AARI Arctic and Antarctic Research Institute

MARLIN-YUG SCIENTIFIC-MANUFACTURING COMPANY

Technological input of Russia to operational meteorological monitoring of the Arctic using drifting buoys

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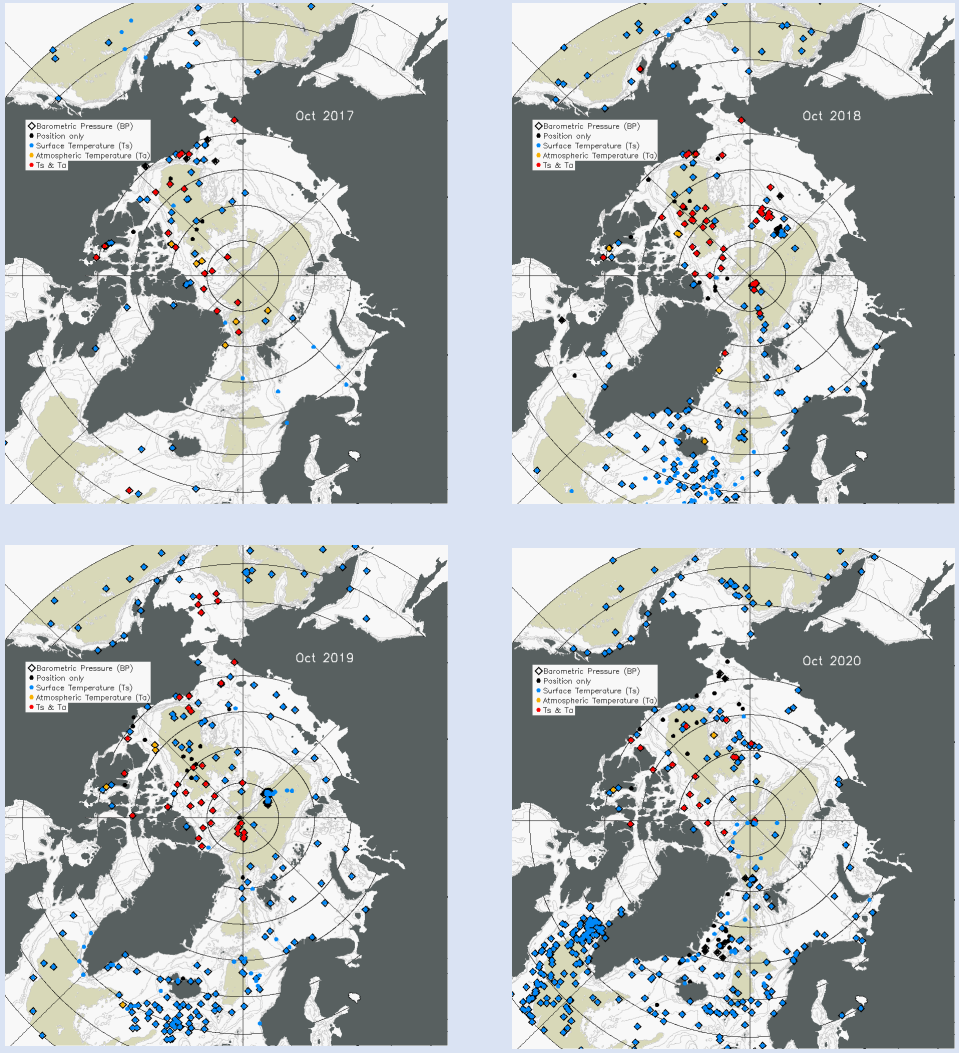
International projects in the Arctic presently implemented by AARI and Marlyn-Yug

YOPP Special (SOP) and Target (TOP) Observing periods (2018 – 2022)

