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Critical Success Factors of the ReefTEMPS sensors-oriented environmental information system for a real operatinality.

Fiat Sylvie, Régis Hocdé, David Varillon, Antoine de Ramon N'yeurt, Jérôme
Aucan

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Presentation

Sylvie FIAT
UMR ENTROPIE
IRD

Team collaboration

Régis Hocdé,
David Varillon,
Antoine De Ramon
N'Yeurt,
Jérôme Aucan

Critical Success Factors

of the

ReefTEMPS

sensors-oriented

environmental information system

for a real operatinality

Component of the French
Seashore and Coastal
Research Infrastructure



ReefTEMPS

Network of coastal oceanic sensors
since 1953



3 research teams



4 data management sub-networks



- Global ReefTEMPS pacific zone
- Institute of Research for Sustainable Development
- University of South Pacific
- South Pacific Community
- University of New Caledonia

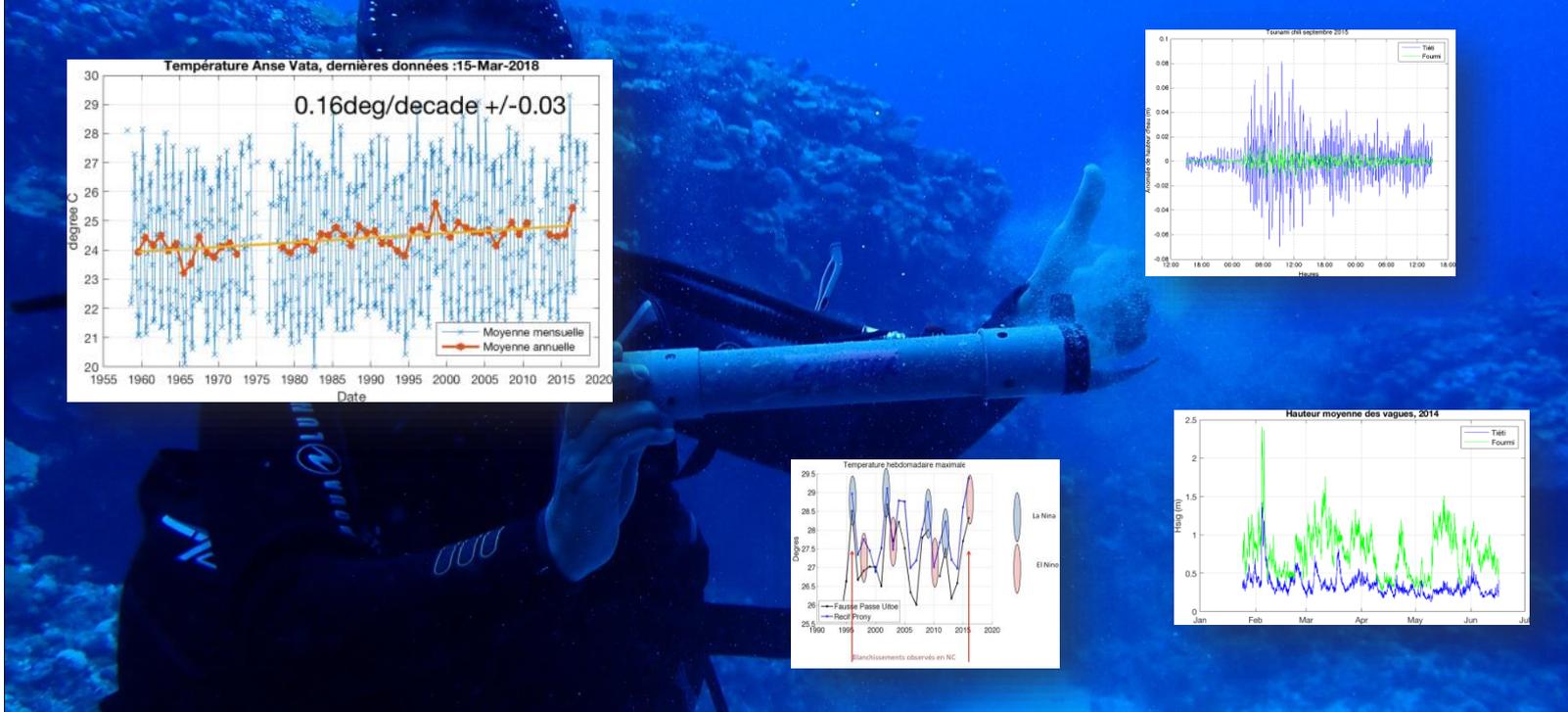
164
sensors

94
platforms

14
countries

51 \bar{M}
measurements

175 timeseries



History

More than 60 years of data collection

7
physical
parameters

> *Temperature, sea pressure, salinity, wave, turbidity, conductivity*

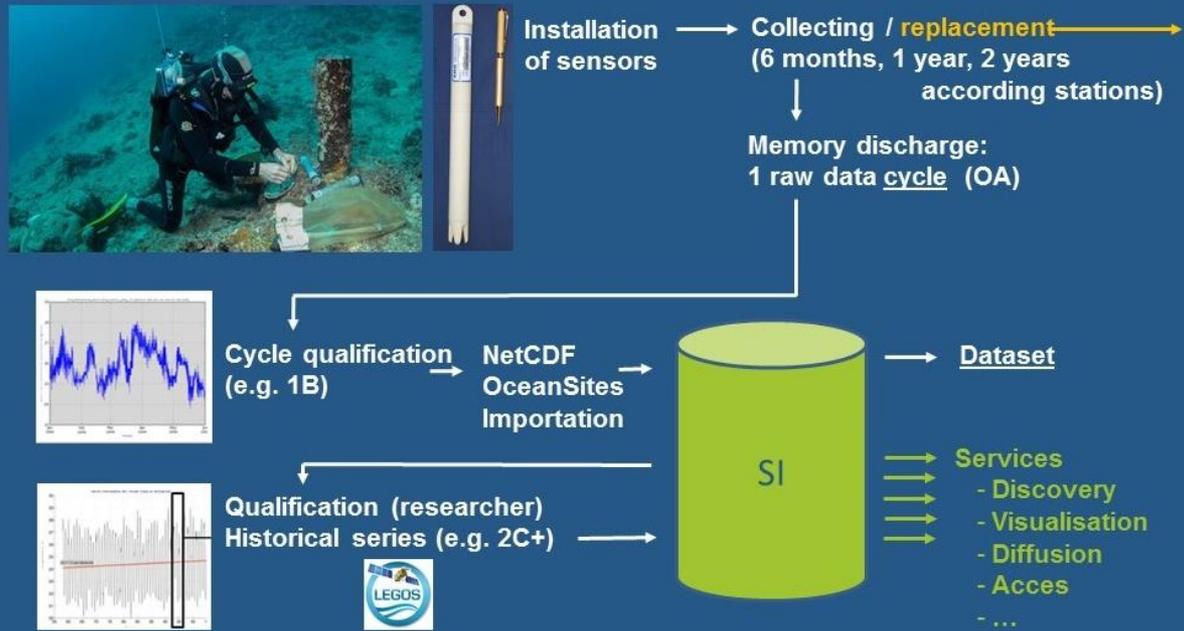
> *Global warming, Lagoon water circulation, Tsunamis, Coral bleaching, Algae proliferation, decision manager*

72
sensors in
activity

± 70
data imports
per year

$+5 \bar{M}$
measurements
per year
(exponential
growth)

Each platform: mono / multi-parameters instrument (s)



Live

Data cycle

60s / 30mins
acquisition
rates

- > NetCDF following Climate and Forecast (CF) Convention and OceanSites Data Format Reference
- > Data qualification includes manual and automatic controls

Catalog with
ISO19115 and
Marine
Community Profile

Metadata and
dataset identified
by DOIs

Reference in
international
catalogs

Open and
normalized

Open source
based software



Findable

- Ensure data continuity in a virtual warehouse or data center logic
- Diffuse data in catalogs



Accessible

- Make data accessible and validated to the community



Interoperable

- Be interoperable and provide data to data warehouses
- France Ex: CORIOLIS
- Europe Ex: SeaDataNet,
- South Pacific region, International Ex : SOPAC, PI-GOOS, **IMOS**

How to cite 

Varillon David, Fiat Sylvie, Magron Franck, Allenbach Michel, Hozbani Thierry, De Ramon N'Yeurt Antoine, Ganachaud Alexandre, Aucan Jérôme, Pelletier Bernard, Hoodé Régis (2018), ReefTEMPS: The Pacific island coastal ocean observation network. SEANOE. <https://doi.org/10.17882/55128>

Reusable

- Produce and disseminate maps and indicators
- Clear and accessible data usage licence

