



# Satellite AIS (A,B) and monitoring of Inland Water Transport

LPGAN for Inland Water Transport applications

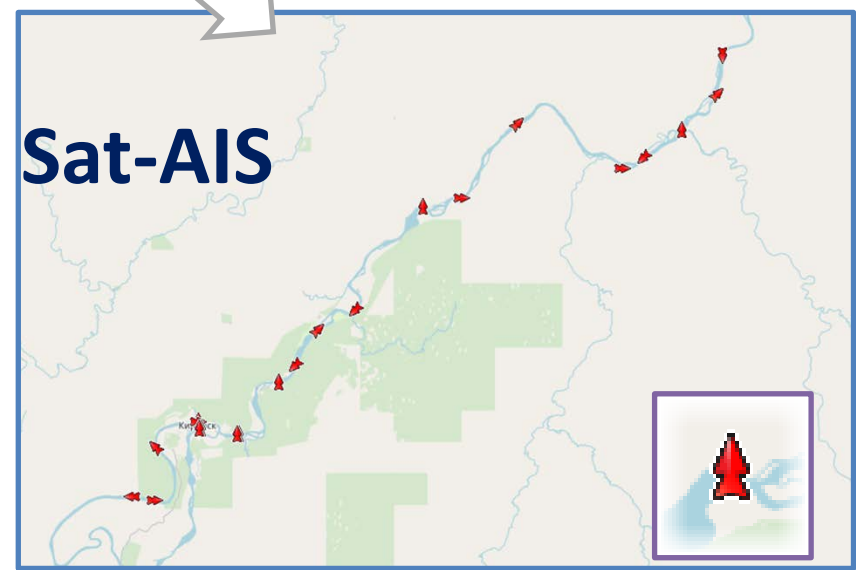
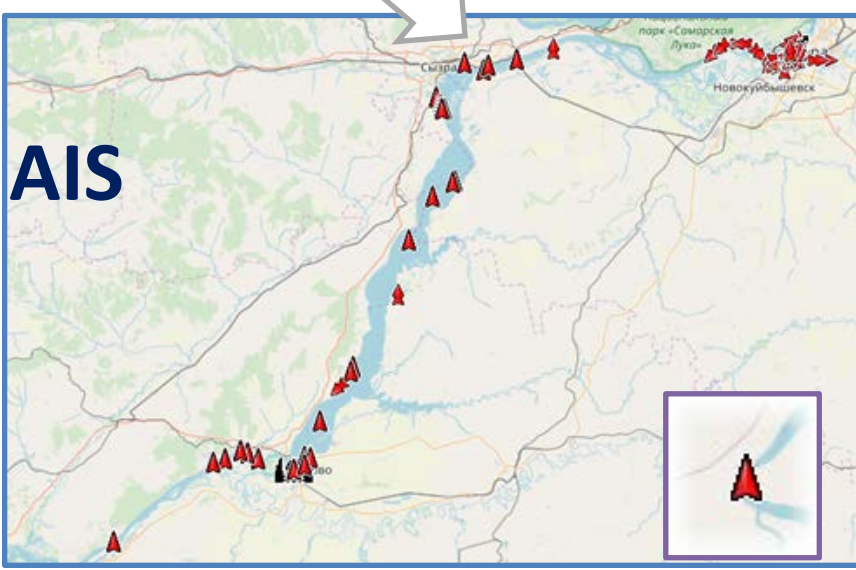
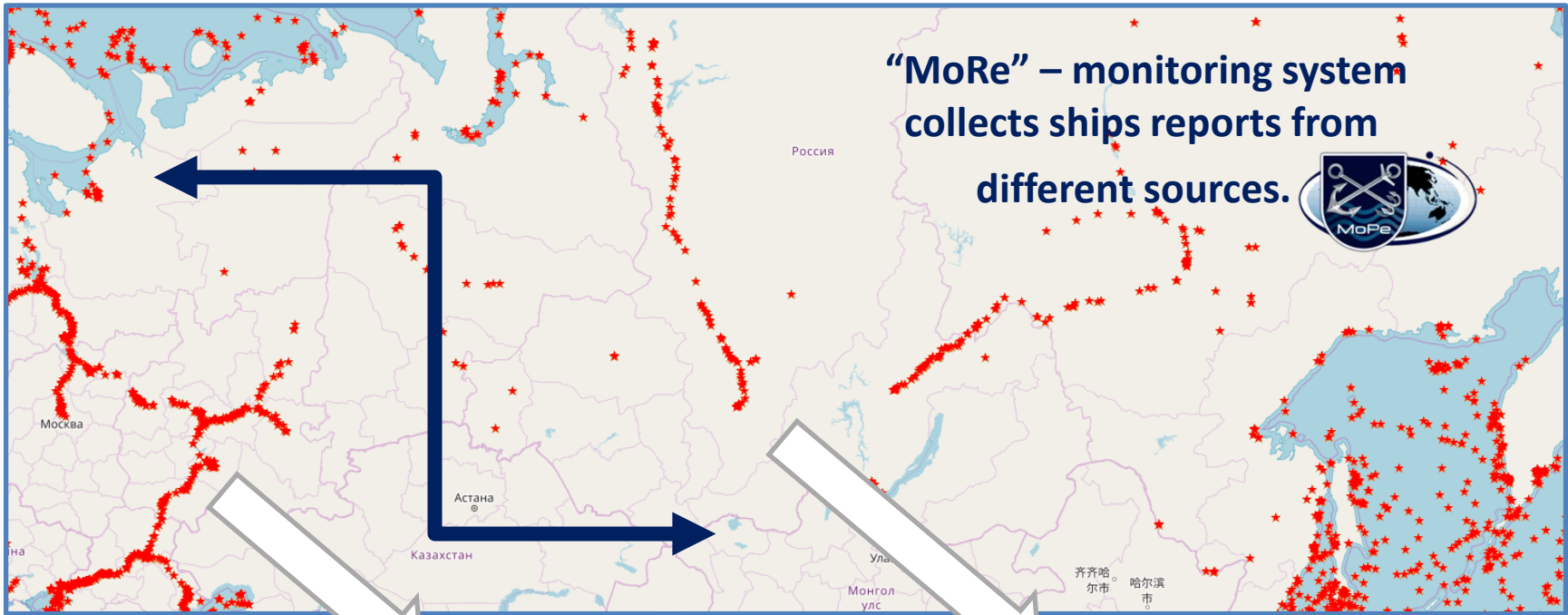