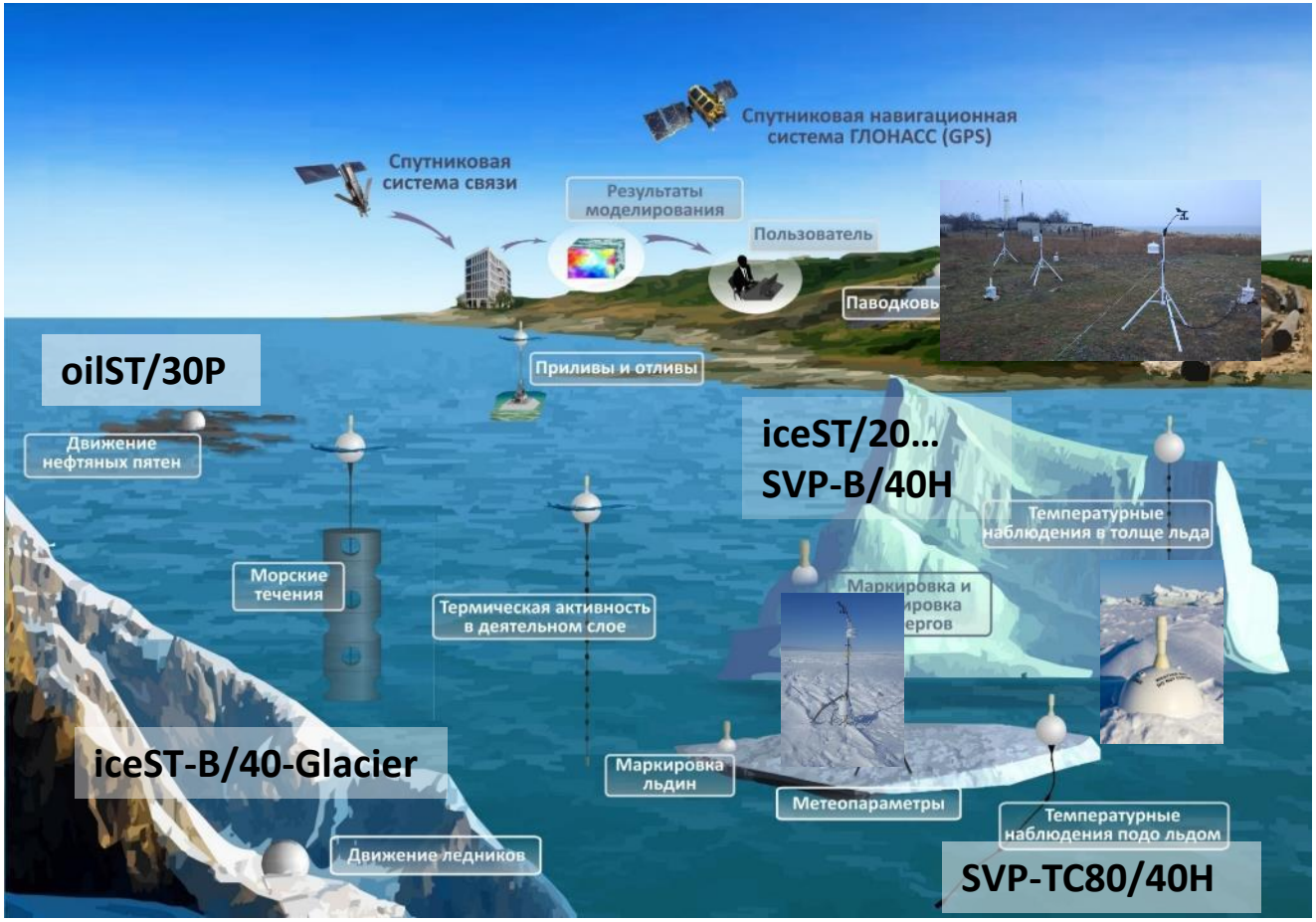


MOSAIC (2019 – 2021)

