



OceanoScientific Southern Expeditions

2019 - 2020



Partnership for Observation of the Global Ocean

2019 Annual Meeting

Presented by Gérard Eldin - CNRS / INSU

22 January 2019

OceanoScientific Southern Expeditions 2019-2020

Two upcoming expeditions
are scheduled on the same course
from Monaco to Monaco
via a virtual way-point
on the line of the 40th South



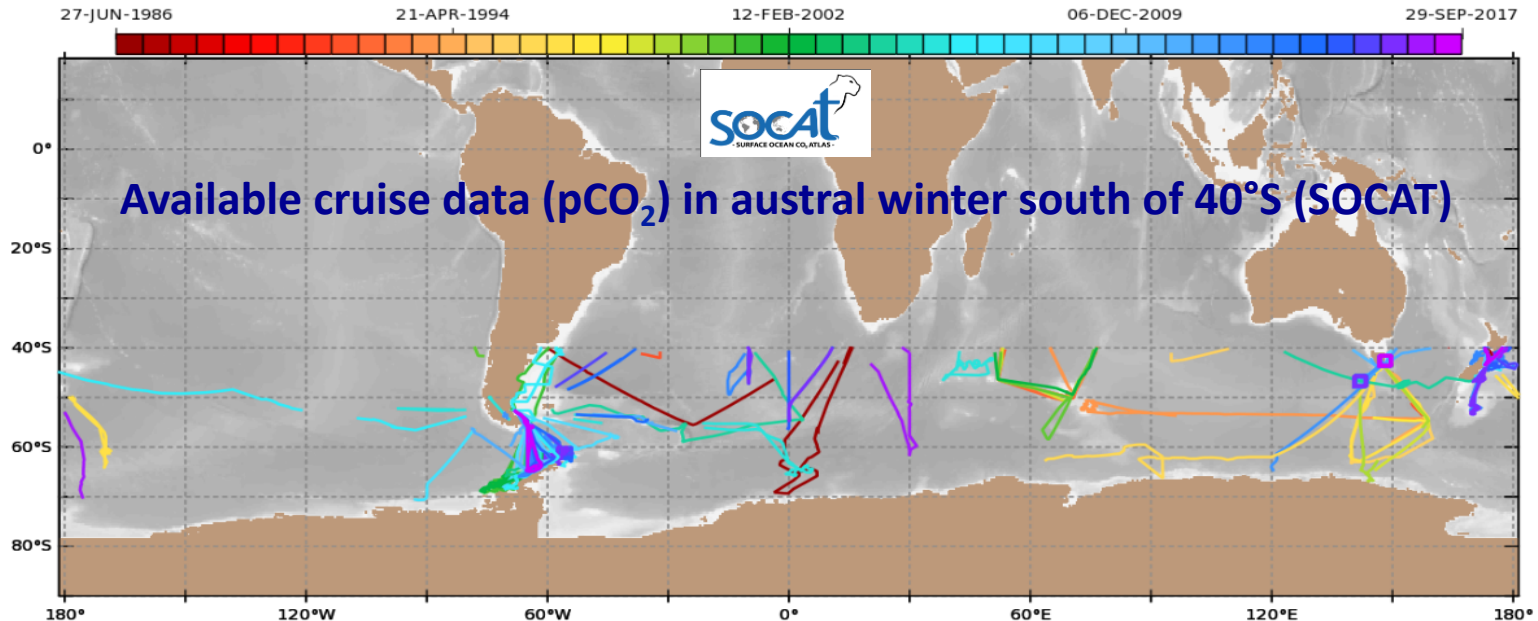
Scientific partners in POGO proposal:

POGO members: CNRS (LOCEAN), IFREMER, SIO, CSIRO, GEOMAR

With: OceanoScientific (Fr), Université de Perpignan (Fr),
FURG (Porto Alegre, Brazil), UFPE (Recife, Brazil), NOAA (PMEL, USA)

Rationale

- Lack of in-situ observations at the air-sea interface in the southern ocean.
- Lack of visible or infrared satellite data.
- Autonomous observation systems (Argo floats, saildrones, wavegliders) need validation.