**(SC.3) Working Party on Inland Water  
Transport (62nd session)  
3 - 5 October 2018**

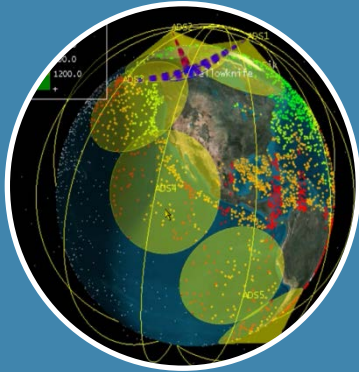


- ❖ 117 river ports.
- ❖ More than 200 companies involved to cargo handling.
- ❖ More than 140 000 km of waterways is used.
- ❖ European part of waterways is well equipped with shore AIS stations.
- ❖ Asia part of waterways has got small number of shore AIS stations. Monitoring can be made with satellite AIS technology only.

**“MoRe” – monitoring system  
collects ships reports from  
different sources.**



# Satellite AIS technology



## Constellation

- Low Earth Orbiting Satellites
- High Detection Technology



## Earth Stations

- Distributed globally
- On every continent including Antarctica



## Data Center

- Located in highly secure facility
- Signals processed into AIS messages



## Customer Delivery

- Industry standard formats
- Multiple delivery methods

*End-to-End Solution for Increased Maritime Domain Awareness*



“Morsviazspudnik” company (MARSAT) – more than 10 years experience of collecting ship reports from different sources (LRIT, AIS, different Sat-AIS systems, SSAS, commercial monitoring with different Inmarsat/Iridium equipment).

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- Sat AIS monitoring of AIS-A shipborne equipment – good quality, with Iridium Next constellation time of delivery near 2-3 minutes. Pole-to-Pole. Problem – it is difficult to make sat-AIS monitoring in intensive navigation areas.
- Sat AIS monitoring of AIS-B shipborne equipment – bad quality without special technology of AIS signals processing and a special version of AIS-B shipborne transceiver.
- One of the methods to improve satellite AIS-B detection - to use ASM 1 frequency (patented **exactTrax** technology by Canadian company **exactEarth**)



## exactTrax technology:

Shipborne AIS transceiver transmits an AIS Message 8 (binary message) on the ASM-1 frequency, with a specially formulated payload that significantly improves the chances of message detection by exactEarth's orbiting satellites. Once detected, exactEarth's data processing system decodes the Message 8 payload and uses the contents to reconstitute a standard Message 18.