- International Arctic scientific projects YOPP and MOSAiC are widely using different types of ice and ocean data buoys
- To support the projects AARI in collaboration with Marlyn-Yug is actively developing measuring and informational techniques to implement activities on a high level resulting in a growing number of drifters in Eurasian Arctic since 2018
- Techniques include three major components: measuring, informational and logistical

Measuring component meets DBCP standards and includes more than 30 types of instruments by Marlyn-Yug https://marlin-yug.com/en/home/

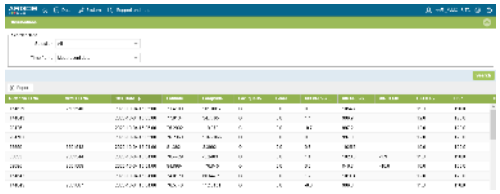
- All the buoys can operate in the Arctic for one year at least
- Capabilities of buoys allow measuring
  - ✓ meteorological parameters in near-surface atmosphere
  - ✓ hydrological parameters within the ocean active layer or below the ice
  - ✓ parameters of ice (movement, temperature processes, freezing/melting).



Informational (delivery) component

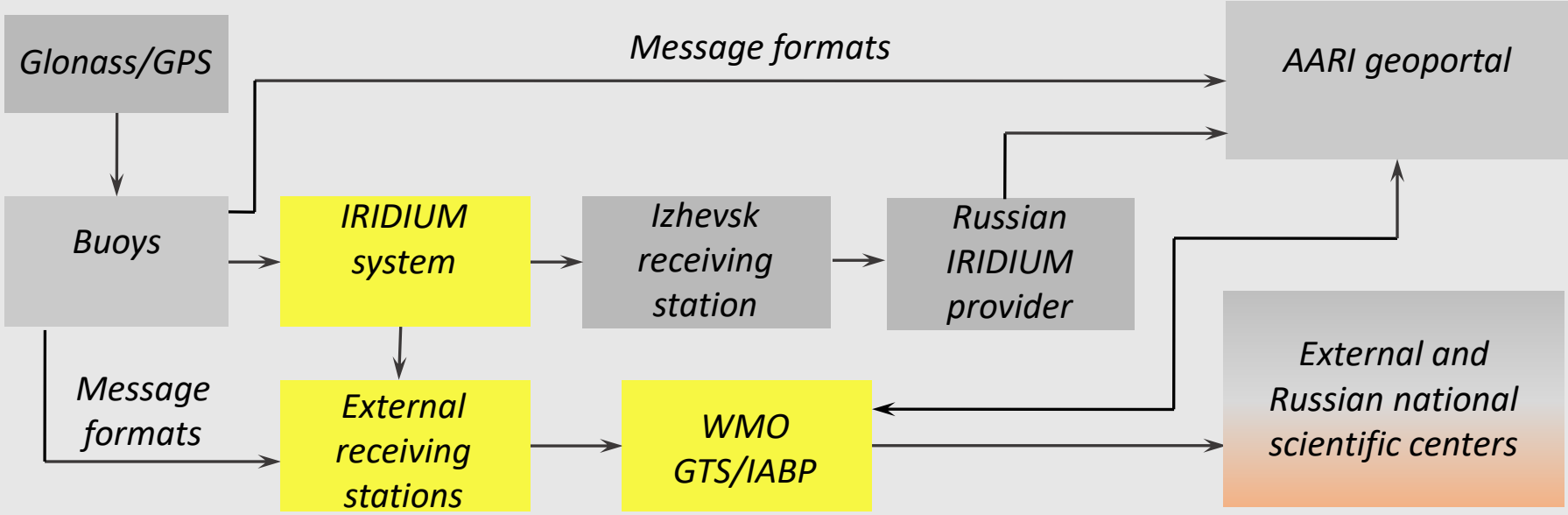
Iridium station in Izhevsk, Russia (since 2016)

