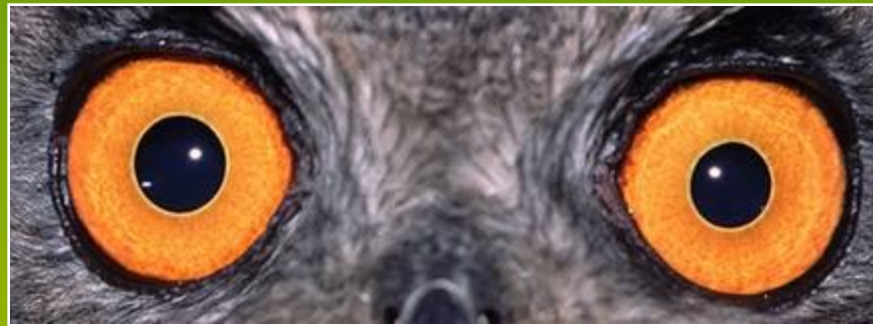


WILDLIFE MONITORING WITH ARGOS

by Christian Ortega



**Zoology & Satellite Seminar
IPEE ASR, Moscou
25-26 February 2009**

- Authorizations in Russia (customs, transmission)
- Tags (choice, testing, attachment)
- Argos Specific (location, processing, data access...)
- Data Processing & Analysis Techniques

- Authorizations in Russia (customs, transmission)
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WILDLIFE AND ARGOS



- Overview of the Argos system :
how does it work?
- Wildlife applications with Argos
- New PTTs for Animal Tracking
- Animals & Oceanography

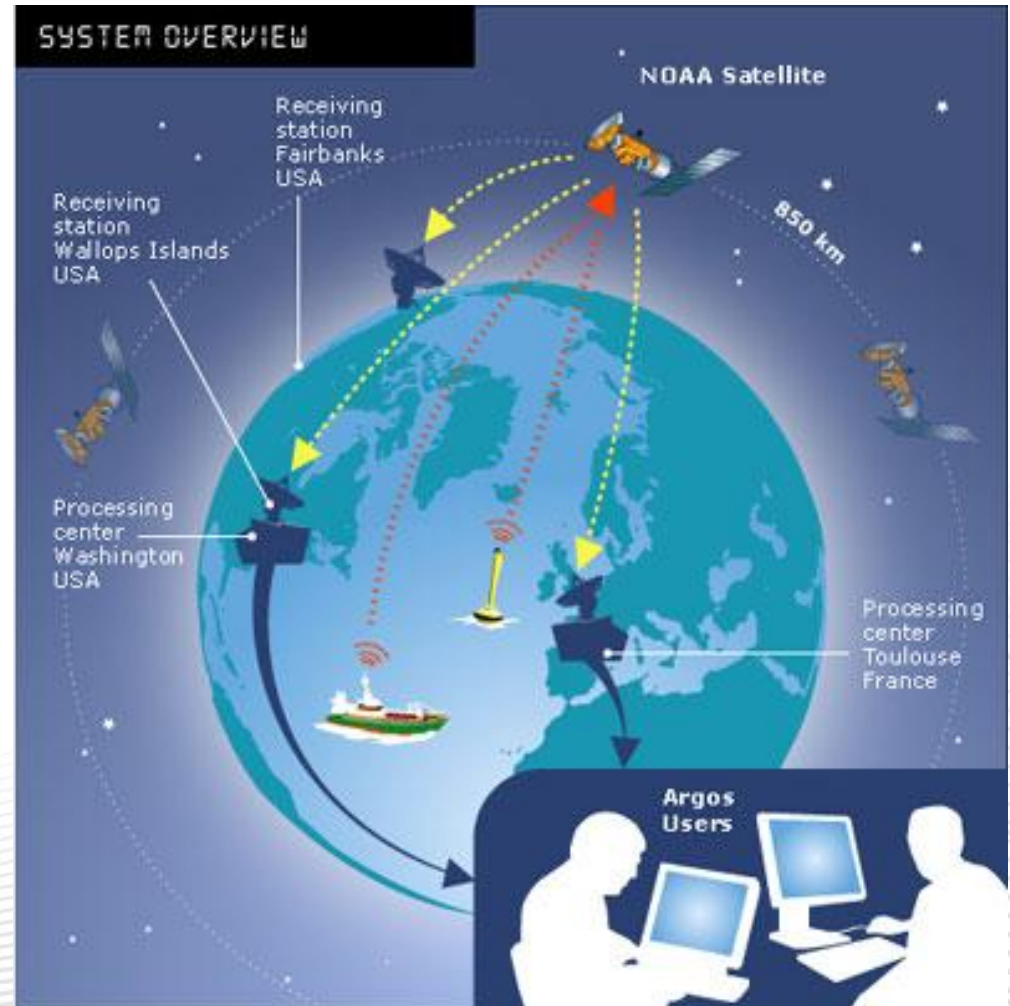
The Argos System



Argos is a Global Location and Data Collection System.

Biologists and scientists use Argos to locate and remotely study animals anywhere on earth.

- 5 NOAA satellites
- 1 METOP satellite
- 54 Regional antennas
- 2 processing & distribution centres