Example: In some regions recent BGC-Argo floats suggest air-sea CO_2 fluxes of opposite sign to the SOCAT winter estimate

2019-2020 OceanoScientific Expeditions will continuously measure from a sailboat:

- Meteorological variables (SLP, wind, air temperature, humidity...)
- SST/SSS, pH, O_2 , $p\text{CO}_2$ (sensors Sunburst and/or Contros) , fluorescence
- Water samples for validation and for for DIC/ A_t analyses will be collected



OceanoScientific Expeditions

In 2005-2006 Yvan Griboval had the idea of using ocean racing yachts that sail around the World in the Roaring Forties and Furious Fifties:

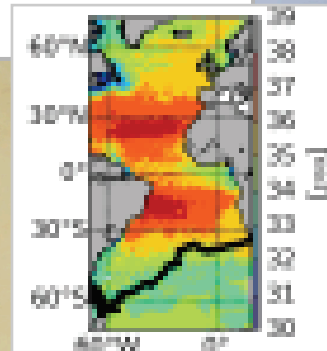
To collect oceanographic and meteorological data at the Air-Sea interface, to feed research on origins and impacts of climate change.

The result was the *OceanoScientific Programme* launched on 14 November 2006.



OceanoScientific has faced with a problem:
no equipment existed in 2006 to equip ocean
racing sailboats with oceanographic equipment.

The *OSC System* was then tested
on the three-master *BARK EUROPA*
in the waters of Antarctica.

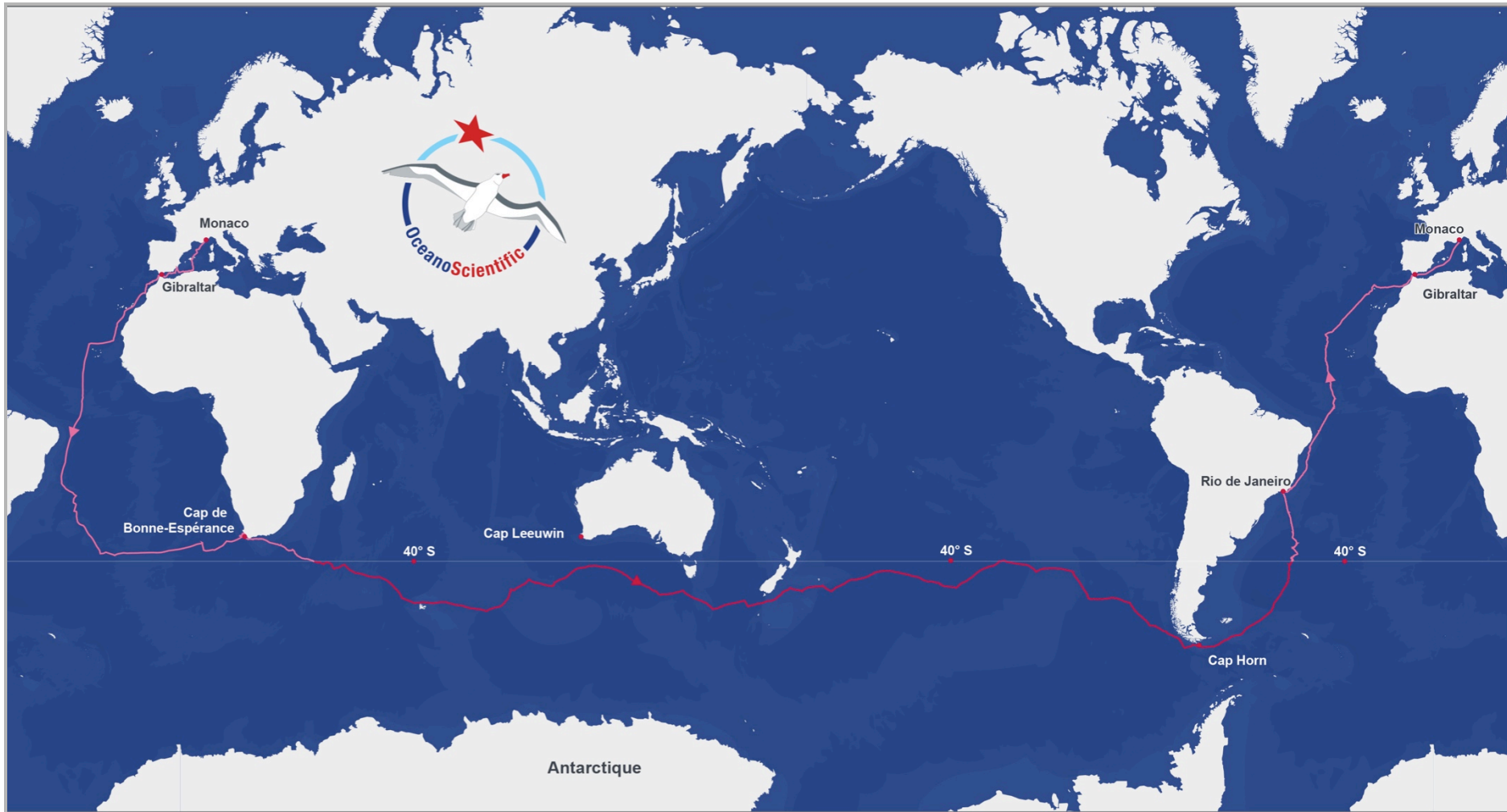


OceanoScientific has called on the
support of scientific advice and
specialists to develop this equipment
that did not exist for sailboats,
in particular by financing and providing
the fruit of his research free of charge
to his German partner Stefan Marx,
when the latter created the SubCtech
corporation in Kiel (Germany).

The *OSC-Software* (intelligent part
of the *OSC System*) is still a unique piece
of equipment in the world today.

In 2016-2017, Yvan Griboval successfully led the first *OceanoScientific Expedition*
Yvan Griboval sailed single-handed for 152 days, 60 days under the 40th South,
via the three main continental capes of Good Hope, Leeuwin, and the Cape Horn
without creating any CO₂ emissions or waste, with an OSC system that he had to maintain
while regularly collecting water samples and deployment of an Argo float at 50° South.

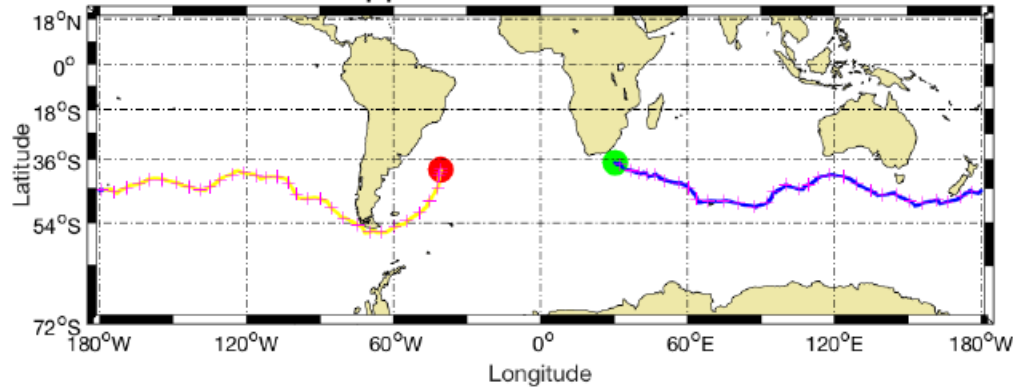




The entire energy of the *OceanoScientific Explorer* sailing vessels is provided by hydro generators without any gas-oil

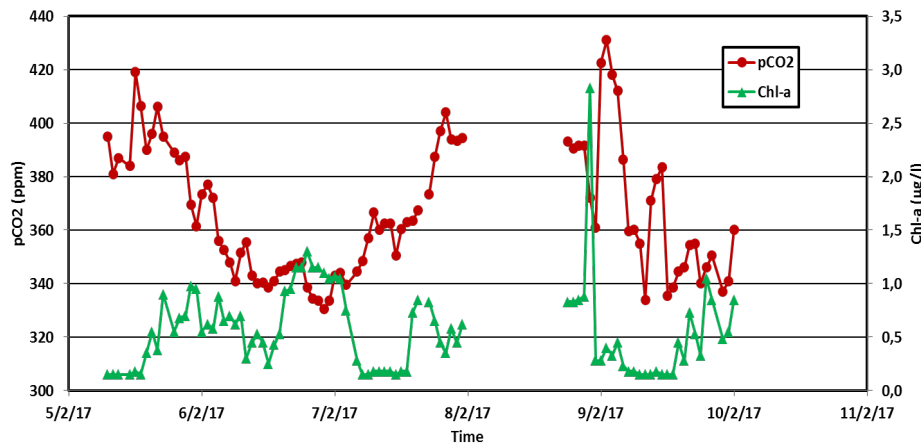
Data from the *2016-2017 OceanoScientific Expedition*