ARGOS-CLS portal



- Informational components allow data transfer via Iridium and Argos-2 satellite telemetry
- Information is delivered to external international and Russian national data centers for processing and global distribution via WMO GTS or other portal
- New data formats were created for transfer and processing of data from new types of buoys with temperature strings with formats introduced in the processing centers

System of informational support



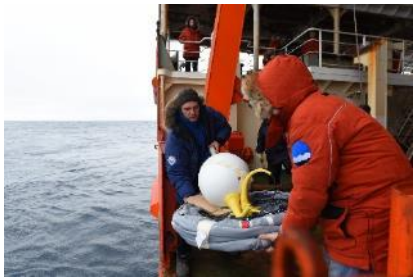
Logistical component and lifetime

- Logistical component is used for delivery and deployment of buoys on ice or water
- Helicopter Mi-8 on ice (Barneo-2018, 2019) campaigns (***, the hardest)
- Helicopter KA-32 on ice, from board R/V “on ice and water (“TransArctic-2019”) (**)
- Manually on ice or glacier at Cape Baranova AARI observatory (2018, 2019*)
- from board R/V on water (“TransArctic-2019”, other various campaings in 2018-2020 (*)
- from board icebreaker “Kapitan Dranitsyn” on ice (MOSAiC supply leg #2) (***)

Lifetimes:

- 503 d longest (FJL and Svalbard waters, Apr 2019-Aug 2020)
- 1 week shortest (pulled under ice in Barents sea)
- Lifetime greatly depends whether or not the buoy will survive approaching ice edge or gain stable position during initial ice formation








Quality control after deployment is done collaboratively by Marlyn-Yug and AARI mostly through the EUMETNET portal

http://esurfmar.meteo.fr/qctools/

Surface Marine Data and QC Plots

Use this form to consult surface marine data plots (received on GTS) for the past 2 weeks of an observation system with Call Sign or WMO Number

Enter Call Sign or WMO Number : 2501544

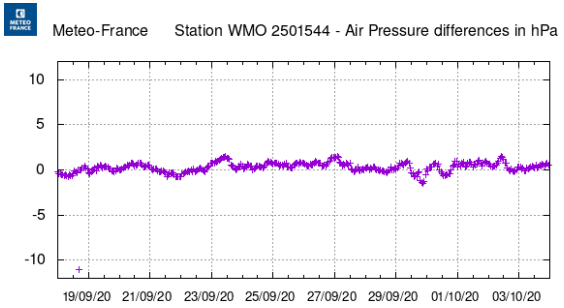
Type of plot to generate :

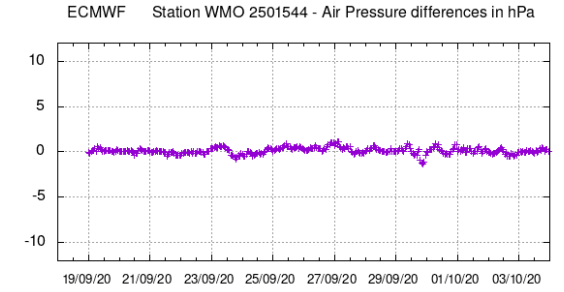
- Data Plot
- Data Plot (scaled)
- Quality Control Plot