Argos: Simple & Robust



- Ideal for transmissions in harsh environment

Argos
Transmitter



Argos: Small & Low-Power

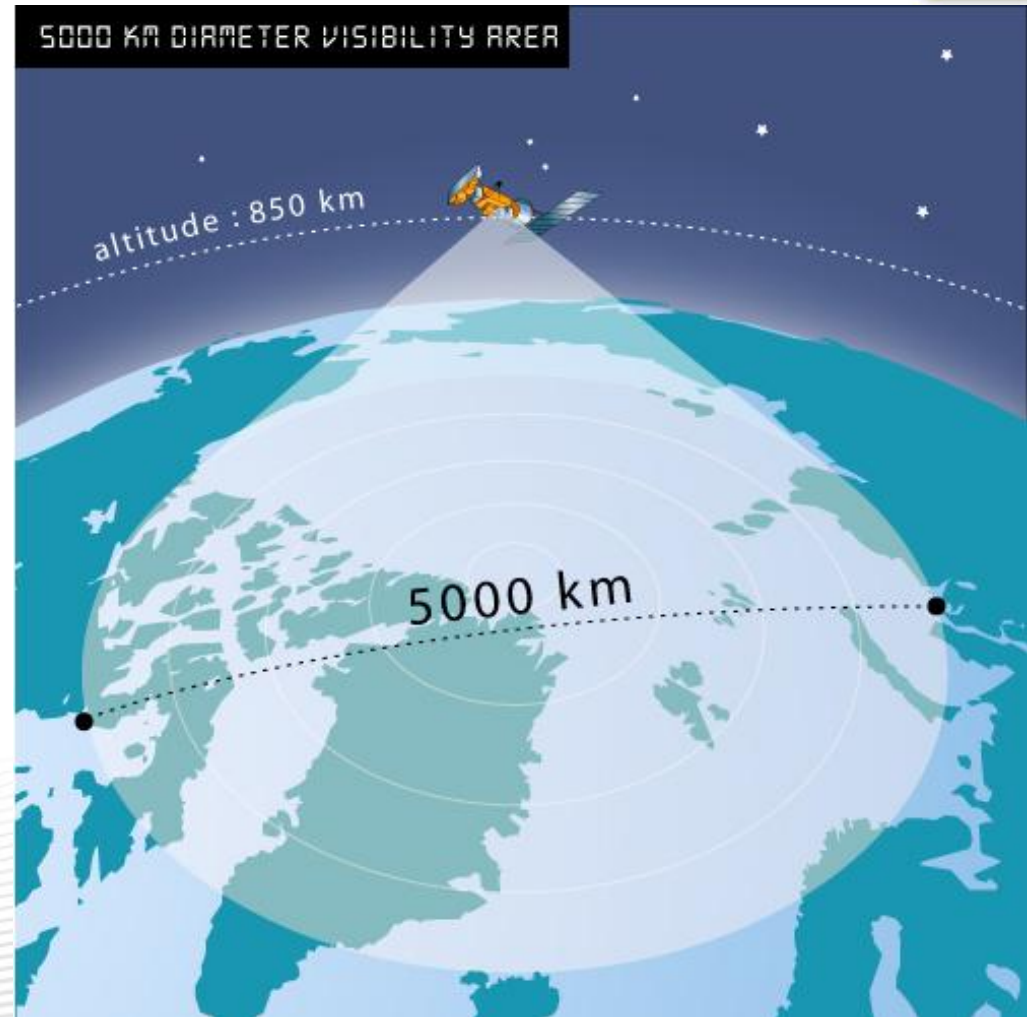


- Low-power transmission → longer lifetime
- The smallest Argos drifter

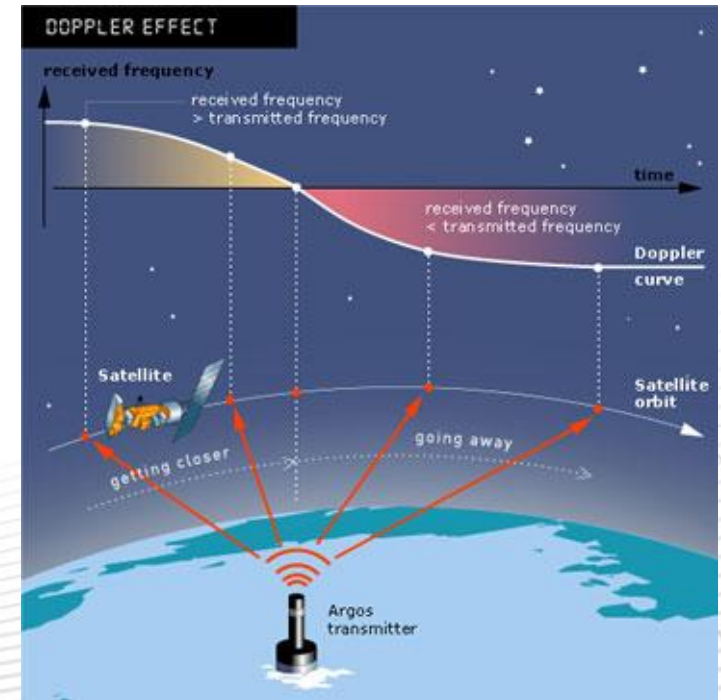
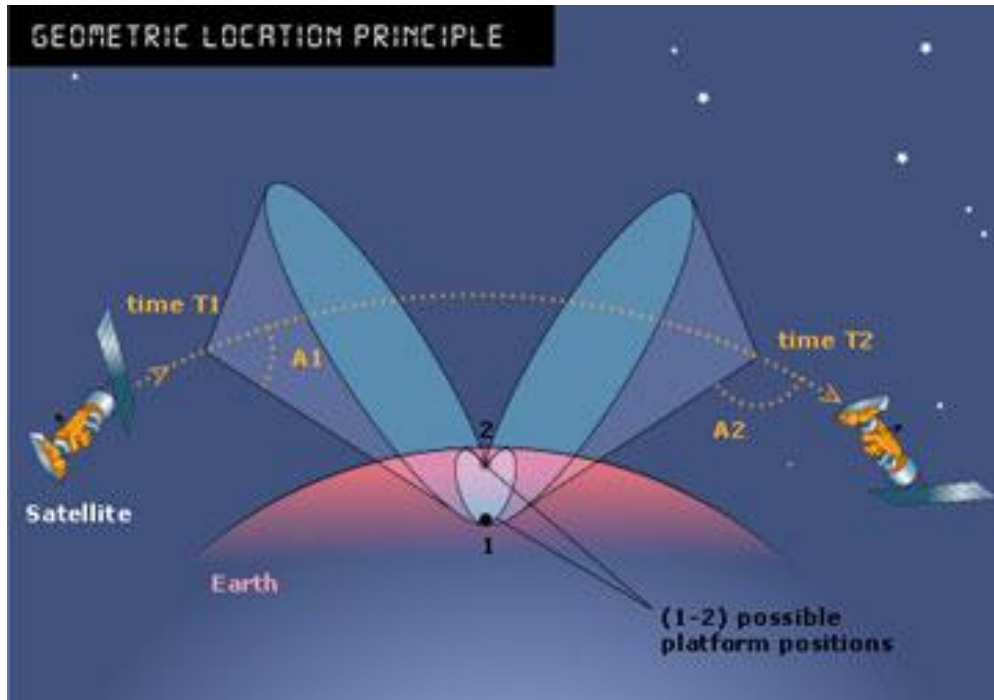


Pop-up tag on a
shark
Tx 125 mW.

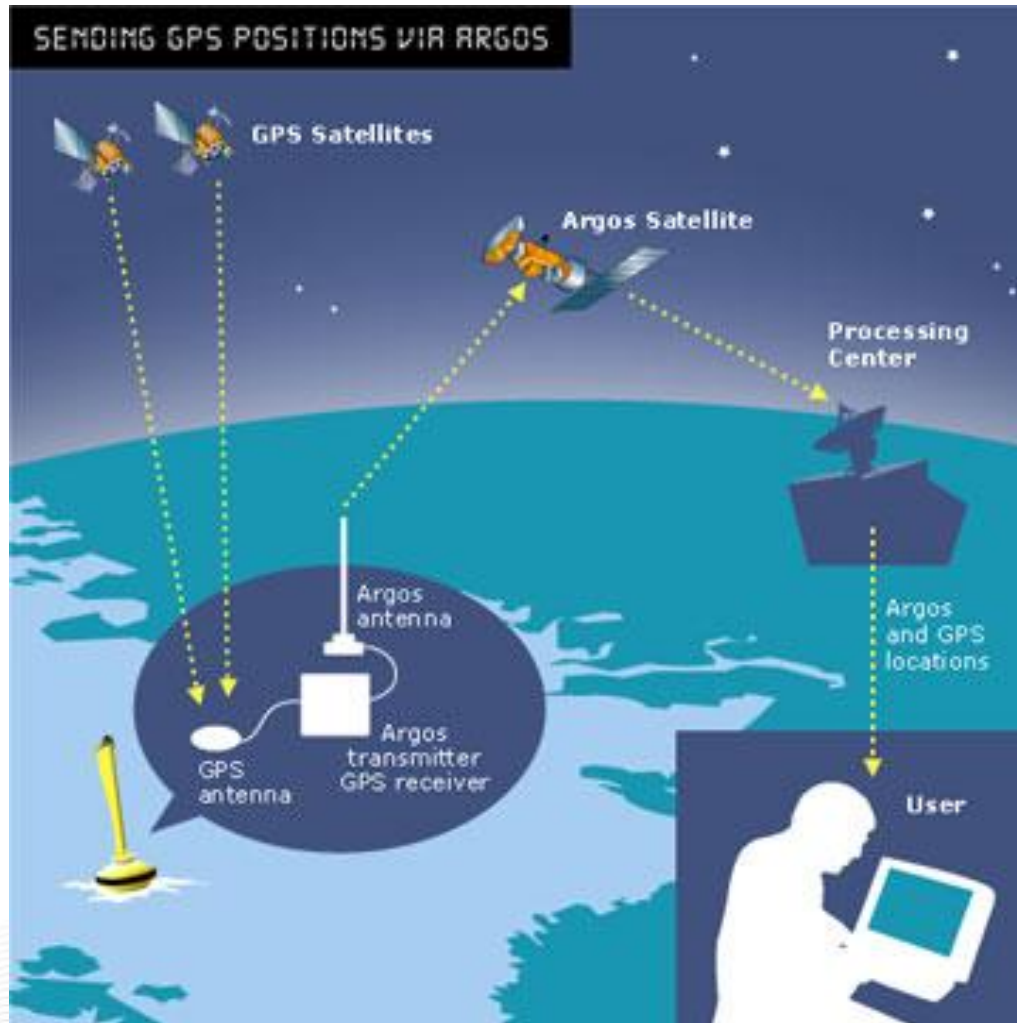
- Polar orbiting Satellites at ~ 850 km altitude
- 100 mn are necessary to complete 1 total orbit
- The ground visibility is 5000 km



Argos Localisation based on Doppler-Fizeau effect



Argos + GPS Location



- More frequent and accurate fixes
- GPS integrated in platform
- GPS positions sent in messages
- Decoded at CLS
- Distributed & displayed

Two Processing Centers



**NORTH AMERICAN
USERS**

OTHER USERS

**WASHINGTON
PROCESSING
CENTER**



Internal Redundancy

**FULL
REDUNDANCY**



**TOULOUSE
PROCESSING
CENTER**



Internal Redundancy

**ALL ARGOS DATA
FROM ALL ANTENNAS**

24/365 Operation

Argos Applications



Oceanography



**Ocean races
Adventure**



Meteorology



Wildlife tracking



Operational oceanography



Maritime safety



Radar surveillance



**Fishery
management**



Catch effort monitoring



**Space systems
metrology**





Argos is unique for the study of long distances migrations.

Argos PTTs (Platform Transmitter Terminal) are:

- Miniaturised
- Low consumption
- Robust

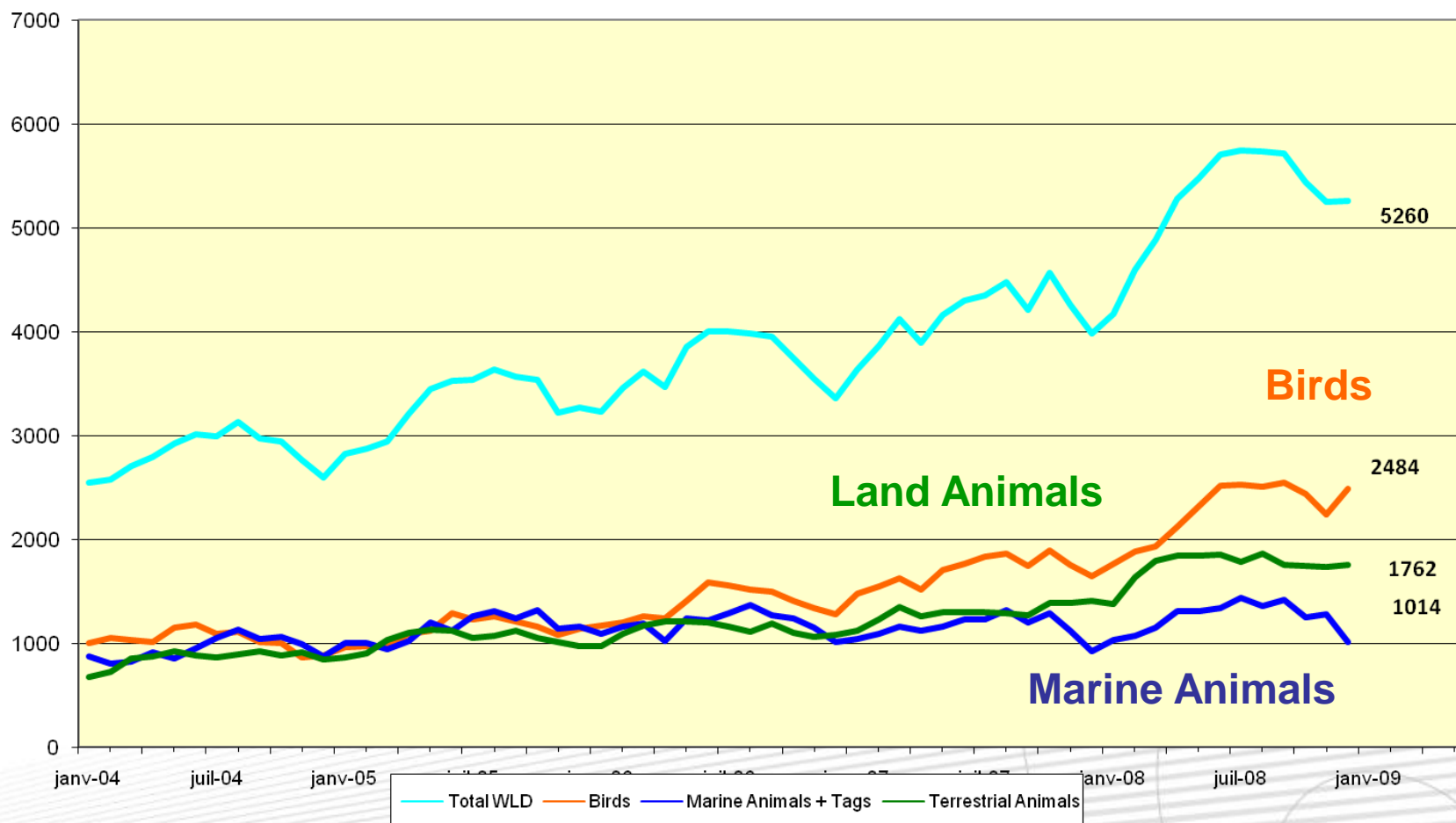


~ 6000 animals tracked in 2008

Animal Platforms Now



ACTIVE ANIMAL PLATFORMS



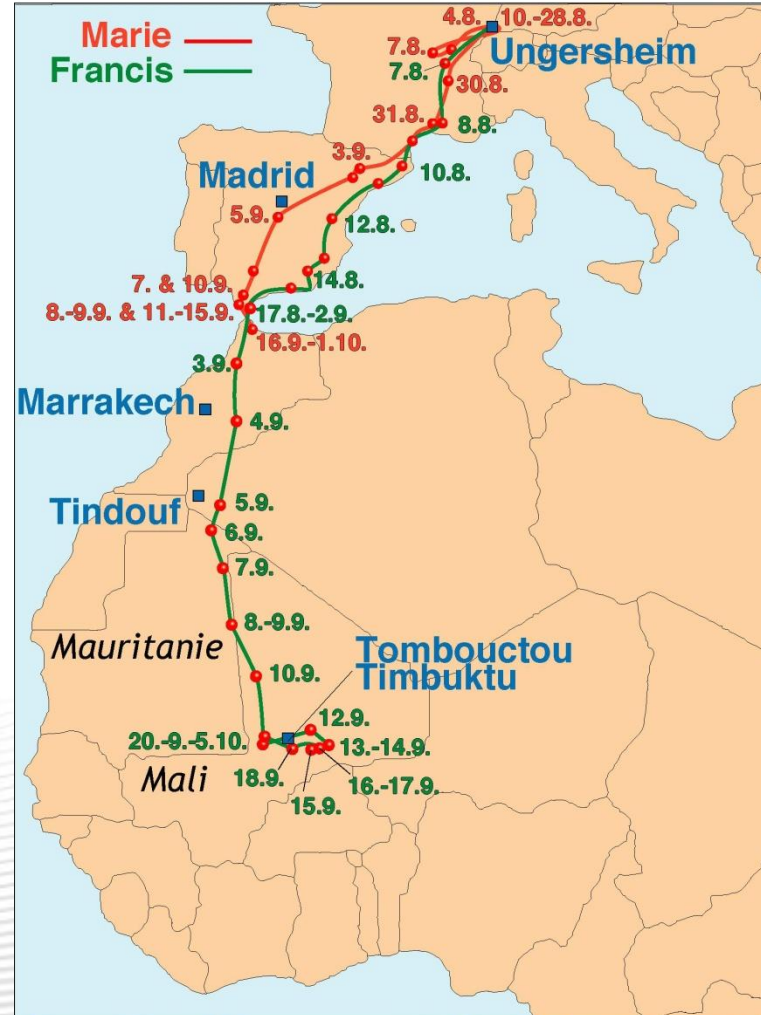
Bird Migration Studies



Les déplacements de Marie et Francis Die Zugroute von Marie und Francis



Stork Tracking

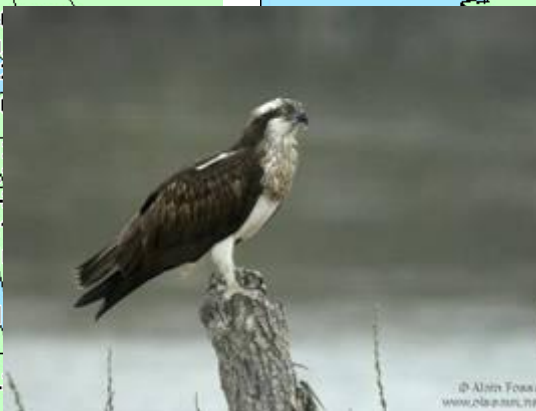
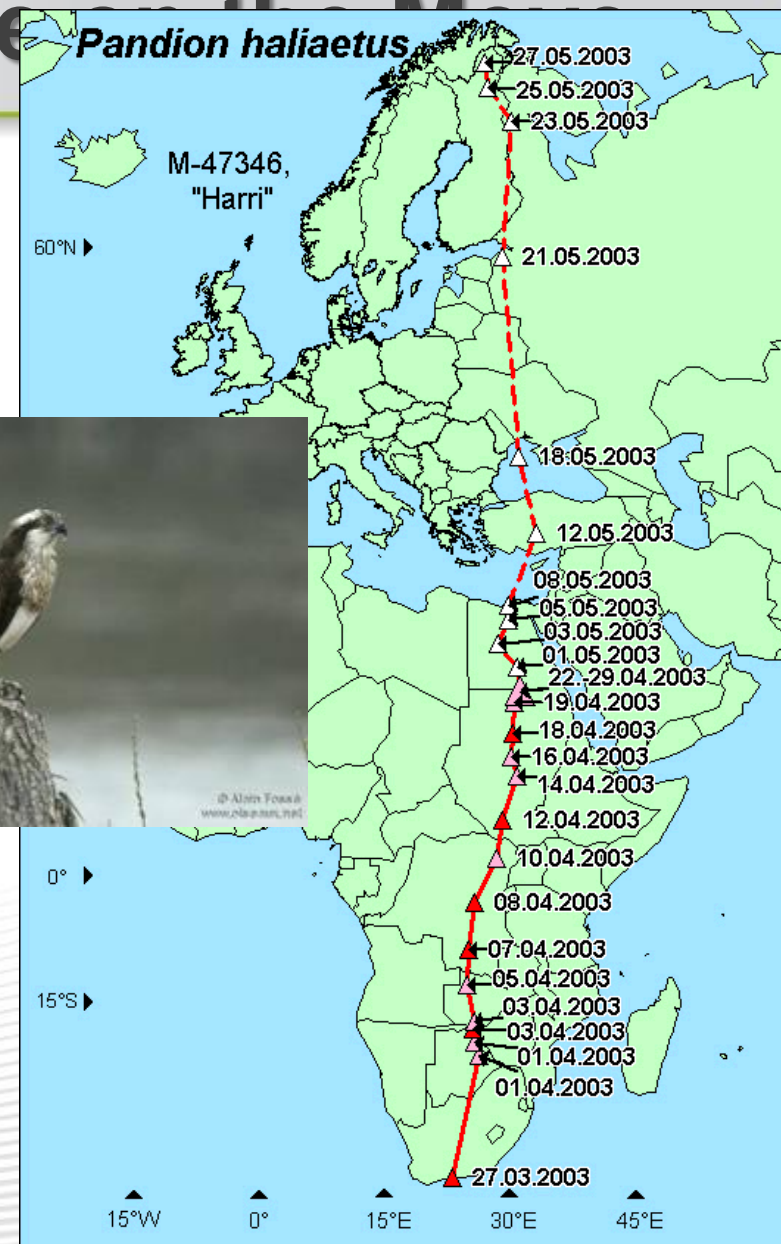


