

“Automatic Identification System as Aids to Navigation (AIS-AtoN) implementation on Orcadas Islands and Antarctic zone”

**Project carried out by the Argentinian Navy -
Antarctic Naval Command - Naval Hydrography
Service - Hidrovía S.A.**

IALA – ENG 5 – October 10, 2016

"Automatic
Identification System
(AIS) as Aids to
Navigation (AtoN) in
Antarctic zone" project

2011 – 2016

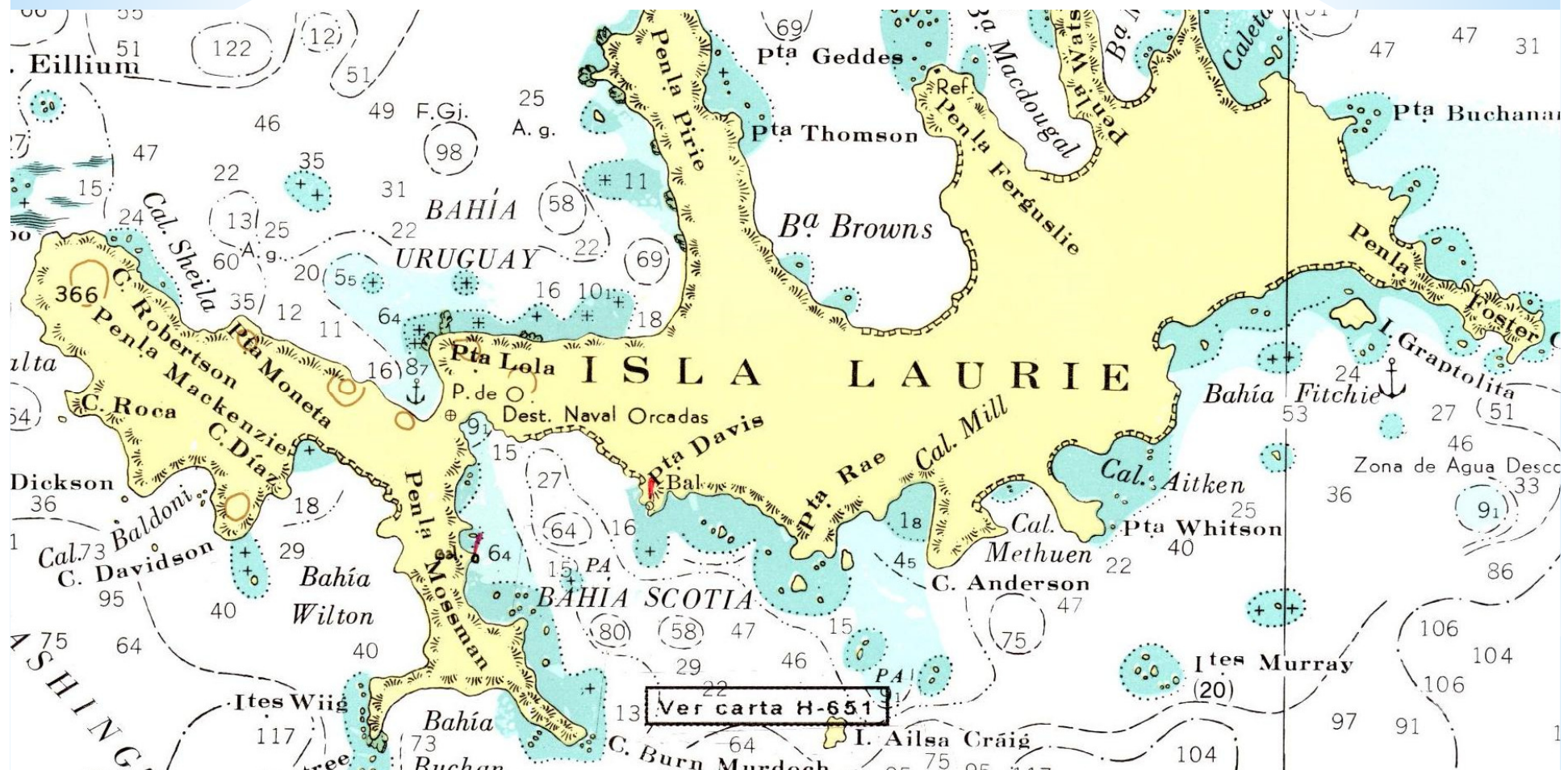


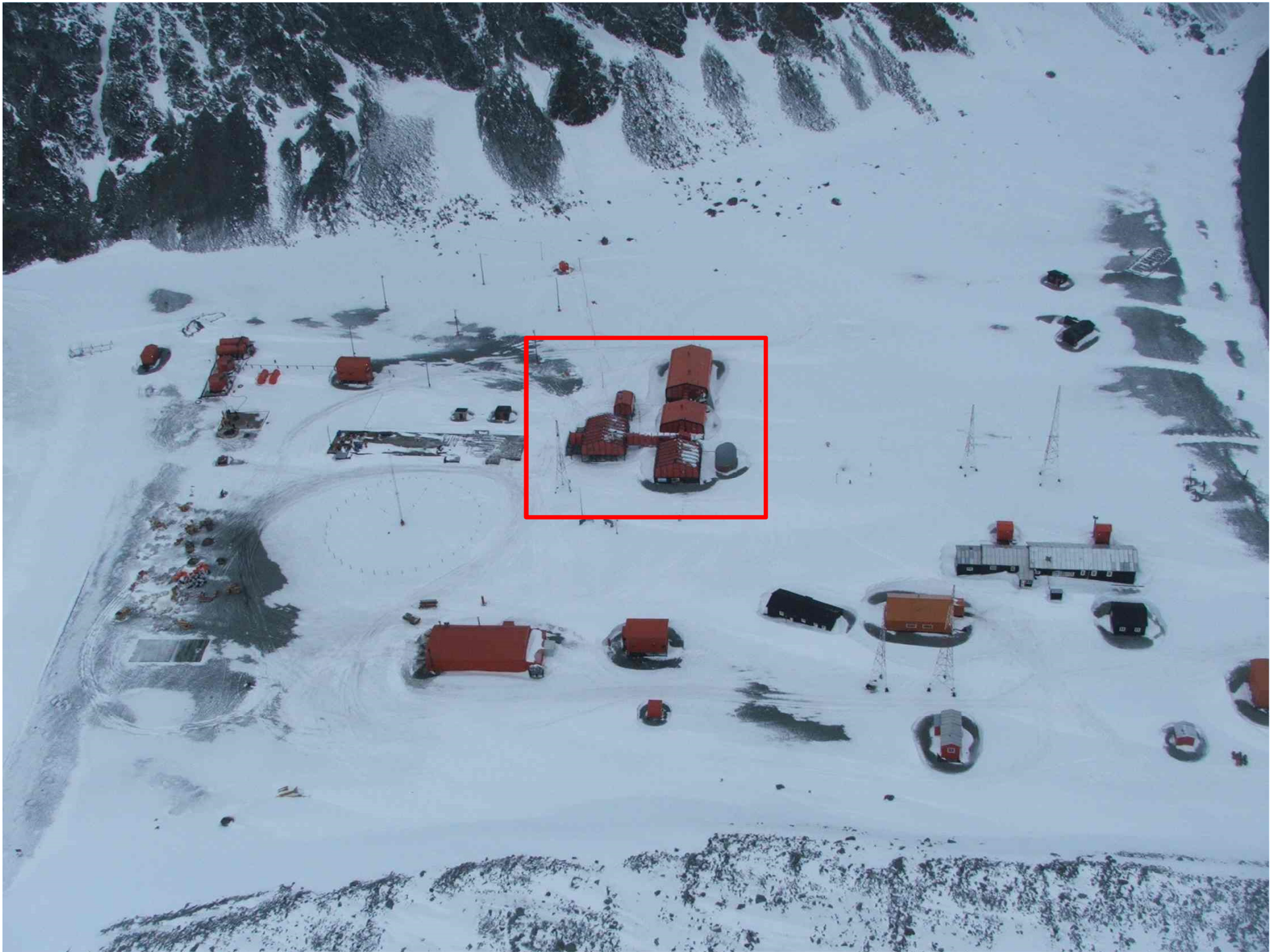
Benefits of AIS-AtoN use in Antártica's navigation

- Reception and visualization of the real or virtual AIS-AtoN automatically represented on the electronic chart display system (ECDIS).
- Targets information can be received from locations where radars can't reach; from behind islands or riverbends, ice.
- Real time tracking and identification, with digital data registration.
- Weather information transmission from an AIS-Aton through the message 8.
- Provide a greater navigation safety by "illuminating" with AIS technology for every ship in navigation zones and landfall marks, within the influenced area.

Laurie Island – Orcadas Base

Fase I: Sep up of an AIS-AtoN and an AIS receiver on Orcadas Base. Device's functioning monitoring and analysis under extreme weather conditions (below zero temperatures, strong winds and ice).