Objectives

Data dissemination

Understandable
formats for (all kind
of) researchers

- > *NetCDF, WMS, WFS, SOS, CSW, CSV, raw images access formats disponibles*
- > *Compliance with FAIR data practices*

POSTGRES
POSTGIS

THREDDS

Python ws

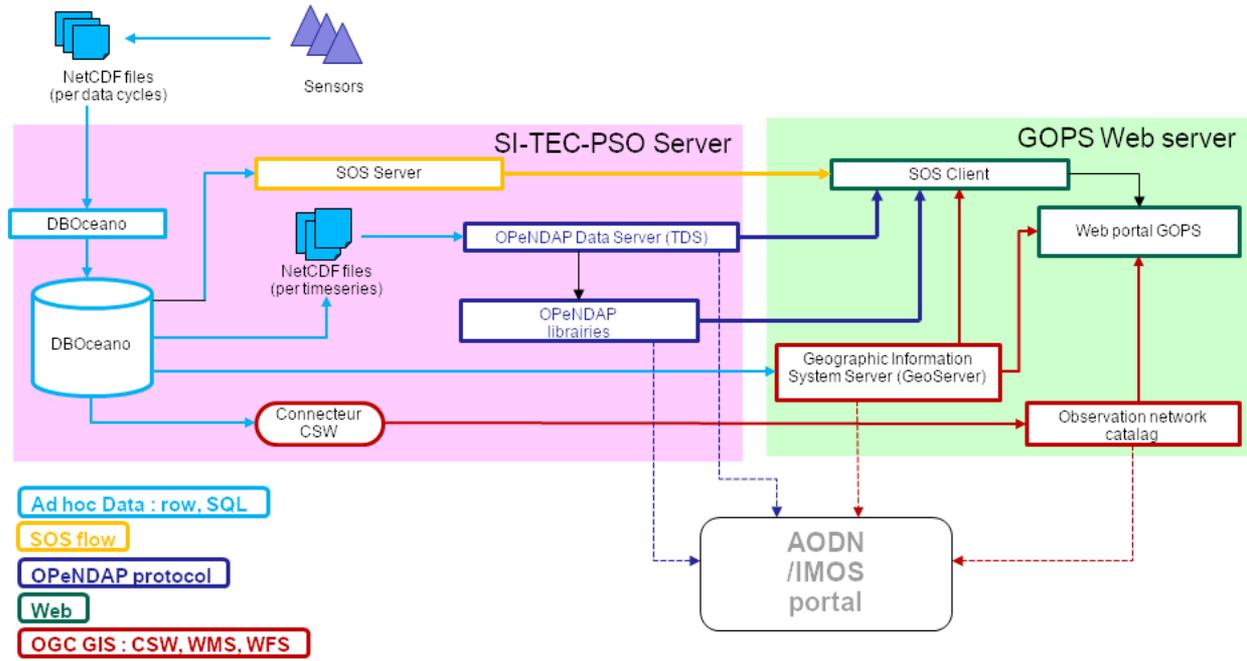
Geonetwork

Geoserver

Constellation

52North
SWC

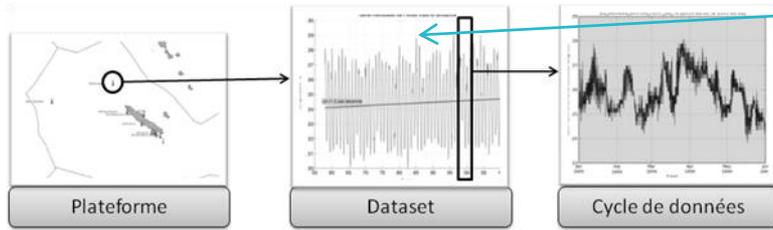
Liferay



Information system design v.1 - 2010

- > AODN portal is the Australian Ocean Data Network
- > Standards and Open sources software deployed as a Server/Client architecture

SOS v.1



Series: ANSEVA01-TEMP_3B_TR

Physical parameter code TEMP

Physical parameter SEA TEMPERATURE

Processing code 3B

Processing CALIBRATED REDUCED DATA

Instrument family code TR

Instrument family THERMISTOR CHAIN (DELAYED MODE)

Valid time

Begin 1958-02-15 12:00 GMT+0000

End 2010-06-22 21:00 GMT+0000

Last coordinates

Latitude -22.30376 °

Longitude 166.44331 °

Depth 2 m

Measurement Cycles (by more recent)