©Museum Fribourg (CH)

mise à jour le/ aktualisiert am: 6.10.00



CL
COLLECTE LOCAL



Balbusard pêcheur



- **Birds and Emerging Diseases: Avian Influenza**

- **Transmission Risk and Movements of Birds from Kazakhstan**

- **A project with FAO**



Marabou storks in Tanzania :

- What disease these birds may carry ?
- When and where can they spread the disease ?



Marabout d'Afrique
Leptoptilos crumeniferus

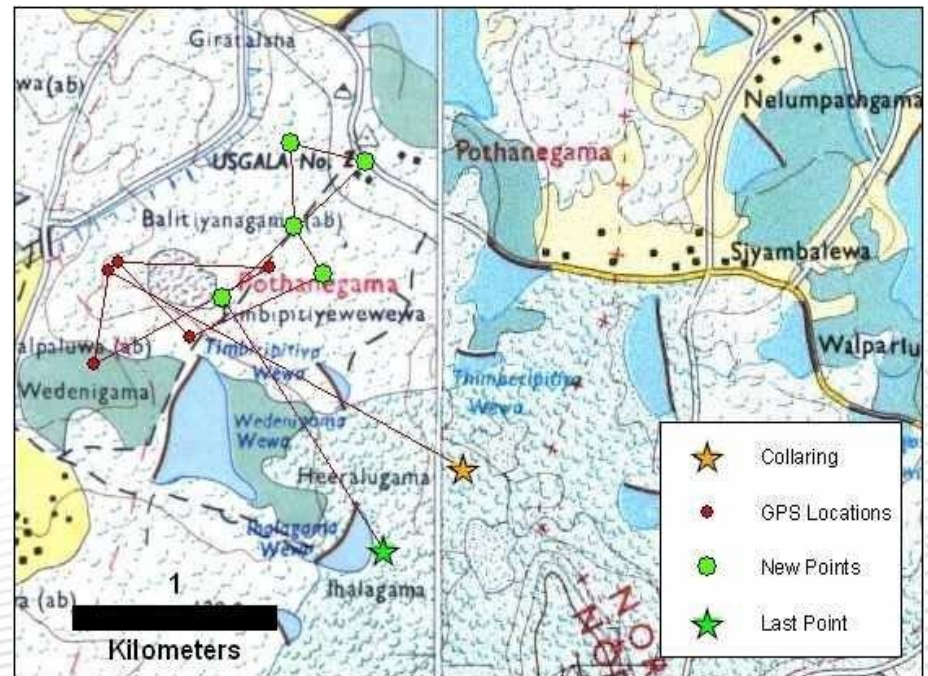
© Callie de Wet
www.oiseaux.net

Study of the movement patterns of wildlife with respect to land use types and seasonal habitat variations.

Gnou tracking in Africa



Elephant tracking in Sri Lanka





Fish Tag



Study & Evaluation of Marine Ressource
Tuna, Swordfish, Marlin, Sharks, Heels....

Biology Study, Climate Change

Marine Animals



Seals, Sea Lions, Walrus, Turtles, Dolphins, Penguins, Whales....

New Transmitters for Land Animals



**Classical collar
Argos Only**



GPS collars with Store-on-board datalogging and a compact, **light-weight design (190 gr) that's ideal for use on smaller animals.**