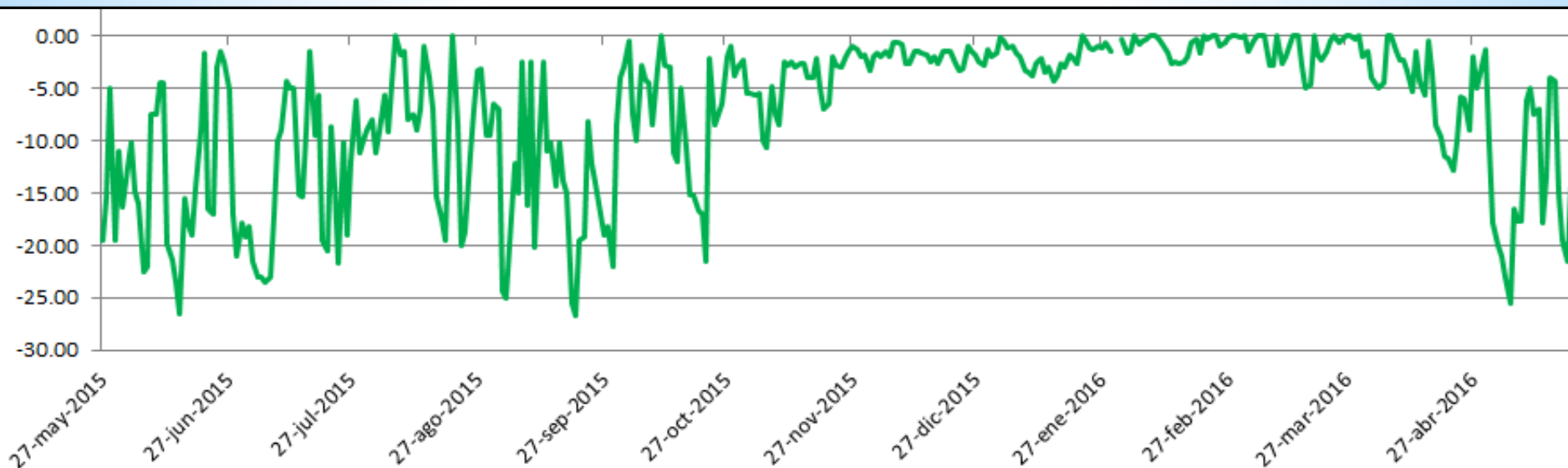


Fase I, possible effects to study

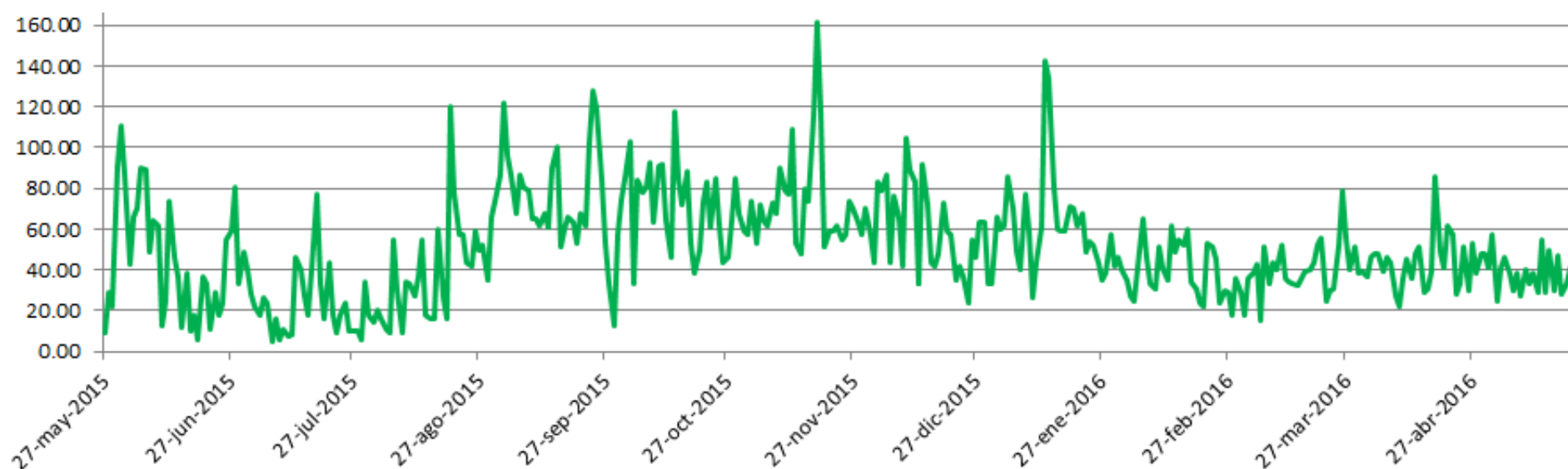


- Freezing on the connectors and VHF wire.
- Antennas' durability.
- Loss of GPS signal due to ice over the equipment.
- Condensation problems inside the equipment (sealing verification)

Lowest temperature that the AIS-AtoN and the VHF antenna were exposed to (-27 °C).



Strongest winds that the AIS-AtoN and the VHF antenna were exposed to (150 km/h)



Installing an AIS aid to navigation on the Argentine Antarctic Naval Base

By Mariano L. Marpegan, Hidrovia S A;
Captain Guillermo Palet, Argentine Navy;
Captain Valentin Sanz Rodríguez, Argentine
Navy and Raúl S. Escalante, Hidrovia S A

Overview

The IALA EEP Committee has analyzed the operation of aids to navigation in Arctic regions, pondering weather conditions which may alter considerably the performance of the signals and electronic equipment installed therein. As a result, Hidrovia S.A., the Argentine company concessionary of the operation and maintenance of dredging and signalling works throughout the 1600 kilometres of the Confluence-Santa Fé/Santa Fé-Ocean main waterway, together with the Antarctic Naval Command of the Argentine Navy, has decided to install an AIS-AtoN and an AIS receiver station in Orkneys Naval Base.

Environment

This Antarctic base is located on Laurie Island, coordinates Lat: 60°44'S ; Long: 044°44'W, and is part of the South Orkney Island, discovered by George Powell in 1821. It has been permanently occupied by Argentine residents since its acquisition on

22nd February 1904, one year after the ramshackle premises and weather station were installed by Doctor William Bruce during the Scottish National Antarctic Expedition. For the next 40 years it remained the only permanent settlement in the Antarctic region.

Current staff is comprised of 17 members of the Argentine Army, Argentine Air Force and Antarctic National Directorate, which pursuant to the Antarctic Annual Plan perform studies of height and surface meteorology, seismology, geomagnetism, geological surveys, glaciology, sea-ice state, biology, birds and marine wildlife. They are also in charge of monitoring the ecosystem, preserving the sights and historical monuments and offering guidance, assistance and control to the tourist contingents that frequently arrive on cruise ships.

Its coastline, featuring a host of bays of different sizes, tends to freeze due to the influence of the Wendell Sea, allowing for navigation only during the summer. The lo-

west temperature recorded was -44°C, and the highest reached 15.2°C with both average temperatures standing at -8.9°C and 0.4°C respectively. Wind speed can reach 150 knots.

Project and Objectives

This project was first introduced in October 2011, amidst EEP17. Its main objective is to compare the operation of

Instalación de una ayuda a la navegación de AIS en la Base Naval Antártica Argentina

El Comité de EEP de IALA ha analizado la operación de las ayudas a la navegación en las regiones Árticas considerando el clima, que puede alterar considerablemente el rendimiento de las señales y de los equipos electrónicos instalados allí. Por consiguiente, Hidrovia S.A., la compañía argentina concesionaria de la operación y mantenimiento del dragado y señalización en la totalidad de los 1.600 kilómetros de la vía navegable principal Confluencia-Santa Fé/Santa Fé-Océano, junto con el Comando Naval Antártico de la Armada Argentina, ha instalado una ayuda a la navegación de AIS y una estación receptora de AIS en la Base Naval Orcadas ubicada en la Isla Laurie. Desde 1904 la base ha estado poblada permanentemente y desde 1952 ha sido el Puesto de Avanzada Naval Orcadas, que dirige el Servicio Hidrográfico Naval (SHIN). El proyecto fue presentado en octubre de 2011 para comparar la operación de las ayudas a la navegación de AIS con los informes emitidos por la base naval a efectos de correlacionar los parámetros operativos y la transmisión del mensaje 21 y las variables climáticas registradas. Se consideraron varios objetivos y está planificada una fase adicional con respecto a una segunda ayuda a la navegación de AIS.

AIS-AtoN with the reports issued by the Antarctic Orkney Base, in order to correlate the operating parameters and broadcast of message 21 with the weather variables registered.

The installation and deployment of the AIS-AtoN and receiving system was conducted during the 2011-2012 Antarctic Campaign.

