolidation Phase mid-2019 to 2022
- Data denial experiments
- Model developments
- Dedicated reanalyses
- Operational implementation
- Evaluation of forecast improvements and use
- YOPP publications
- YOPP conference

Jun Inoue (NIPR, Japan)
YOPP Special Services Periods (SSPs)

Special Services Periods (SSP)
- SSP1
- SSP2

Special Observing Periods (SOP)
- Arctic
  - SOP1: Feb-Mar
  - SOP2: Jul-Sep
  - SOP: Nov-Feb
- Antarctic

Launch Event

2017 2018 2019 2020

Preparation Phase YOPP Core Phase YOPP Consolidation Phase

Core modelling & prediction

MOSAiC

Jun Inoue (NIPR, Japan)
Polar services over oceans and air spaces

Routing

Ships, aircrafts

Providers

ECMWF, ECCC, etc

End users

Captains, pilots, etc
Issues for an ice-strengthen ship during freezing season

Sea-ice regulation:
The navigation should be carried out only at the open water* where the ice thickness is less than 0.70m and the concentration is less than 1/10. (*the area where the ice thickness is less than 10cm are defined as Open Water)

Air temperature regulation:
MIRAI shall not proceed into the area where the air temperature below -15°C is expected. Such temperature is beyond ice/cold region resistant specification of Mirai.

We need high resolution weather and sea-ice forecasts in real time.
Daily observation meeting on RV Mirai

- Demonstrate how to interpret the forecasting info
- Train ship crew for understanding the limitation of the info (uncertainty, different performance of each center, etc)
- Apply the system to decision making

https://ads.nipr.ac.jp/venus.mirai/
How does VENUS look like?

This service is partly based on data and products of the European Centre for Medium-range Weather Forecasts (ECMWF).

This is a contribution to the Year of Polar Prediction (YOPP), a flagship activity of the Polar Prediction Project (PPP), initiated by the World Weather Research Programme (WWRP) of the World Meteorological Organisation (WMO).

https://ads.nipr.ac.jp/venus.mirai/
Comments from our Canadian ice pilot

During MR18-05C, daily sea ice analysis and forecasts for navigational recommendations utilizing daily sea ice concentration chart in conjunction with TOPAZ and NOAA sea ice chart forecasts emailed by MPC was augmented by onboard accessed VENUS ECMWF and Canadian sea ice concentration products. The addition of these two products provided more reliable and accurate forecast of sea ice concentration required for navigational purposes.

It is recommended that access to Canadian and ECMWF products be maintained for future ice transit voyages.
Lessons learned from the cruise: Consider the ship crew’s mind

It is very important to activate the dialogues between providers and end-users.
Seasonality of polar routes in the Northern Hemisphere

Summer: Central route, and Pacific route

Winter: Central route, and Atlantic route

Routing depends on atmospheric circulation

Summer

Z250 & WS250
MJJA
(a) PR-CR

Winter

DJFM
(b) AR-CR

Selecting tail wind situation

How is the routing features in the Southern Hemisphere?

- Less skillful weather forecasts due to sparse observing network
- Degree of flight delay could be more significant than that in NH

YOPP-SH would be a great opportunity to investigate the issues of air traffics related to atmospheric predictability

Jung et al. (2016 BAMS)
Flying over the Southern Ocean with a large uncertainty

Jun Inoue (NIPR, Japan)

Jung et al. (2016 BAMS)

Sato, Inoue et al. (2018 GRL)

Mean Z300 spread, WS300, Z300 (CTL) & Sonde points
[01 – 30 Nov. 2017]
Difference in delay time in recent Decembers

The case of QFA28

Evaluation of YOPP-SH observations on commercial flights

Understand how the YOPP observations contributed to airline services

Flow-dependent observation signal
Summary

- Demonstrate the impact of skilful forecasts on service changes and end user decision making
  - Safe navigation in polar oceans
  - Economic and accurate flights in polar air spaces

- It is very important to activate dialogues between providers and end-users (e.g. ECMWF Observation Campaign WS)

References: