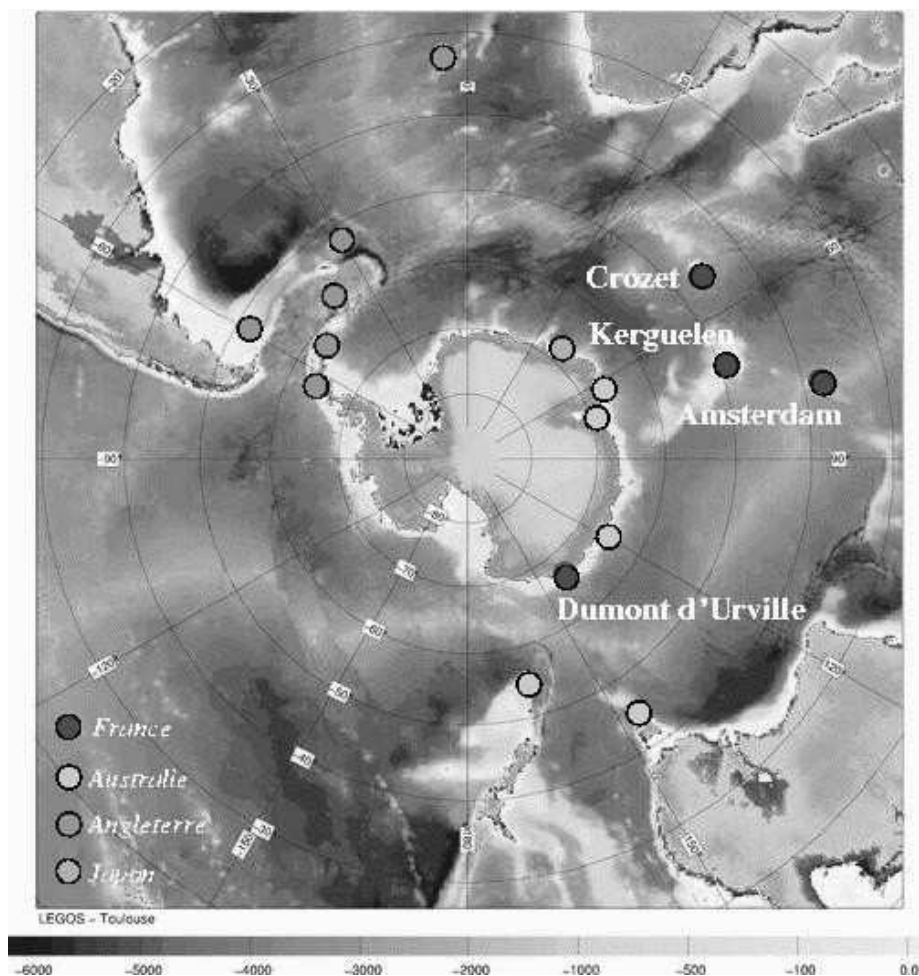


## ROSAME Tide Gauges Network Technical aspects & Specific Constraints

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### Introduction

The ROSAME tide gauges network (*Réseau d'Observation Sub-antarctique et Antarctique du niveau de la MER*) is a French contribution to the GLOSS (*Global Sea Level Observing System*) international network. It is composed of 4 permanent stations in the southern part of the Indian Ocean located at Crozet, Kerguelen and Saint-Paul Islands and in the Southern Ocean at the French base of Dumont d'Urville in Antarctica. This network was initiated at the beginning of the 90's during the WOCE (*World Ocean Circulation Experiment*) program. These stations satisfy to the WOCE requirements for *in situ* sea level data (i.e, high precision sea level measurements, hourly data acquisition, real time transmission, etc). Principal scientific objectives attached to this network are the monitoring of the Antarctic Circumpolar Current, the study of the ocean dynamic in the Kerguelen region and the validation of altimetric data (TOPEX/POSEIDON, ERS1/2, JASON1 and ENVISAT ).