Ship positions: 30/01/2017-04/04/2017



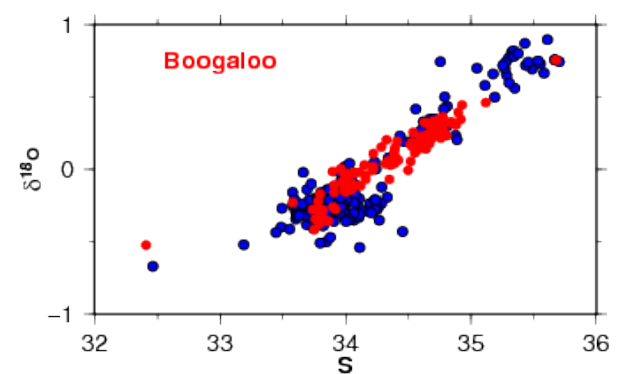
Continuous meteorological and TSG (T/S) data **transmitted in real time** through the French Met Service, LOCEAN and the Coriolis consortium.

T/S data validated in DM and transmitted to GOSUD (IODE/UNESCO).



Fluorescence of Chl-a and a few days of pCO₂. At that time pCO₂ data **could not be validated** because the sensor was not efficient.

cruises southern ocean Jan–March 2017



Water isotopes (water cycle studies) **Validated** and transmitted to GISS (Goddard Institute data base)

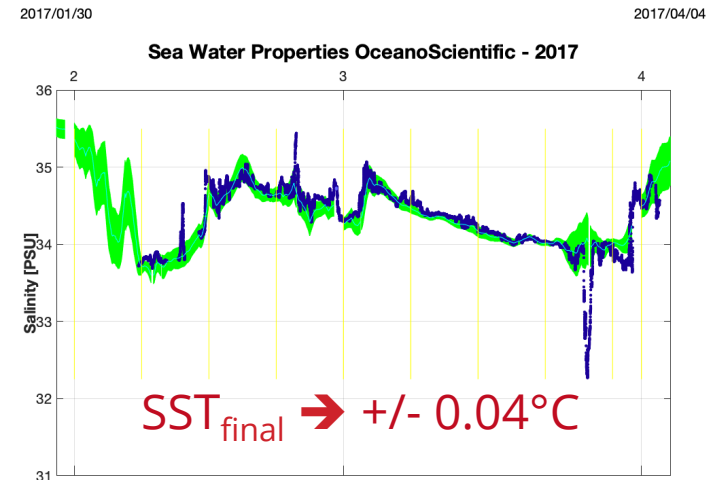
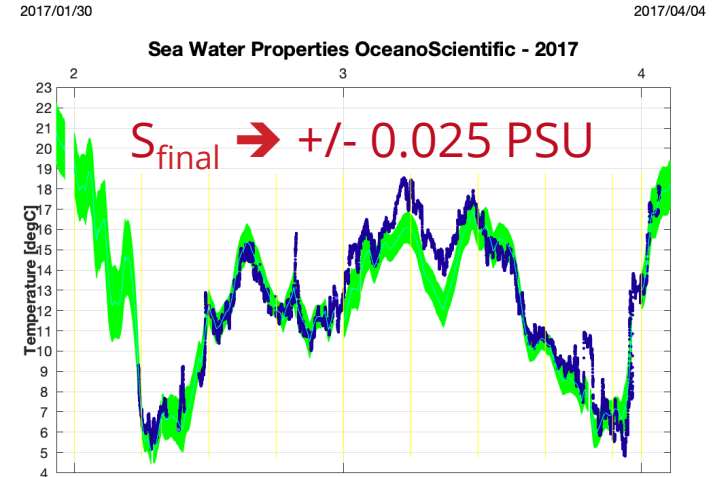
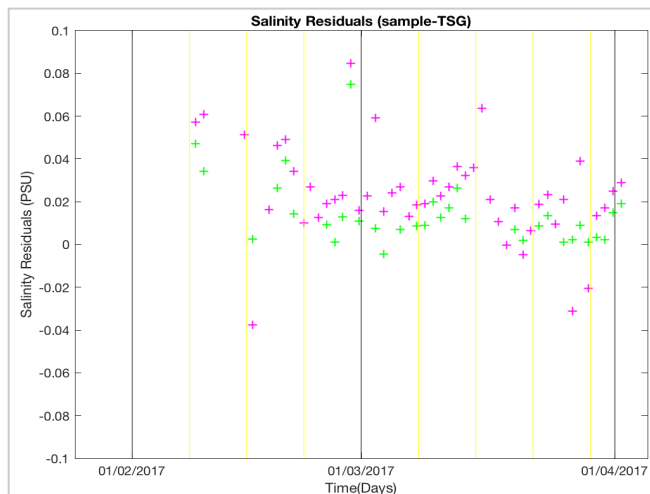
Example of validation: T/S