New Transmitters for Birds



New!!:5 grams – Solar Pannel



9.5 grams – Solar Pannel



© Microwave Telemetry 22 grams Solar Argos/GPS

GPS Antenna



45 grams Solar Argos/GPS



New transmitters for Fishes & Marine Animals



Fish tag, pressure,
Temperature, Light, Salinity, Depth



Fastloc GPS PTT

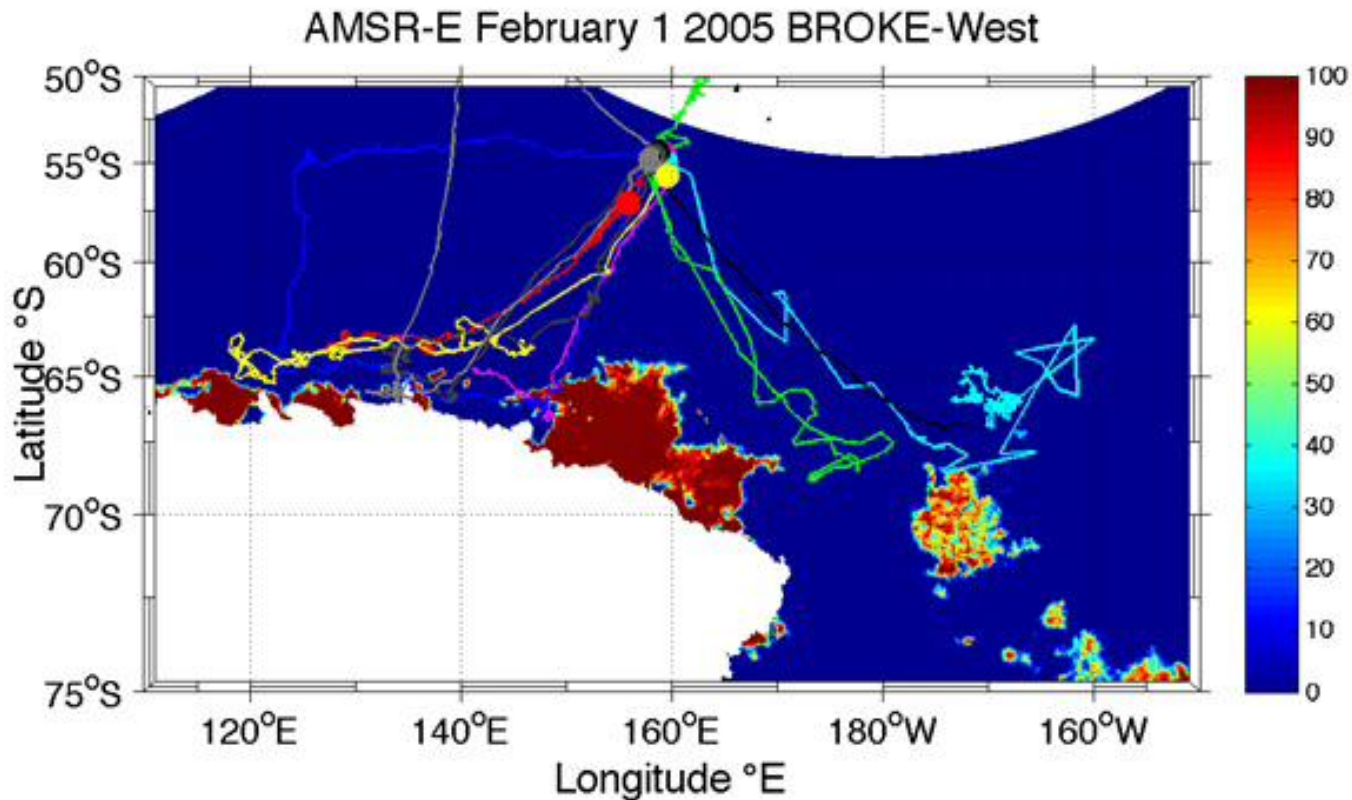


Animals & Oceanography



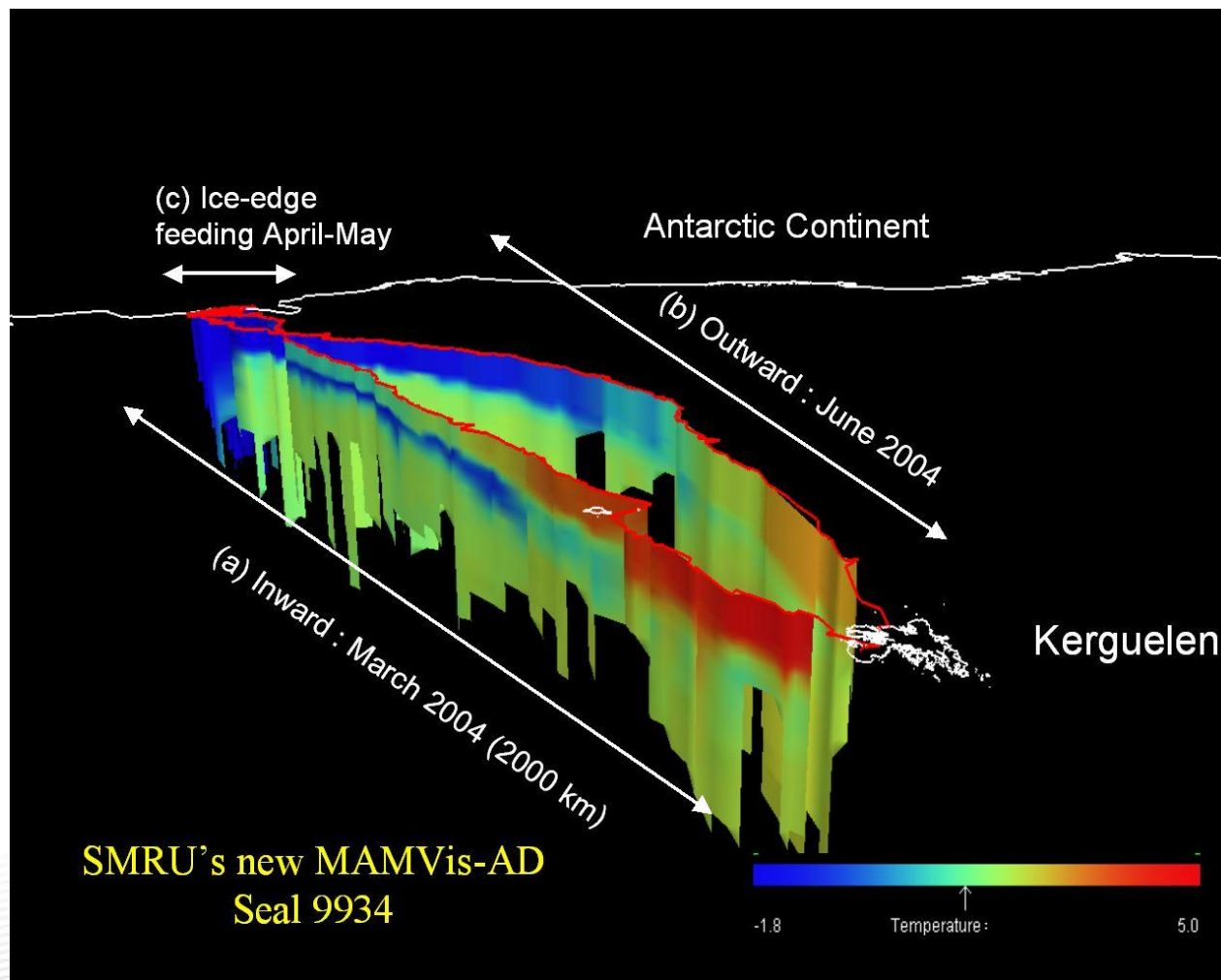
* Voluntary (?) Observing Seal

Seals Tracks & Ice



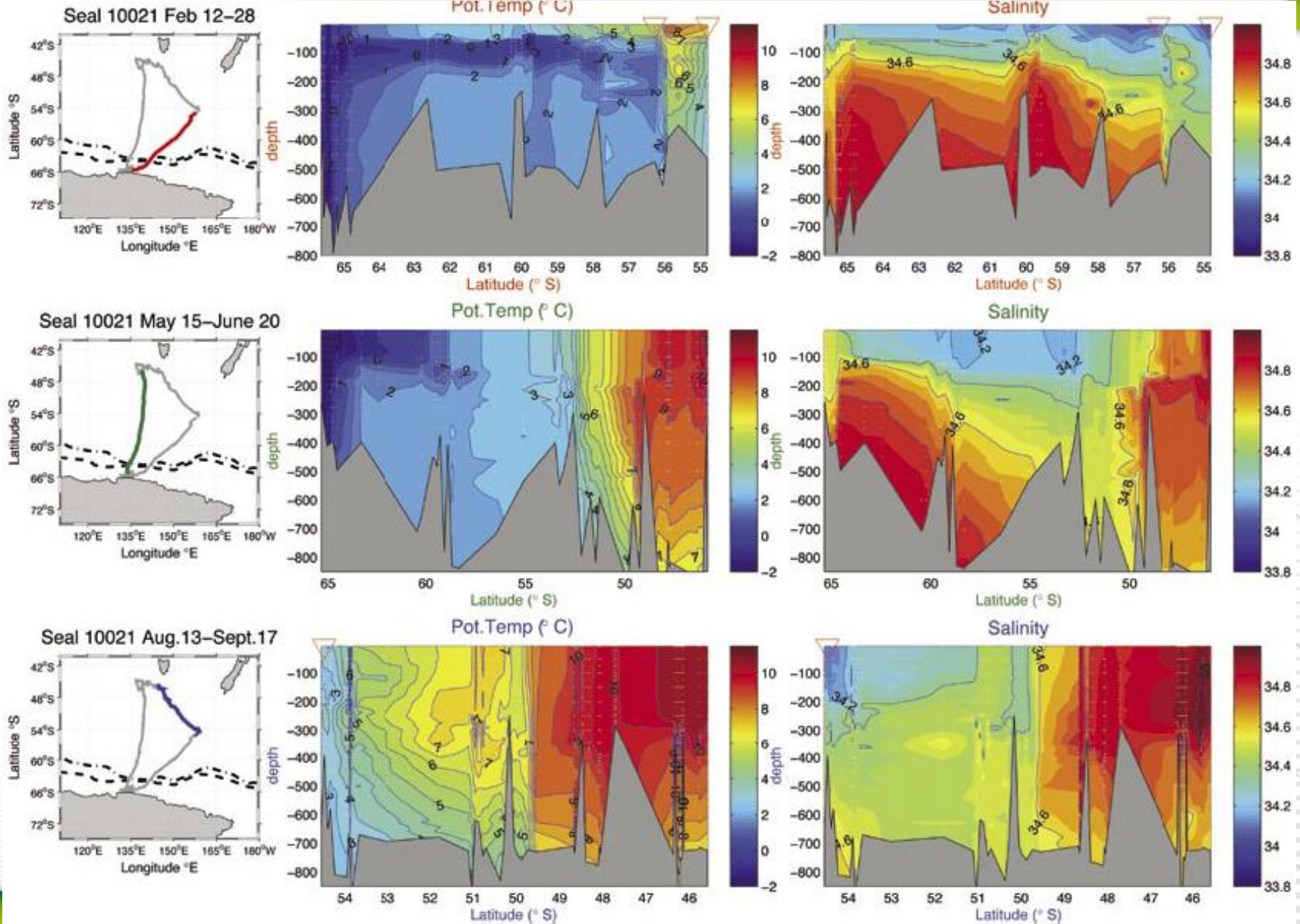
Courtesy Marc Hindell et al., Univ. Of Tasmania