**Figure 1:** Localisation of the ROSAME stations in the context of the *in situ* sea level measurements in the Southern Ocean.

## Technical Characteristics

### Sensors and Stations



All sites are equipped with pressure sensor, sea water temperature sensor and atmospheric barometer. Kerguelen and the new Crozet station have also a conductivity sensor. These sensors are connected to a central station which pilots the acquisition of the data and builds a message, which is transmitted by satellite via the ARGOS system. All the ROSAME stations are alimented by batteries. A yearly maintenance is made on each site during the logistic rotation of the oceanographic Marion Dufresne Vessel. During these operations, battery and sensor are changed, infrastructure and equipment are controlled and fixed.

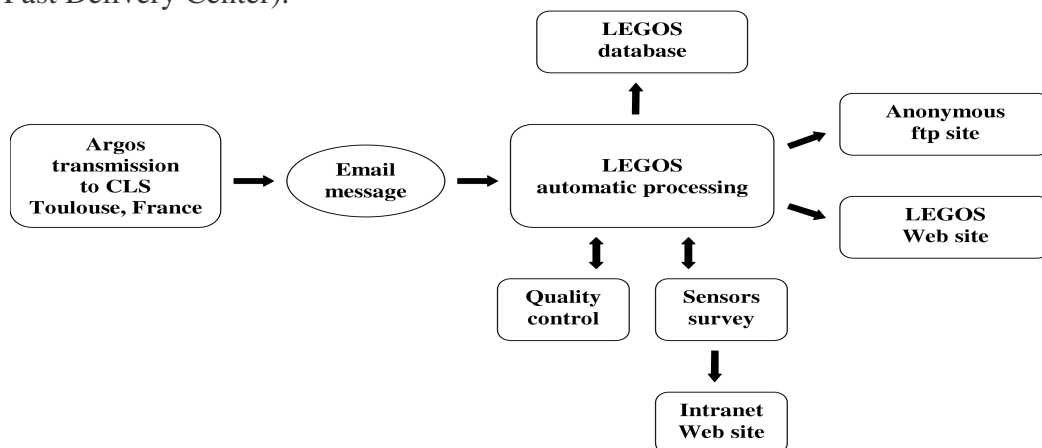
The acquisition frequency of data is one hour except for Dumont d'Urville station where it is half an hour. All these stations have a backup

memory.

**Figure 2 :** Bottom pressure sensor and stilling well of Kerguelen tide gauge. Sensors have to be changed every two years in order to be recalibrated by the constructor.

### Data processing and banking

The measured parameters are transmitted in quasi real time via the Argos system to CLS collecting centre in Toulouse. The data are then received and processed in LEGOS by an **“automatic acquisition/quality control/fast delivery software for real time follow-up of data coming from a tide gauge network”** (see P. Téchiné et al. in this proceedings for a detail presentation of the software). Controlled data are made available via Internet at the Hawaiï data centre (Sea Level Fast Delivery Center).