## Local manufacturer of AIS-B transceivers exactTrax technology:

“Radioterminal” – company



**VEGA VG-3944R / VG-3944T**

- ❖ AIS transponder class B (2-5 Wt)
- ❖ 5,6" LCD
- ❖ GPS/GLONASS
- ❖ 10,5 – 35 VDC, <500 mA, 12VDC
- ❖ AIS1, AIS2 + ASM-1
- ❖ SD slot

# Source of GNSS data to be used for ship monitoring ?



GNSS system	IMO resolution
GPS	MSC.112(73)
GLONASS	MSC.113(73)
BDS	MSC.379(93)
Galileo	MSC.233(82)

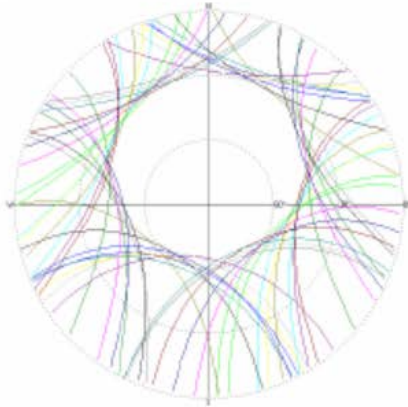
In Russia, government supports development of GLONASS/GPS receivers and promote mandatory equipping governmental users with combined GLONASS/GPS receivers.

## IMO Resolution MSC 95/22/Add.2:

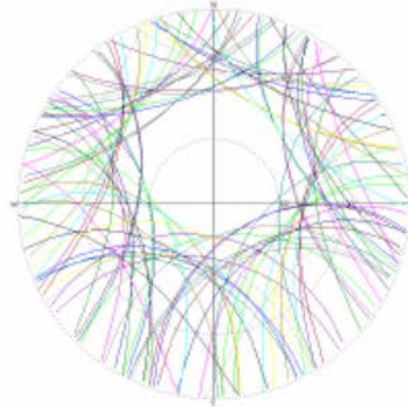
*“A multi-system receiver using navigation signals from two or more GNSS, with or without augmentation, provides improved position, velocity, and time data. An improved resistance to intentional and unintentional radio frequency interference is achieved when two or more independent or frequency diverse radionavigation systems are used. Such a combined approach also provides redundancy to mitigate the loss of a single system.”*

## Improved accuracy, reliability, continuity and availability

Example: GPS vs. GPS+Glonass Satellite Trajectories at high latitude



**GPS only,  
Observer's Latitude: 75°N**



**GPS + Glonass,  
Observer's Latitude: 75°N**  
Filling in some of the "empty space" due to a higher Glonass inclination angle

**Source:**



**PPP (Precise Point Positioning) technology, tests made by NovAtel:**

### PPP correction source

- TerraStar-C (GPS/GLONASS)
- TerraStar-C (GPS only)

### Horizontal RMS Error (cm)

- 5,3
- 6,4

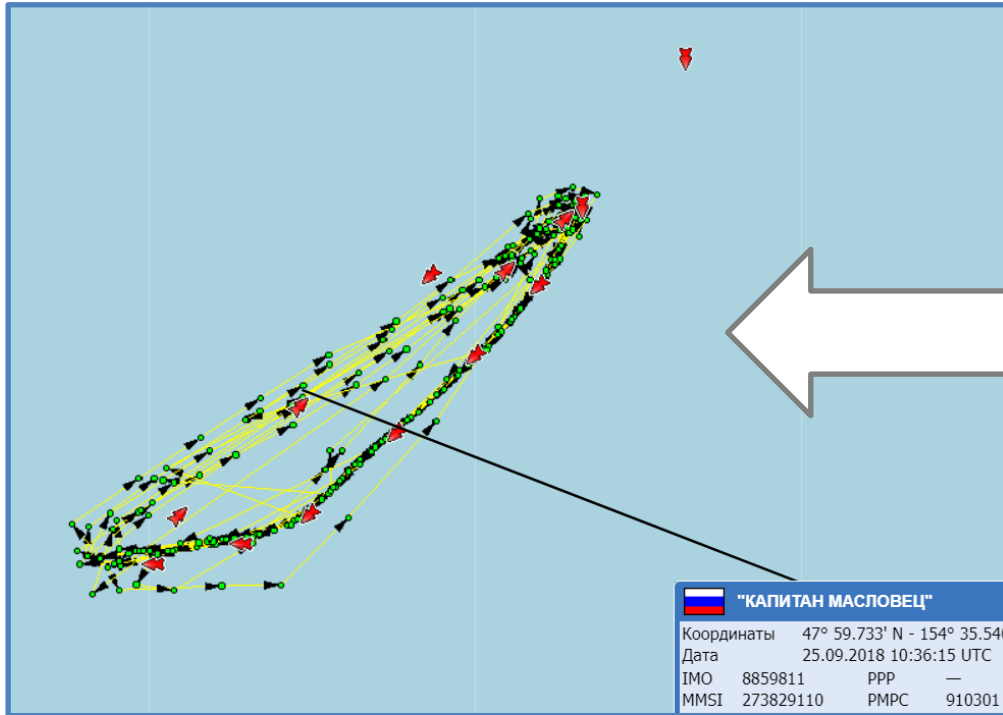
### Vertical RMS Error (cm)