Seal Tracks in 3 Dimensions!!



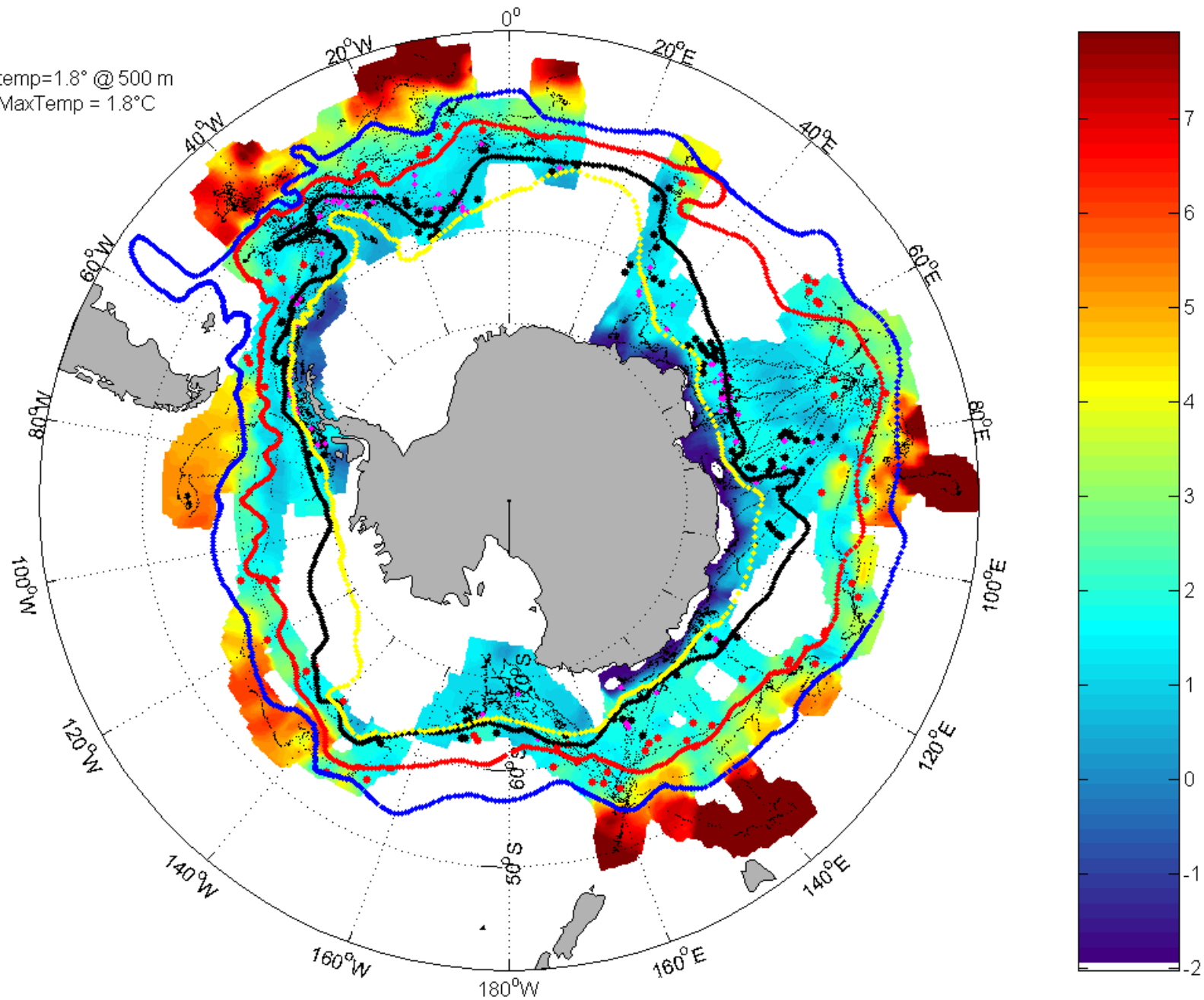
SMRU's new MAMVis-AD
Seal 9934

Temperature & Salinity profiles



Seals temperature @ 200 m (scale 200 km)

seals positions
PF seals
SACCF seals; temp=1.8° @ 500 m
SACCF seals; MaxTemp = 1.8°C



The END



THANK YOU FOR YOUR ATTENTION



About Fish Tags



How pop-up and archival tags work:

- All tags measure pressure + temperature+ light level
- **Pop-ups** detach from the animal and transmit **PART** of the recorded measurements through ARGOS



Pop-up tag

GPS under the water ?