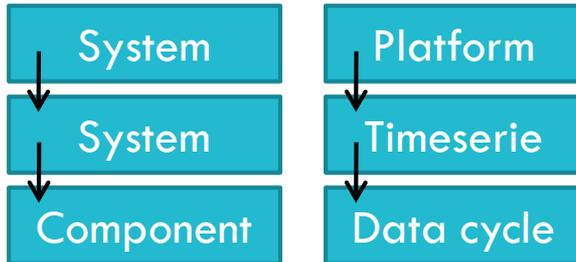
- 1957-04-16 → 2010-06-22
ONSET Générique - SIN N/A
- 1958-02-15 → 2010-04-15
ONSET BUCKET HYBRIDE - SIN N/A

DescribeSensor

```

    0" standalone="yes"?>
    s="http://www.opengis.net/sos/1.0"
    gml" xmlns:xlink="http://www.w3.org/1999/xlink"
    /1.0" xmlns:swe="http://www.opengis.net/
    www.opengis.net/sampling/1.0" xmlns:ogc="http://
    tp://www.opengis.net/ows/1.1" xmlns:sm1="http://
    s:swe1="http://www.opengis.net/swe/1.0"
    xmlns:ns12="http://www.opengis.net/gml"
    sensorML/1.0.1" xmlns:xs1="http://www.w3.org/2001/
    t10n-1" xst:schemaLocation="http://www.opengis.net/
    /sos/1.0.0/sosAll.xsd http://www.opengis.net/
    s.net/sampling/1.0.0/sampling.xsd">
  
```

SensorML Standard ↔ Our data



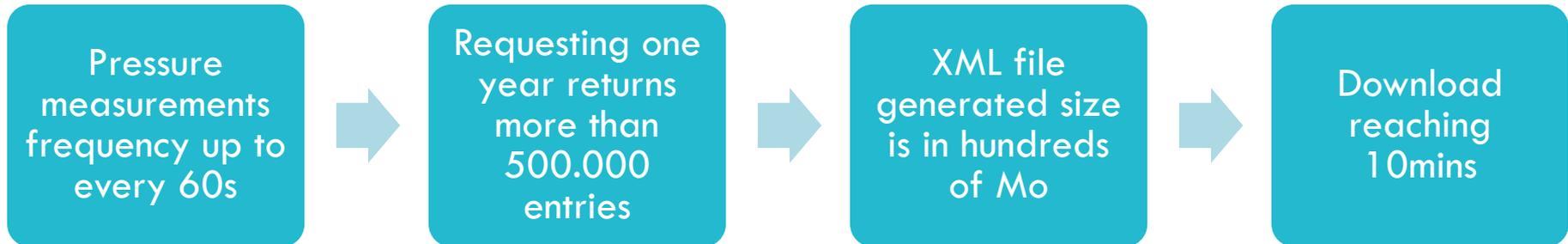
```

    <gml:Envelope axesLabels="Y X" srsDimension="2"
    srsName="urn:ogc:def:crs:EPSG::4326">
    <gml:lowerCorner>-22.30376 166.44331</gml:lowerCorner>
    <gml:upperCorner>-22.30376 166.44331</gml:upperCorner>
    </gml:Envelope>
    <om:boundedBy>
    <om:member>
    <om:Observation>
    <om:samplingTime>
    <gml:TimeInstant>
    <gml:timePosition>2011-06-17T09:30:00+1100</gml:timePosition>
    </gml:TimeInstant>
    </om:samplingTime>
    <om:procedure xlink:href="urn:gops:plateforme:ANSEVA01:TR_0A_TEMP"/>
    <om:observedProperty xlink:href="http://www.brest.ird.fr/us191/database/
    db-oceano/physical_parameter.html#TEMP"/>
    <om:FeatureOfInterest xlink:href="urn:gops:platform:ANSEVA01"/>
    <om:result xsi:type="swe:DataArrayPropertyType">
    <swe:DataArray definition="http://mmisw.org/ont/mml/general/
    timeSeriesDataDefnrd">
  