The objectives of this research project are based on the completion of the following tasks:

- ✓ Analyze and compare against other AIS

operating zones the special propagation registered when, under certain weather conditions, there are different refraction indexes in the troposphere, forming propagation channels for the VHF frequencies throughout extensive distances.

- ✓ Monitor the operating standards of the AIS-AtoN equipment subjected to extreme weather conditions, and comparing them with the reports performed every three hours at the Naval Base.
- ✓ Separately energize the equipment dur-

ring the first phase of the project so as to not hide the power shortage within the possible flaws of the equipment.

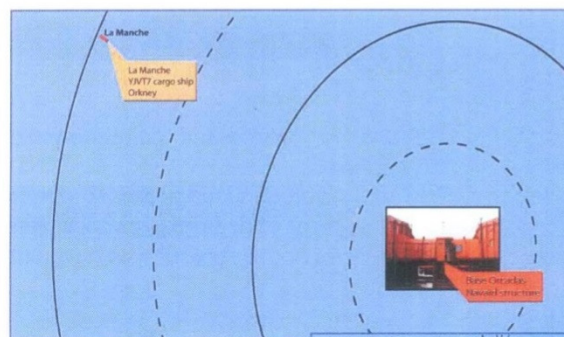
- ✓ Enhance knowledge acquired on the implementation of electronic systems subjected to harsh environmental conditions.

- ✓ Develop an AIS training protocol for technicians from the Argentine Navy, company employees and external personnel.

The final installation of the transmitting antenna as well as the AIS system itself was performed on one of the fixed antennae at base, at a height of 20 metres. The receiving antenna was placed nearby at a similar height.

The receiving system includes Rx equipment, an adapter and collector of DB9 connections, converter, power supply, UPS and an unmanaged switch which provides the link to the router of the satellite system.

Next phase of the project includes the installation of a second AIS-AtoN on a beacon, two kilometres distant from the base and powered by an independent power supply. ■



On the image above is displayed the range of the receiver equipment installed in the Base, for a ship bound under the name La Manche. This very special feature of propagation at long distances shows the benefits of having AIS-AtoN equipments installed in a place as inhospitable and inaccessible out of range of navigation routes. The distance between each circle with centre on AIS-AtoN target is 150 kilometres.



The AIS-AtoN system was configured under the name Base Antártica Orcadas MMSI number: 997011088 and call sign: LA9996. The image shows the AIS-AtoN detected and observed by means of the geo-referenced chart

This Antarctic base is located on Laurie Island, coordinates Lat: 60°44'S ; Long: 044°44'W, and is part of the South Orkney Island

Installation d'un "AIS-aide à la navigation" à la base navale argentine de l'Antarctique

La commission EEP de l'AISM a analysé la mise en œuvre des aides à la navigation dans les régions arctiques, prenant en compte les conditions météorologiques qui peuvent altérer de manière considérable les performances des signaux et des équipements électroniques installés en ces lieux. En conséquence, la société argentine Hidrovia S.A., concessionnaire de la gestion et de la maintenance du dragage et de la signalisation maritime sur les 1 600 kilomètres de la voie navigable principale Confluencia-Santa Fé/Santa Fé-Océano, avec le commandement naval antarctique de la Marine Nationale de l'Argentine, a installé un « AIS-Aide à la navigation » et une station de réception AIS sur la base Navale d'Orkney, située sur l'île Laurie. La base a été armée en permanence depuis 1904. Depuis 1952, c'est le cas de l'avant-poste naval Orkney, qui travaille pour le service naval hydrographique. Le projet a été lancé en octobre 2011 pour comparer le fonctionnement de l'« AIS-Aide à la navigation » avec les comptes rendus produits par la base navale de façon à corréliser les paramètres d'exploitation et l'émission du message 21 et les variables météorologiques enregistrées. Différents objectifs ont été considérés et une nouvelle phase est planifiée quant à une seconde « AIS-Aide à la navigation ». ♦

Fase II

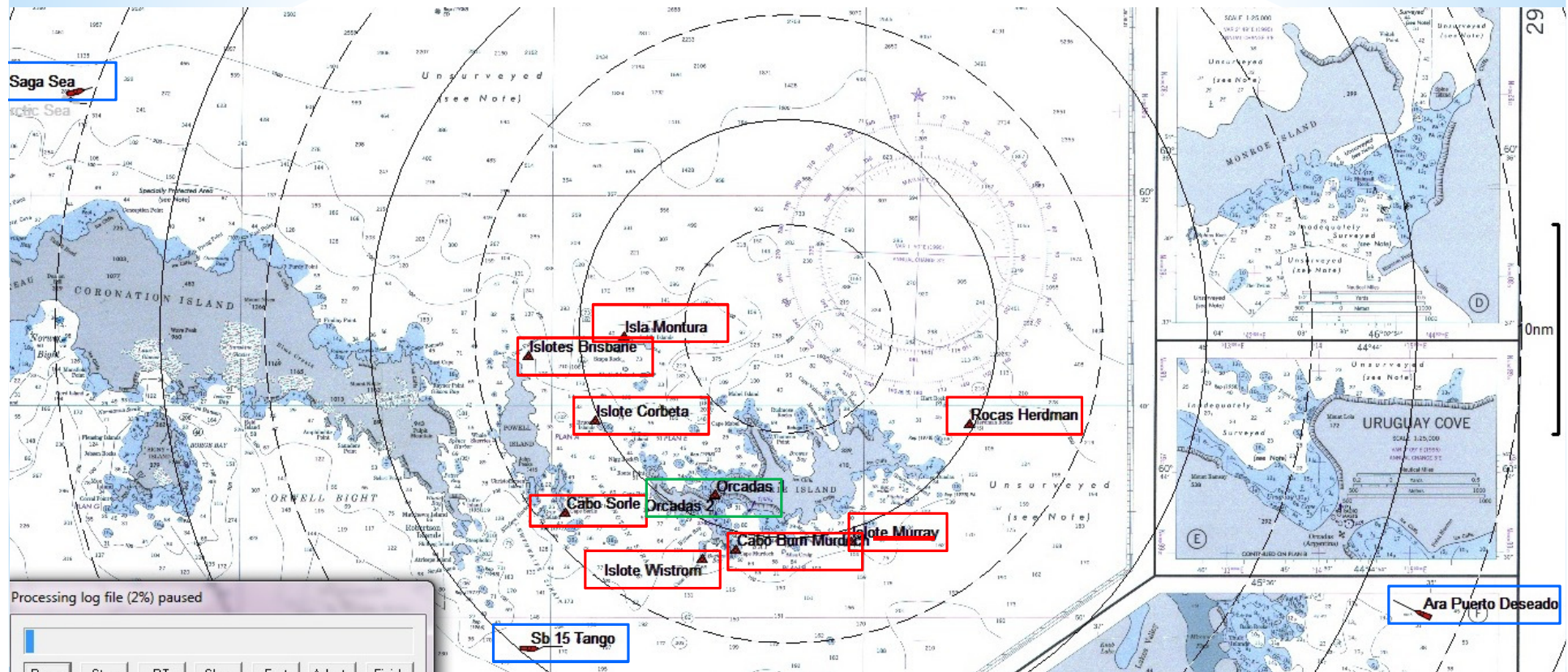
A second AIS-AtoN type 3 was installed to increase the amount of electronic Aids to Navigation.