Providing reliable data with known error bar.



T: Combining measurements from the *OSC system* with the keel temperature sensors allowed to correct *OSC System* values from thermal exchange with the boat interior reducing the error bar on the final SST values.

S: Water samples are used to estimate and correct instrumental salinity bias



Two upcoming expeditions are scheduled on the same course from Monaco to Monaco via a virtual way-point on the 40th parallel.

***The OceanoScientific
Southern Summer
2019-2020 Expedition
December - February***

***The OceanoScientific
Southern Winter
2020 Expedition
June - September***



To carry out extreme
OceanoScientific Expeditions
you need a yacht capable of sailing
fast enough not to be caught up
in the really bad weather
of the powerful southern depressions.

The new *OceanoScientific Explorer*
33.5m maxi-catamaran
will become the most efficient
scientific sailboat in the world,
and the fastest too.

The entire energy of this
OceanoScientific Explorer
is provided by hydro generators
without any gas-oil.



Implementation

March to October 2019

The scientific and technical team will work on the **choice of instruments and sensors**, the strategy of data validation and qualification and the collection of water samples.

A crew of 7 or 8 members will be formed, **including one scientist**, to log sensors data, maintain instrumentation and collect water samples during expeditions.

December 2019 - February 2020

Southern Summer 2019-2020 Expedition - Monaco to Monaco.

June - September 2020

Southern Winter 2020 Expedition - Monaco to Monaco.

During both expeditions, near-simultaneous measurements with other elements of the observing systems (research expeditions, instrumented moorings, wave gliders and sail drones, possibly SOCCOM BGC-Argo floats) will be favoured.

Contributors to the proposal from various institutions will help for that.

October 2020

End of real time data transmission, start of water samples analyses.

July 2021

End of water samples analyses and of post expedition calibration of sensors.

Data management 1/2

Data transmission:

Data will be transmitted in near real time to:

- GOSUD (Global Ocean Surface Underway Data)
an IODE / UNESCO Project for scientific use.
- Copernicus Marine Environment Service through its in-situ observations component for model validation and assimilation purposes
- Ocean data will be inserted on the GTS either by Ifremer or by Météo-France
- Meteorological data will be inserted on the GTS by Météo-France



After the expedition and / or on a regular basis, the full resolution dataset will be transmitted to the most relevant data centers for final archiving and for a wide distribution and a wide usage. This includes the final calibrated datasets and water samples analyses

Data management 2/2

Data qualification:

Real time data will be quality controlled (automatic QC) and delayed mode datasets will be produced by Ifremer under LOCEAN scientific expertise



Data archival:

The data will be long term safeguarded using the Ifremer facilities

Data dissemination:

Through GOSUD, SOCAT, Copernicus CMEMS, Météo-France



Data publication:

We propose Seano.org (Ifremer) as data publishing tool





THE FUTURE IS BLUE, LOVE THE OCEAN