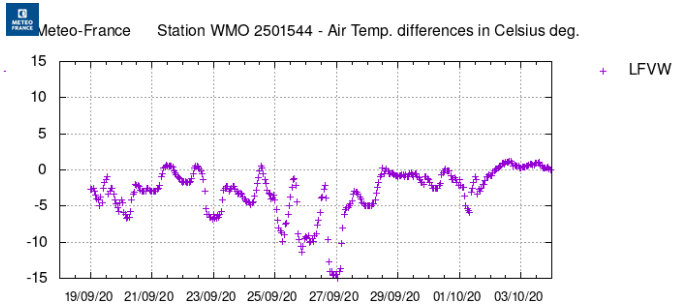
OK

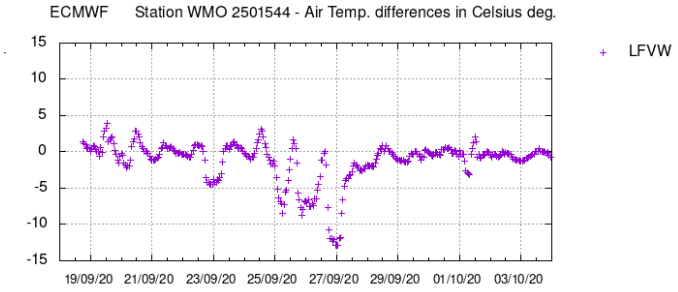
Parameter selection : (select in the list the parameter to monitor ...)

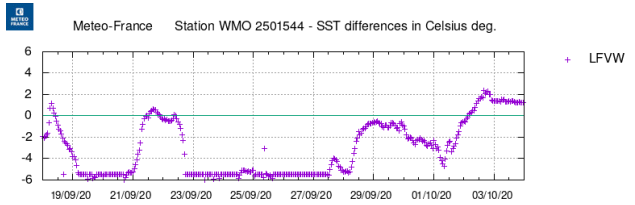
- Atmospheric Pressure
- Air Temperature
- SST
- Wind Direction
- Wind Speed
- Wind Speed (correction)
- Humidity
- Salinity
- Wave height
- Wave period
- Wave direction
- House Keeping 1 (Battery Voltage)
- House Keeping 2 (Submergence)
- Delay
- All in the same page...