```

GetObservation

SOS v.1 - GetObservation

SOS Server limitation of the request set to 1 year



Strength & Weakness SOS v.1

Strength

- ✓ Findable
 - Well referenced
- ✓ Accessible
 - Data easy to get

Weakness

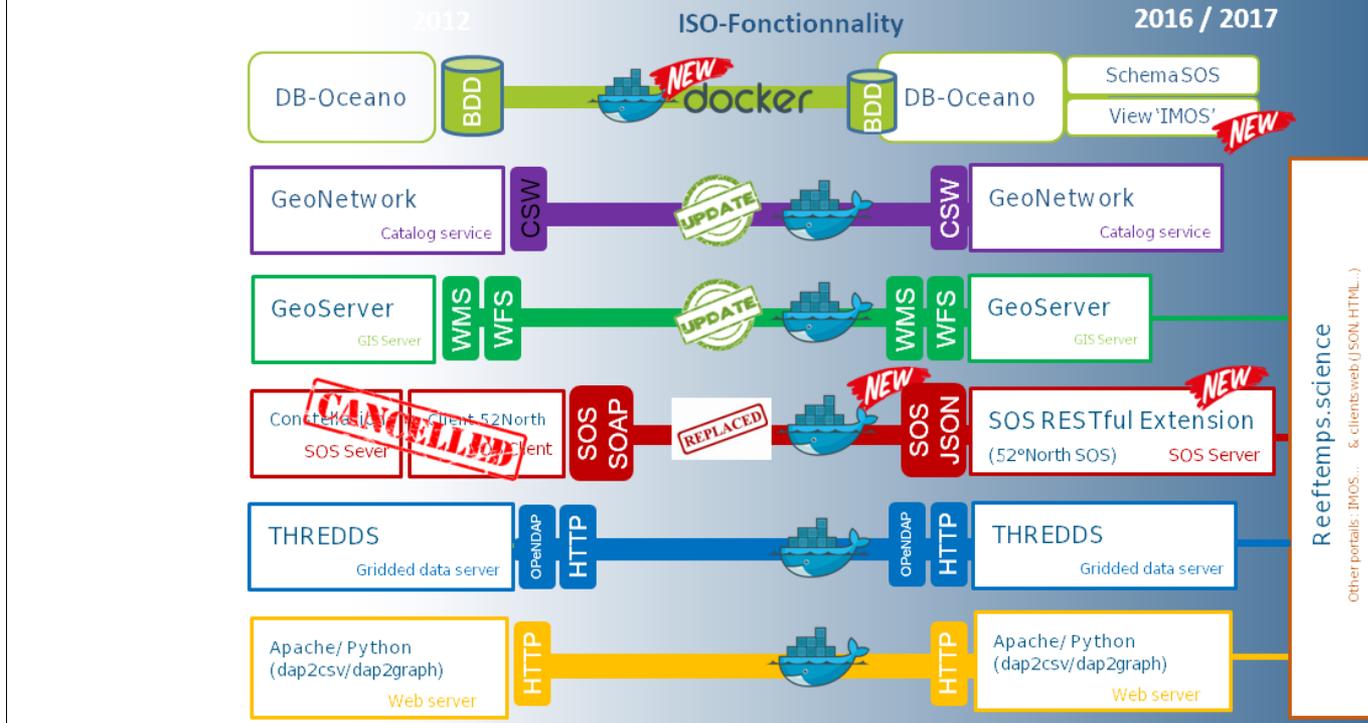
- ✗ Interoperable
 - x SOS mapping
- ✗ Reusable
 - x Response time

SOS schema
=
No SQL join

Docker
=
Container as
a service

SOS RESTful
Extension
=
JSON data

SEANOE
=
National
reference



Information system design v.2 – 2016/2017

- > Architecture made as services consumed by ReefTEMPS data portal
- > SEANOE is a publisher of scientific data in the field of marine sciences. It is managed by the ODATIS data center of France's Earth System research

Réseau d'observation des eaux côtières du Pacifique insulaire

Réseau

Réseau Reeftemps

Station COK Manihiki Atoll 01

Réseau Réseau d'observation des eaux côtières du Pacifique insulaire
Producteur IRD Nouméa
Coordonnées 10°25.430'S, 160°59.816'O
Propriétés physiques Sea temperature

Dataset

MHXCOK01_TEMP_DA_TR

Station COK Manihiki Atoll 01
Plateforme MHXCOK01
Propriété physique SEA TEMPERATURE
Traitement cycle RAW DATA
Famille instrument THERMISTOR
Unité de mesure Celsius degree
Date début 27/10/2012
Date fin 26/01/2015

Télécharger les données

Dataset complet du 27/10/2012 à 25/01/2015

(peut prendre quelques secondes avant de commencer)

- OpenDAP/Thredds
- Metadonnées/GeoNetwork
- NetCDF OceanSite
- CSV
- Aperçu graphique