Fase II Visualization

The following reception patterns were verified:

- 60 NM northwest of the Base
- 25 NM south of the Base
- 40 NM east of the Base



ORCADAS TO THE WORLD

← → ↻ 🏠 <https://www.marinetraffic.com/en/ais/details/ships/shipid:854001/mmsi:997011088/vessel:ORCADAS%201>



MarineTraffic

🌐 Live Map

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⚙️ Services ▾

🔍 Vessel/Port



ORCADAS 1



OffShore Structure

🔔 Create notifications for this Vessel

Fleet controls:

[Add to Fleet](#)

[Contribute to this page](#)

IMO: -

MMSI: **997011088**

Call Sign: -

Flag: **Argentina [AR]**

AIS Vessel Type:

OffShore Structure

Gross Tonnage: -

Deadweight: -

Length Overall x Breadth Extreme:
4m x 4m

Year Built: -

Status: **Active**

Latest Position

Out of range



Newer position available via Satellite



Position Received:

2016-08-24 11:45 UTC

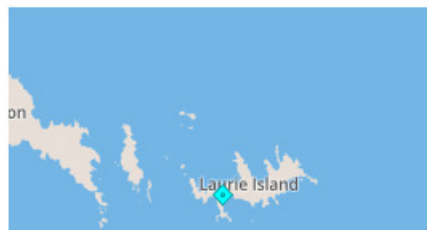
Vessel's Time Zone: -

Area: **Atlantic South**

Latitude / Longitude:

-60.73807° / -44.73789°

Status: **Aid To Navigation**



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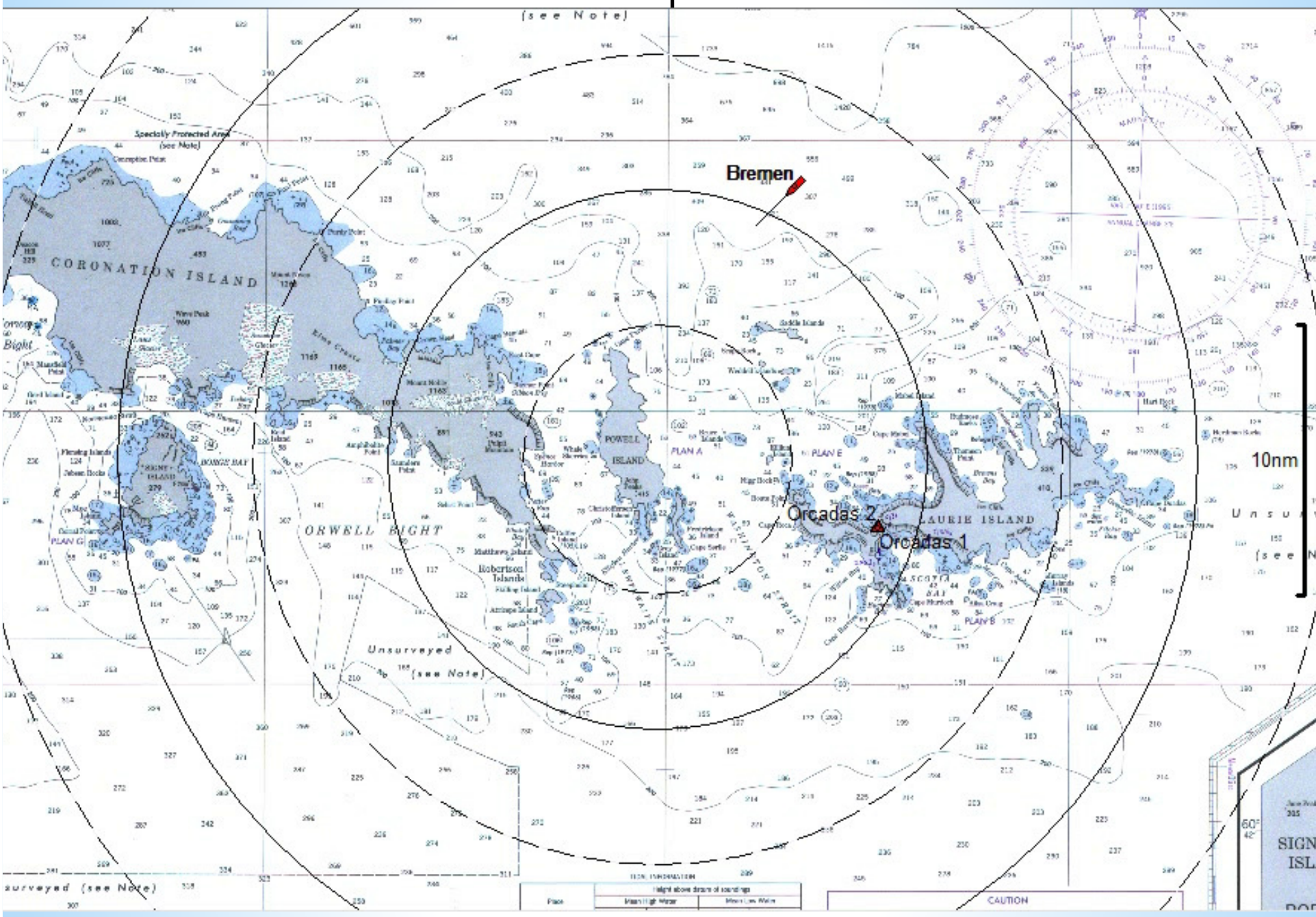
Vessel's Wiki