- 7,6
- 9,7

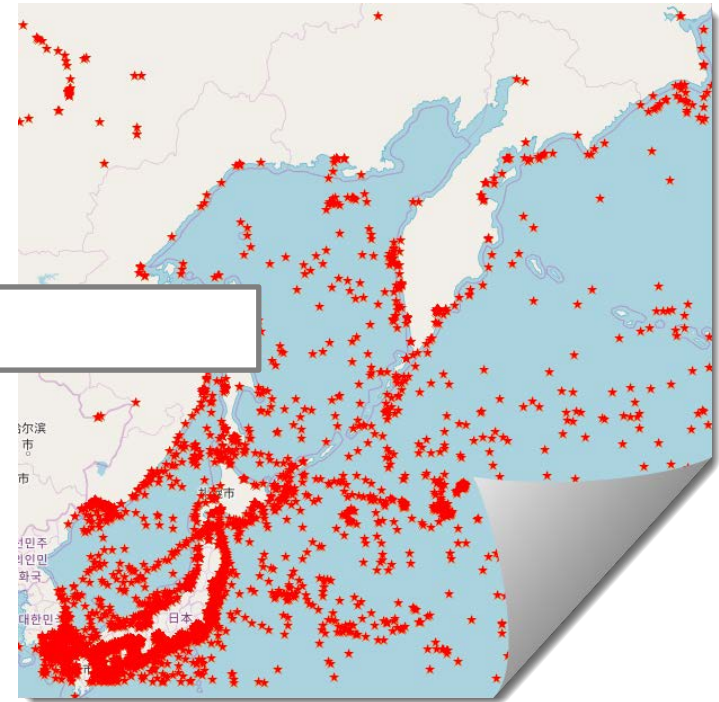
RMS - Root Mean Square (error)



## Ship under test



## Test area



## Summary:

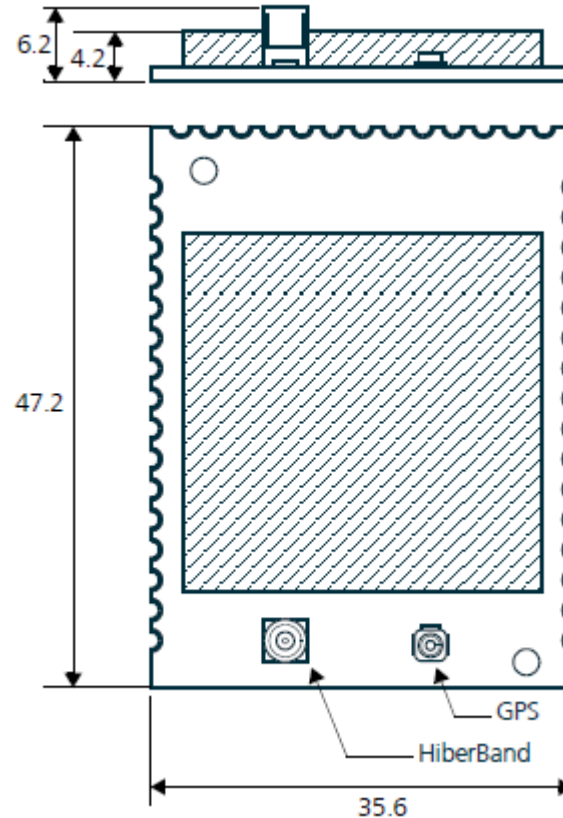
- ❖ Sat-AIS technology can be used for ships equipped with AIS class B transceiver.
- ❖ Sat-AIS technology works equally unstably for AIS-A and AIS-B in intensive navigation areas.
  - ❖ In intensive navigation areas Sat-AIS data should be combine with shore AIS data.
- ❖ Sat-AIS monitoring is a need for inland waterways areas where it is impossible to build shore AIS infrastructure or no economical reason to do it.
- ❖ Sat-AIS technology is not working in a proper way near big cities due to difficult electromagnetic situation.