Affiner la période de téléchargement



Propriétés physiques

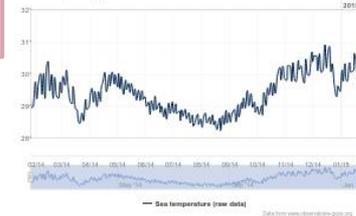
-- tous confondus --

 Stations
 COK Manihiki Atoll 01

 Datasets
 MHXCOK01_TEMP_DA_TR

Graphique dynamique des données de la station sur la dernière année de mesure

Reeftemps datagram for COK Manihiki Atoll 01



Pour avoir un meilleur aperçu, vous pouvez sélectionner et sélectionner les séries qui s'affichent sur leur nom dans la légende

CITATION / DOI

Varillon David, Fiat Sylvie, Magron Franck, Allenbach Michel, Hoibian Thierry, De Ramon N'Yeurt Antoine, Ganachaud Alexandre, Aujan Jérôme, Pelletier Bernard, Hocdé Régis (2018), ReefTEMPS : the observation network of the coastal sea waters of the South, West and South-West Pacific. SEANOE. <http://doi.org/10.17882/55128>



Metadata Norm CF & OceanSites & RSS news

Data Discovery OGC Services

Data Discovery SOS API

Open DATA Download and dynamic access

Dataset DOI, Archive download (SEANOE) & License

Critical success factors #1

SOS v2

- ❑ SOS v1 was too permissive
- ❑ Offering as physical parameter instead of platform prevented us from using 52North client solution
- ❑ SOS v2 is more explicit

Critical success factors #2

REST API

- ❑ XML generation is too expensive
- ❑ XML download is too heavy
- ❑ JSON is a better data exchange format.
- ❑ XML is a better document exchange format.
- ❑ REST is easy of implementation
- ❑ JSON is easy to read

Critical success factors #3

SQL SCHEMA FOR SOS

- ❑ Ad hoc database is to be kept
- ❑ SQL Join are heavy with volumetry
- ❑ SQL Views are the same
- ❑ Materialized views are an option
- ❑ Duplication of data in dedicated SOS schema is fast

Critical success factors #4

OPEN DATA ACCESS

- ❑ No user identification required
- ❑ No delay due to id validation
- ❑ No permission to ask
- ❑ Users will get used to using a DOI for data used in publication
- ❑ Seamless interface

Critical success factors #5

MANY
WAYS
TO
ACCESS
THE
DATA

- ❑ Oceanograph physicists can use NetCDF
- ❑ Sensor Information systems can use SOS
- ❑ Ecologists (among others) can understand CSV
- ❑ Catalogs can browse CSV
- ❑ Geo Catalogs can browse GIS
- ❑ People can have a quick look at the data on images
- ❑ Remote systems can listen to data publications updates
- ❑ As in marketing strategy, the implementation of services competing with SOS leads to an increase in the attractiveness and use of SOS

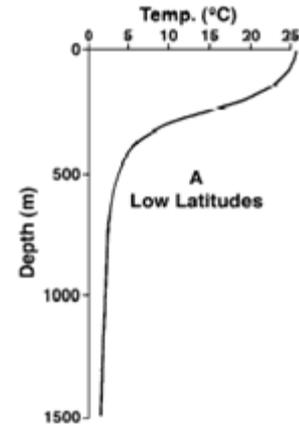
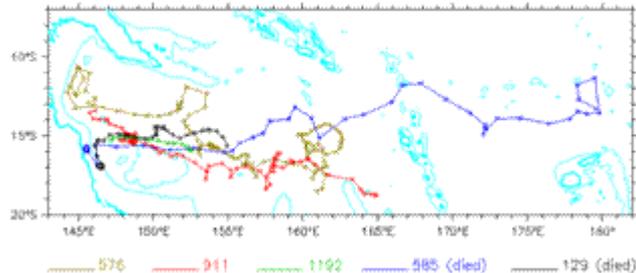
Conclusion

How to cite

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More usages /
visits / citations

Trajectories of Argo floats in the western Coral Sea
3 survivors, 2 lost at sea



More datas
and types of
data

Future

- From timeseries to series
 - NoSQL ?
 - Big Data ?
- Integration of profile data is ready to go
 - Document oriented = direct insertion of netcdf files ?
 - Handling exponential growth of data



<http://reeftemps.science>



THANK YOU !