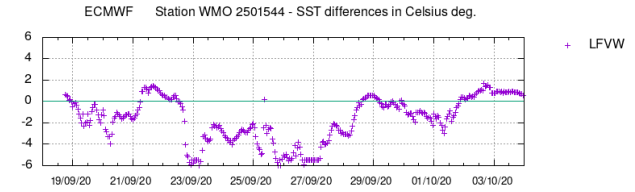


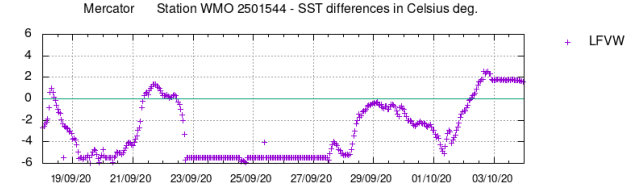






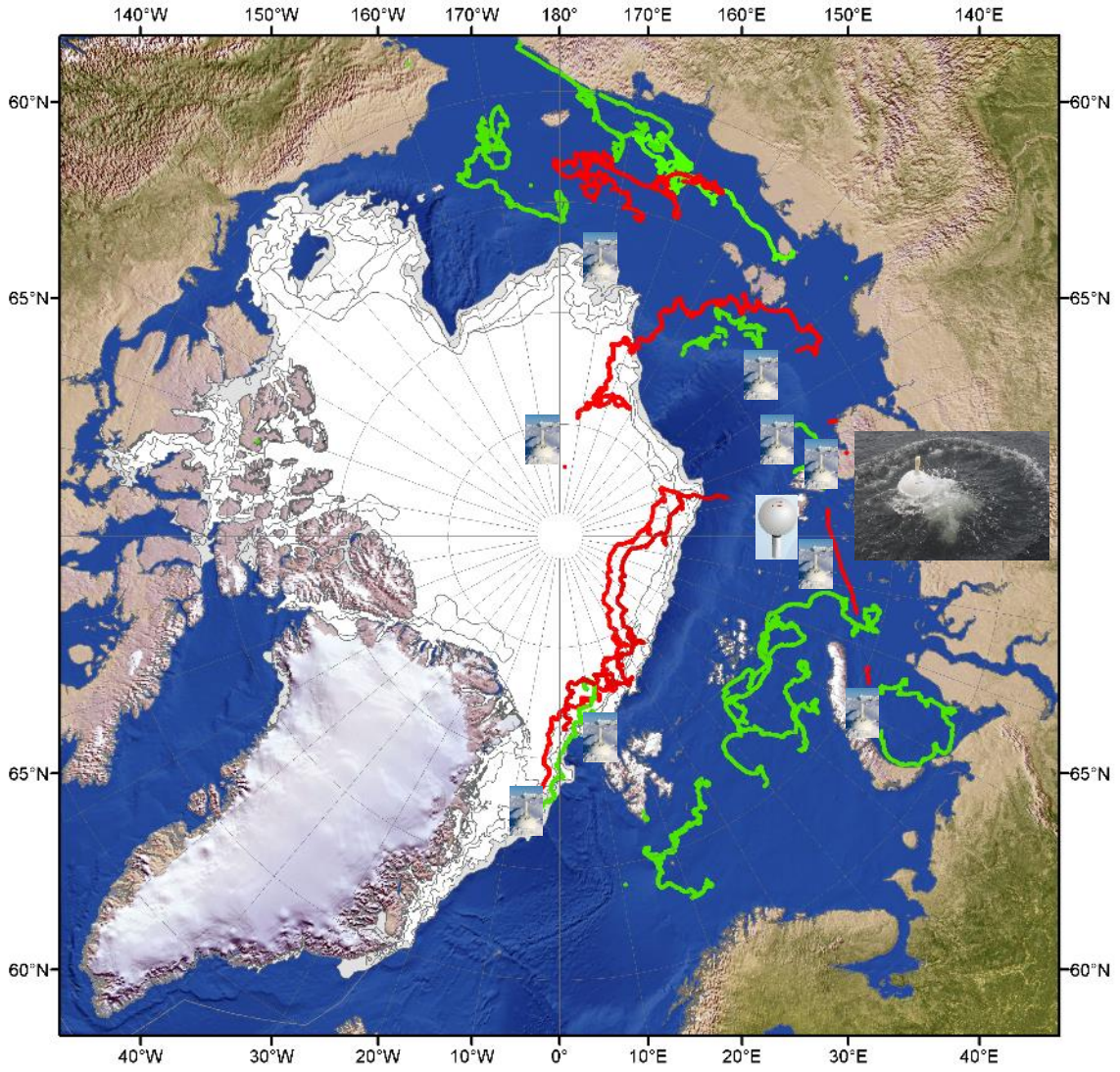






Key highlights for present moment

- Main purposes of the national buoy program remain to support:
  - ✓ the YOPP Operational Periods
  - ✓ operations in Eurasian Arctic
- Totally 22 Lagrangian SVP-B/40H type (air pressure, air temperature, surface ice/snow/water temperature, GPS positioning, ARGOS communication) buoys were in operation during last year (02/10/2019 - 04/10/2020)
- Totally 9 are active as of Oct 4th 2020



red – active 04.10.2020, **green** – inactive 04.10.2020

Summary conclusions

- 29 drifting barometric SVP-B buoys of Marlyn-Yug design with SST and SAT sensors were deployed in 2018-2020 in Eurasian Arctic Seas to support the YOPP SOP within Eurasian Arctic
- Other installations included 12 iceST drifters for MOSAiC campaign, iceST-glacier(s) at Cape Baranova AARI observatory on Severnaya Zemlya, etc
- Statistics describing the SVP-B performance in seasonal cycle, allowed to conclude that
  - ✓ Operational reliability of the buoy is determined by the type of buoy (drogue or not), location (on ice/in water), season (spring, summer, winter)
  - ✓ problems with SVP-B buoys, when working in polar conditions, are the same as for other types of the buoys in the region
  - ✓ low cost of the SVPs allows to create network with excessive density, in the expectation of failure of some of the buoys
  - ✓ Improvement of operational reliability can be gained by molded cases of high-strength polycarbonate plastic, use of conical shaped cases etc
- Further steps will include new types of buoys and buoy networks with improved operational reliability, possibly with adaptive capabilities of operation

Thank you for attention!