# Low Power Global Area Network (LPGAN) for Inland Water Transport applications

## Hiber LPGAN modem



Frequency band – 399-401 MHz



**Customer payload 1152 bits - free to send any data.**

**Accumulator – up to 10 years (3,3 V).**

**Integrated GPS receiver.**

## Low Power Global Area Network (LPGAN) for Inland Water Transport applications

- Low price for hardware and service
- Any stationary or slow moving object can be monitored
- Pole-to-Pole coverage
- Extremely low power consumption



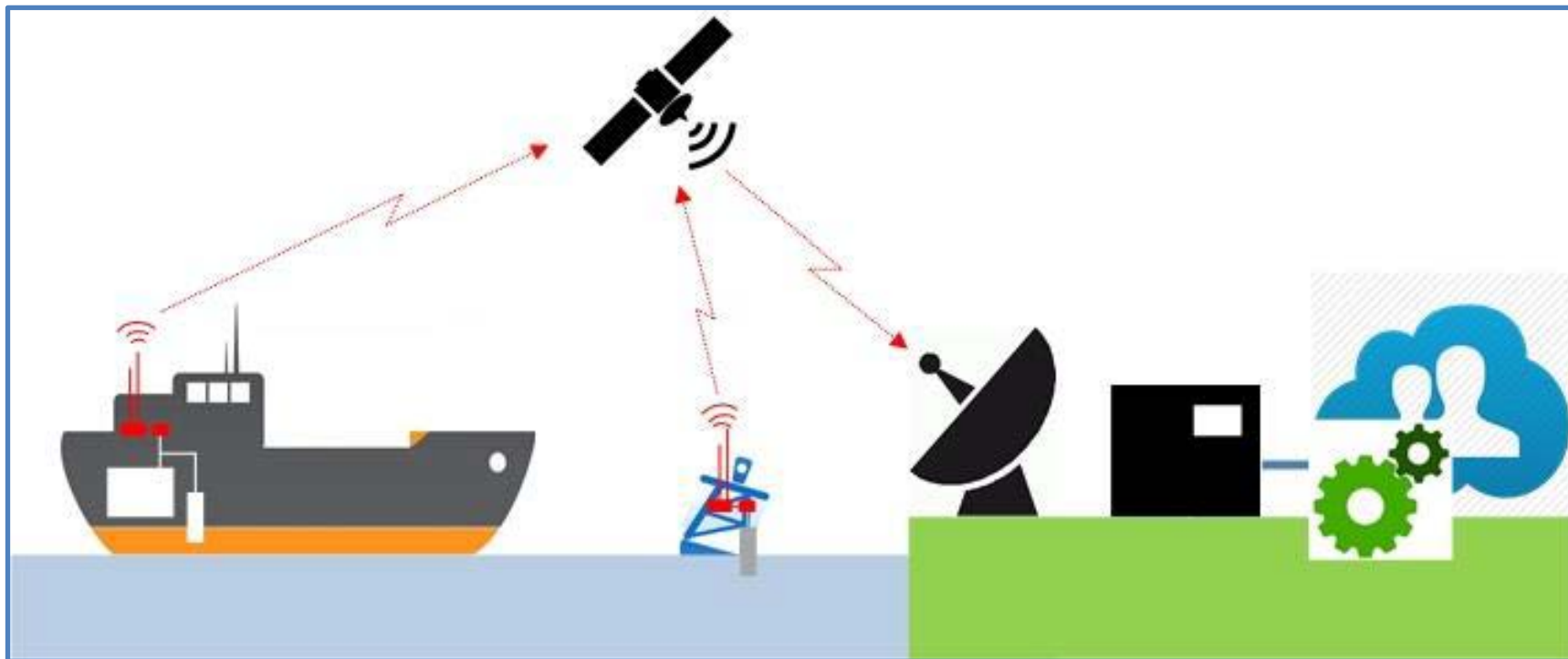
- Controller for the modem you should develop yourselves
- Time of message delivery on the first stage will be 16 hours
- Message size limited to 1152 bits, more messages more payment
- You should develop your own software to process messages

# Low Power Global Area Network (LPGAN) for Inland Water Transport applications

## Areas of applications



# THANK YOU !



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