[Contribute to this page](#)

General

> MMSI: **997011088**

Video - AIS-AtoN network implemented in Orcadas Base



Fase III

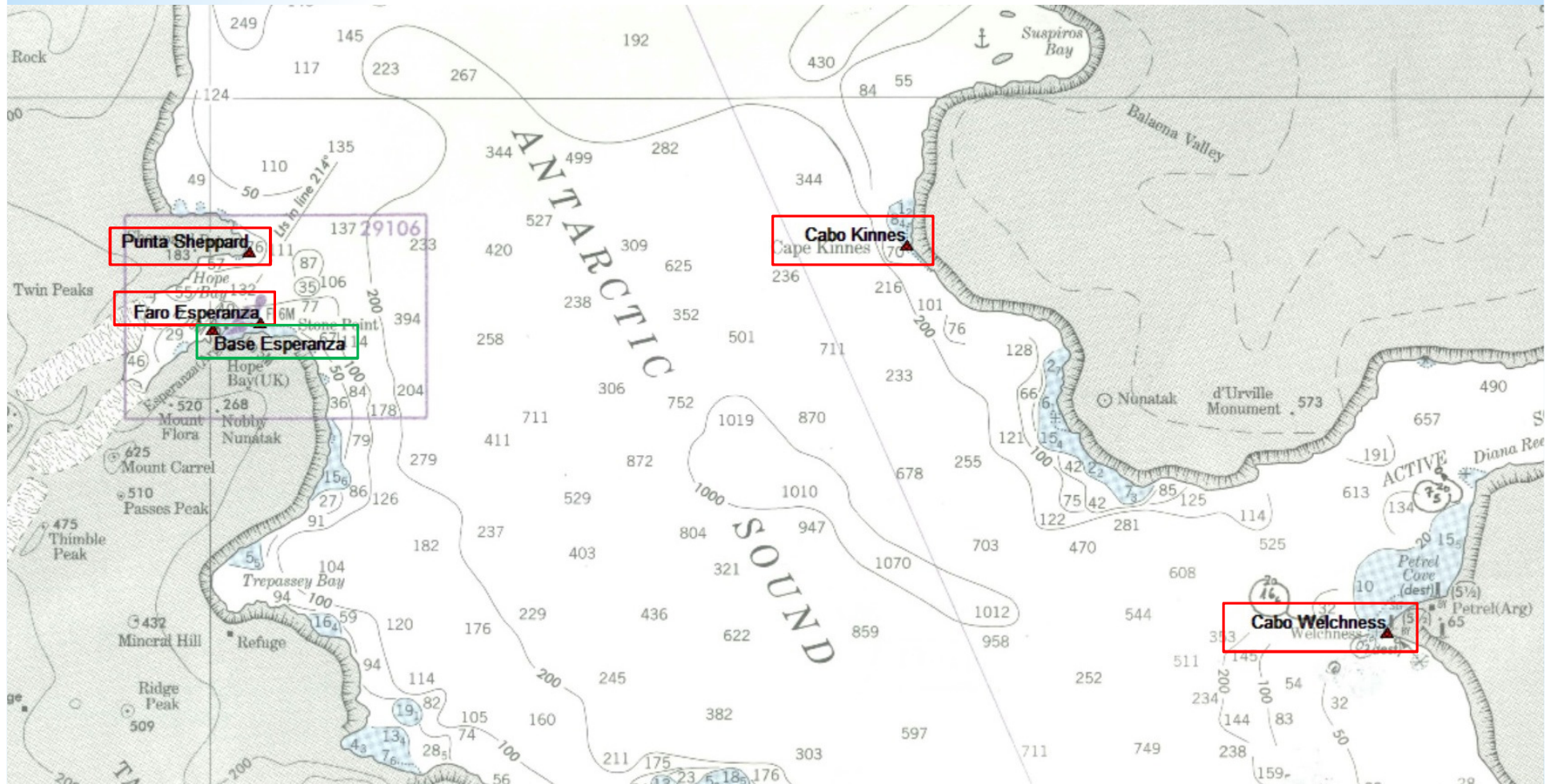


Fase III Visualization

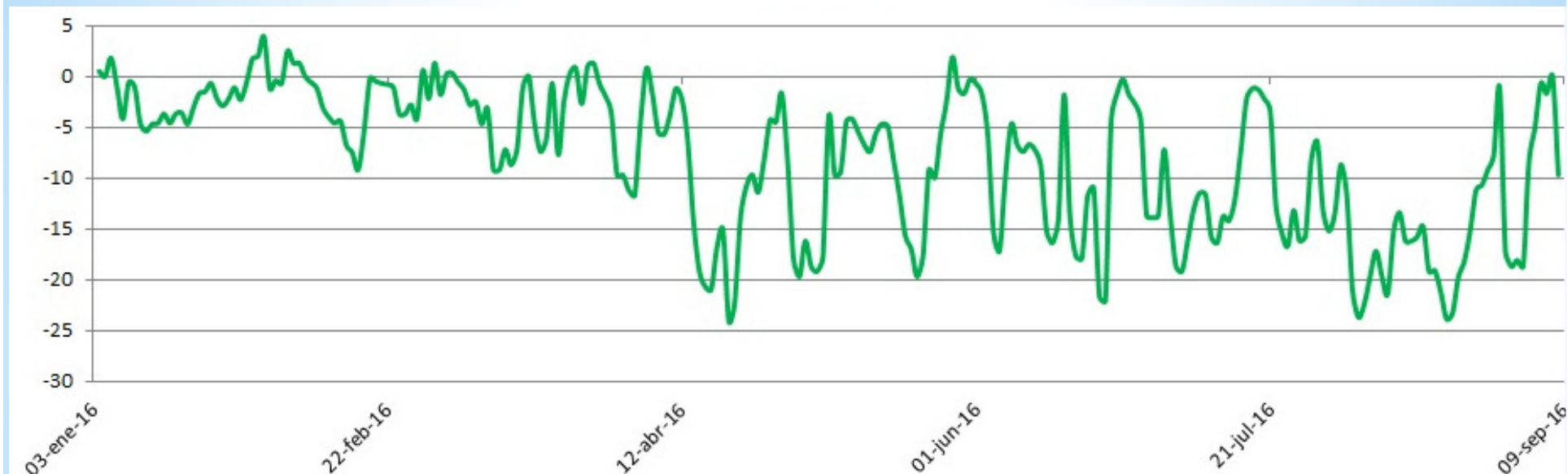


Fase III Visualization

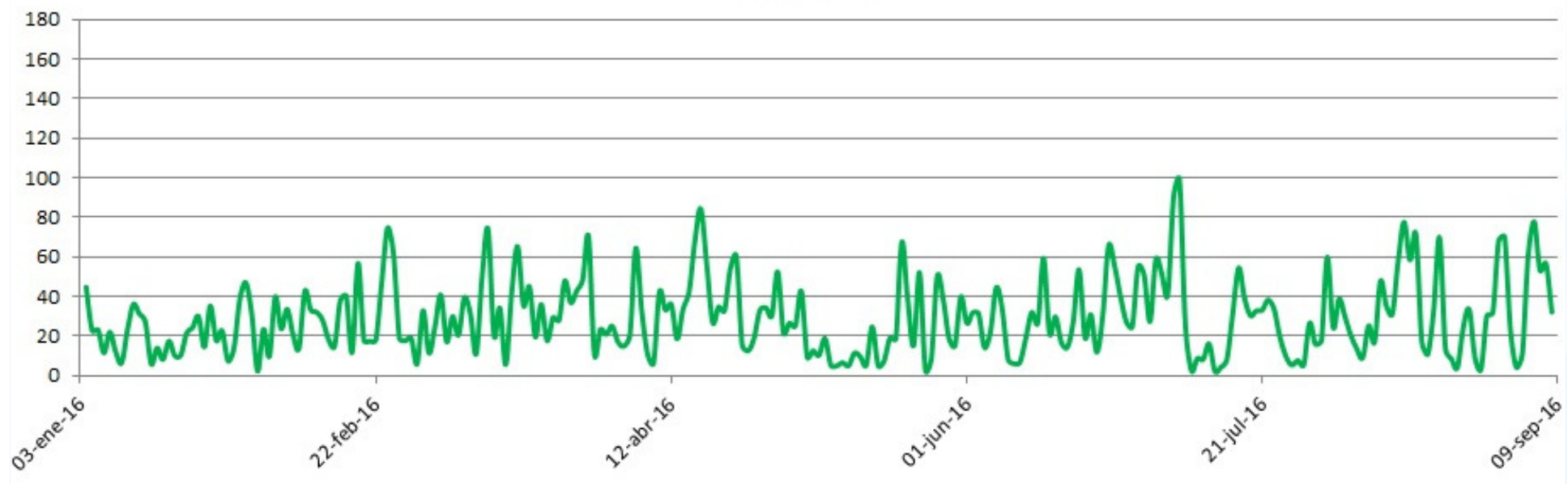
- 1 real AIS-AtoN – Type 3
- 4 virtual AIS-AtoN



Lowest temperature that the AIS and the VHF antenna were exposed to (-24 °C).



Strongest winds to which the AIS and the VHF antenna were exposed to (95 km/h)



ESPERANZA TO THE WORLD

← → ↺ 🔒 <https://www.marinetraffic.com/en/ais/details/ships/shipid:4079378/mmsi:997016109/vessel:PUNTA%20SHEPPARD>

Aplicaciones Haz clic para avanzar una página o pulsa unos segundos para ver el historial



PUNTA SHEPPARD



Navigation Aid



Create notifications for this Vessel

Fleet controls:

Add to Fleet



Contribute to this

IMO: -

MMSI: **997016109**

Call Sign: -

Flag: **Argentina [AR]**

AIS Vessel Type:

Navigation Aid

Gross Tonnage: -

Deadweight: -

Length Overall x Breadth

Extreme:

4m x 4m

Year Built: -

Status: **Active**



Latest Position

Out of range

Position Received: -

Vessel's Time Zone: -

Latitude / Longitude:

-63.37583° / -56.9725°

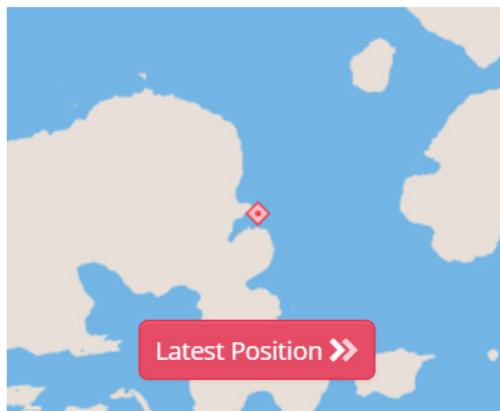
Status: **Stopped**

Speed/Course: **N/a**

Nearby Vessels



Latest Position >>



Be the first to upload a photo for this vessel

Upload a photo

Vessel's Wiki

Contribute to this

General

> MMSI: **997016109**

> IMO: -

ESPERANZA TO THE WORLD



List of the installed AIS-AtoN in Antarctic

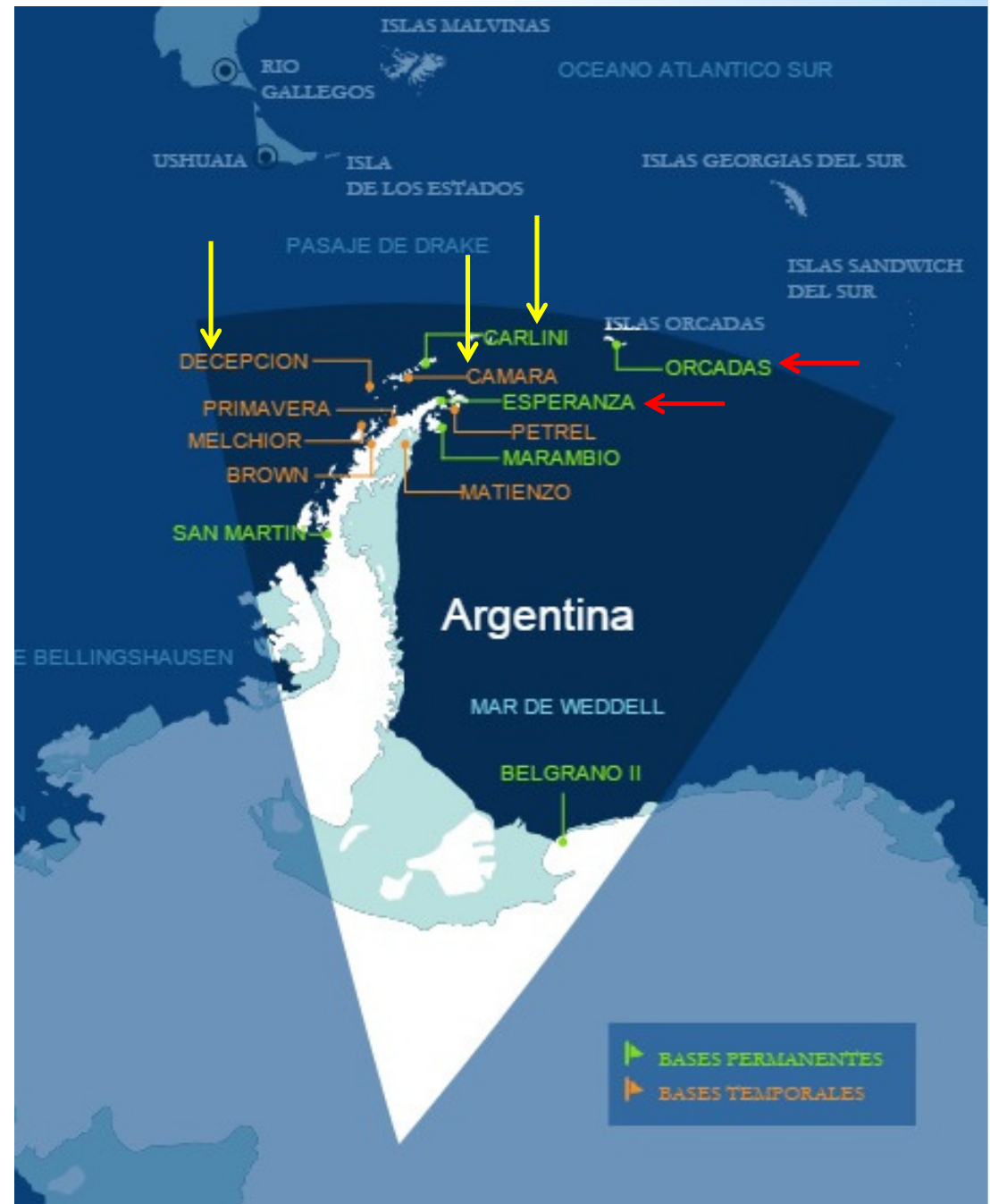
Nº	Name	MMSI	AtoN type		AIS type
1	ORCADAS ANTARCTIC BASE	997011088	Fixed structure	3	Real
2	ORCADAS ANTARCTIC BASE - 2	997011089	Fixed structure	3	Real
3	CAPE SORLE	997016101	Cardinal West	12	Virtual
4	ISLET CORBETA	997016102	Cardinal East	10	Virtual
5	ISLET BRISBANE	997016103	Cardinal West	12	Virtual
6	ISLE MONTURA	997016104	Cardinal East	10	Virtual
7	ISLET WISTROM	997016105	Cardinal South	11	Virtual
8	CAPE BURN MURDOCH	997016106	Cardinal South	11	Virtual
9	ROCK HERDMAN	997016107	Cardinal South	11	Virtual
10	ISLET MURRAY	997016108	Cardinal East	10	Virtual
11	ESPERANZA ANTARCTIC BASE	997011091	Fixed structure	3	Real
12	PEAK SHEPPARD	997016109	Cardinal South	11	Virtual
13	CAPE WELCHNESS	997016110	Cardinal West	12	Virtual
14	LIGHTHOUSE ESPERANZA	997016111	Cardinal West	12	Virtual
15	CAPE KINNES	997016112	Cardinal North	9	Virtual

2011 - 2016

- Orcadas (permanent)
- Esperanza
- 3 – Real AIS
- 12 - Virtual AIS

2017 - 2021

- Carlini
- Decepción (temporary)
- Cámara
- +2 to be determined
- 5 - Real AISs
- 20 - Virtual AISs



Conclusions

- Under the extreme weather conditions in Antarctic, the AIS-AtoN functioned correctly.
- The implementation of AIS-AtoN, represents a significant increase on navigation safety.
- It provided Antarctic with Aids to Navigation with a known initial investment and an almost non-existent maintenance cost..
- Cooperation between organizations facilitated the materialization of the project, optimizing resources.