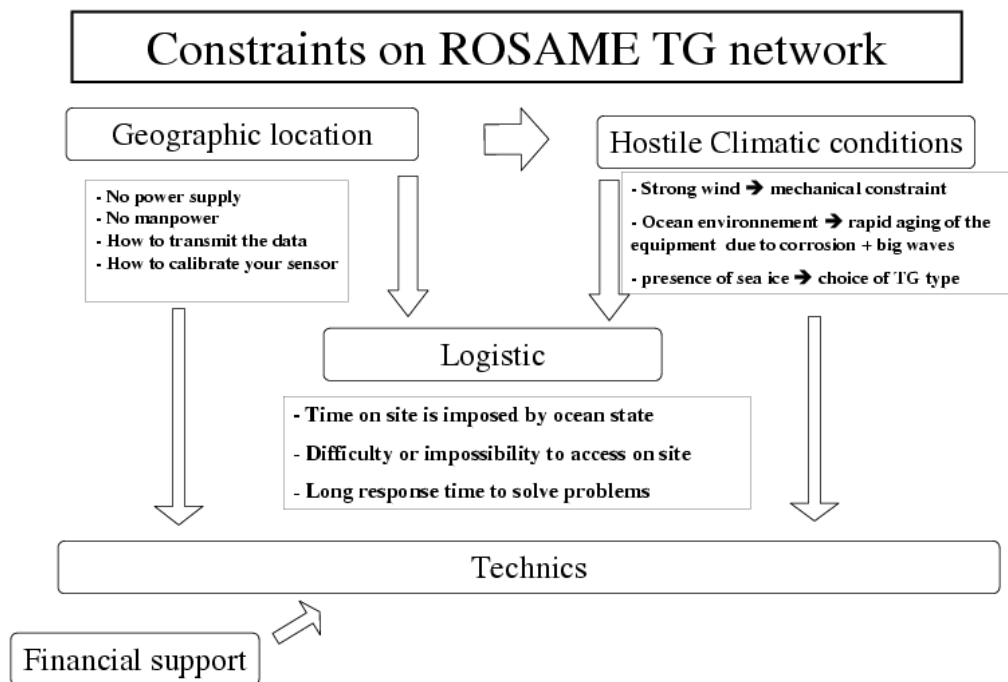


**Figure 3 :** Schema of the automatic software presently developed at LEGOS for the ROSAME network.

## Constraints associated to the network

The choices made to build and maintained the ROSAME network are partly due to the constraints attached to the different sites. Indeed the French Islands located in the southern part of the Indian Ocean and Antarctica are subject to rough climatic conditions and are often difficult to access. Maintenance of the network is scheduled only once a year and its success depends on the weather conditions at that time. Indeed when the conditions are too rough it is quite impossible to proceed to the planned work. Moreover these conditions lead to a rapid aging of the equipment and apply strong mechanical constraints to the infrastructure (see in the next section the example of Crozet). At Saint-Paul Island there is no scientific base and any problem cannot be solved before the next rotation of the vessel, then even very simple problem can lead to important loss of data (see next section for example).

Our conclusion is that logistic is probably the key factor of a good maintenance of a remote tide gauge network. Technical problems are in most case not critical and can be overcome.



**Figure 4** : Schematic presentation of constraints associated to the ROSAME tide gauges network

## Historic of the network and illustration of the constraints

KERGUELEN DATA AT 10/10/2003

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
ker_argos	█	█	█	█	█	█	█	█	█	█	█

**Kerguelen** was installed in 1992, it operates since 1993 without any problem. It is at the moment one of the longest series in this part of the world.

SAINT-PAUL DATA AT 10/10/2003

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
spa_argos	█	█	█	█	█	█	█	█	█	█

**St-Paul** was installed in 1994, it operates since this time with few problems of batteries that are in this case very restrictive due to the fact that this island does not benefit from a scientific base and is completely desert.

CROZET DATA AT 10/10/2003

	1995	1996	1997	1998	1999	2000	2001	2002	2003
cro_argos	█	█	█	█	█	█	█	█	█

**Crozet** was installed in 1995. This station is a real headache since its installation. Its beginning was scattered with electronic problems. Then in the beginning of 1997 the station was stopped due to a landslip. Reinstalled in 1998, other electronic problems lead to send back the station to the constructor. Idem in 1999. On 30 July 2001 the station was broken down by a storm. A new installation is scheduled in 2003. Crozet is probably the most hostile island of this region due to a very rough climatic environment and furthermore the tide gauge site is very exposed to swell and waves.

DUMONT D'URVILLE DATA AT 10/10/2003

	1997	1998	1999	2000	2001	2002	2003
ddu_argos	█	█	█	█	█	█	█

**Dumont d'Urville** was installed in 1997. There was many problems in the connection of the sensor probably due to iceberg calving that damaged the cable that connect the station to the sensor. This station now operates quite well.

To complete this network two moorings are maintained in the vicinity of Crozet and Saint-Paul islands in order to have dynamical information on the link between the coastal sea level measurements and the sea level off shore.