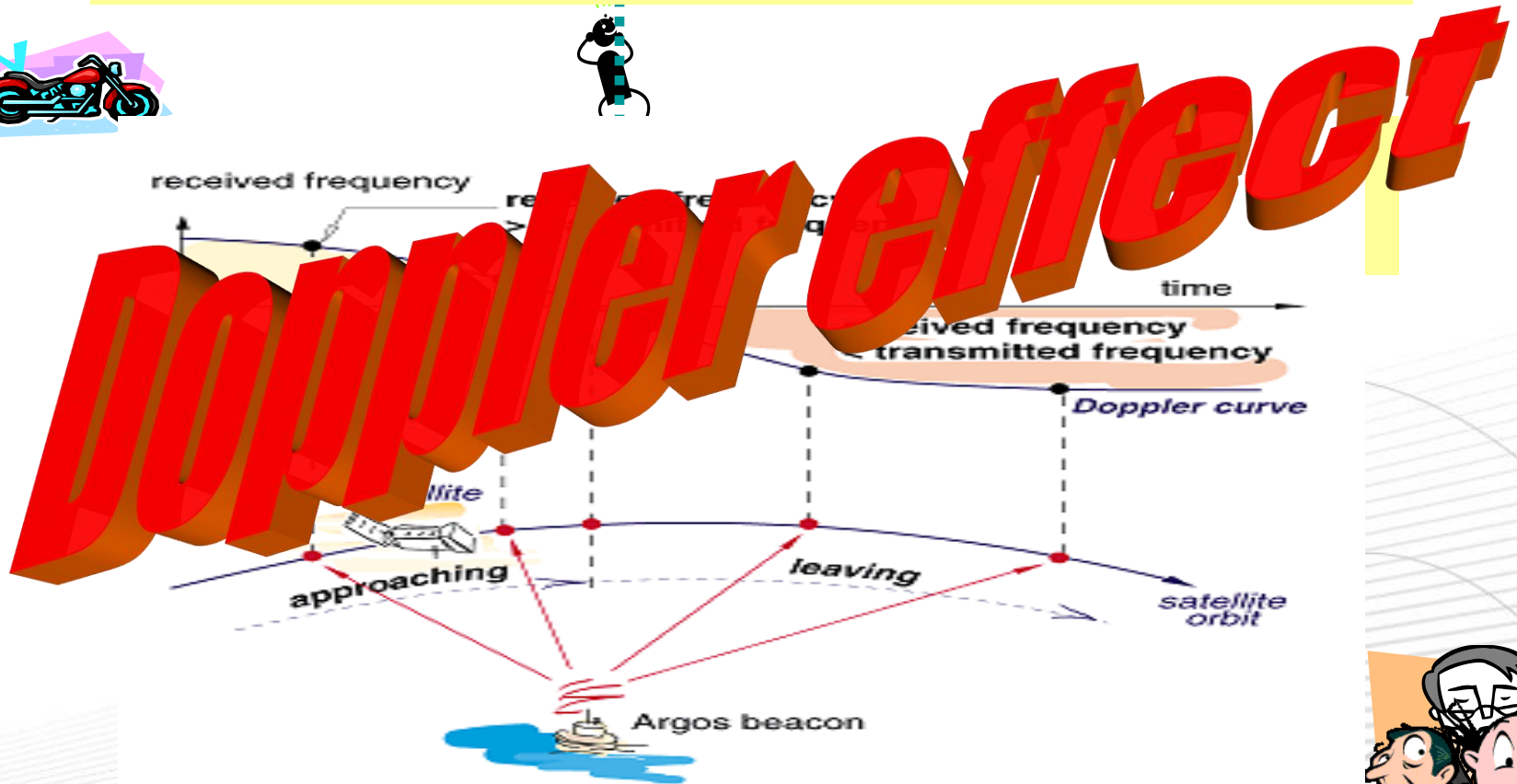
Fastloc GPS - 70 gr :

- No ephemerids recuperation
- Signals collection of GPS satellites in **less than 100ms**
- Distances transmission of GPS satellites via Argos
- Ground calculation of positions **accuracy~50 m**

The Doppler Effect

You are here !!

The frequency received by the satellite varies according to its proximity to the platform



Class of location



*At least
2 messages
during satellite pass*

**Location
Algorithm**

**Validation
tests**

passed

failed

*At least
4 messages*

*2 or 3
messages*

Location accuracies:

Class 3: better than 150 m
Class 2: better than 350 m
Class 1: better than 1000 m
Class 0: above 1000 m

Class A: **3-message
location**

Class B: **2-message
location**

**Unvalidated
Location**

Class Z

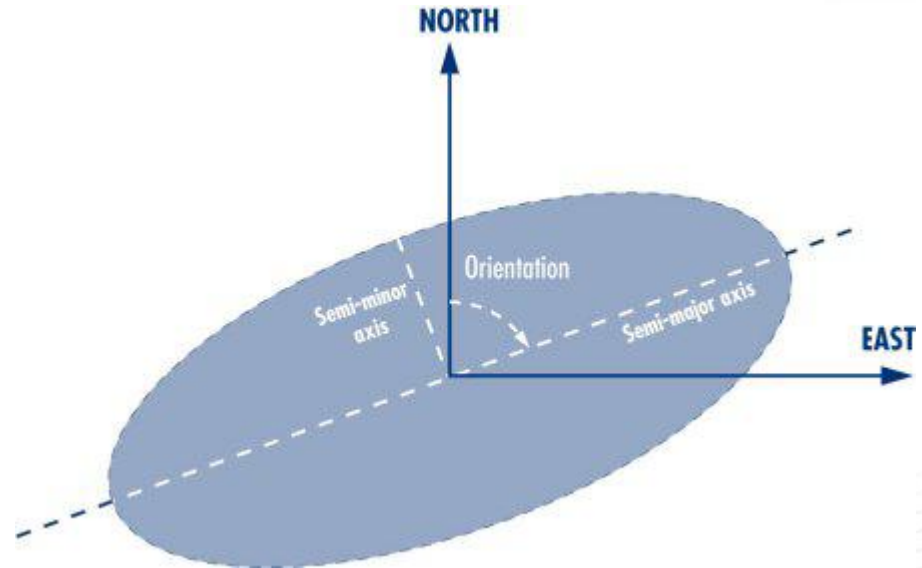
We provide :

For the classes 0, 1, 2, 3

The error circle,
The elliptic error parameters
(orientation half great circle
and half small axis)

For the classes A et B :

The orientation of elliptic
error.



Sélection des données

Messages

Plate-forme: Toutes Tous les messages reçus

Période: Depuis n jour(s) 1 jour(s)

Classe de localisation: ☐

Colonnes

Sélectionner les colonnes à afficher - 31 items

	Ordre	Nom	Libellé
<input type="checkbox"/>	19	Delta freq.	Ecart en fréquence
<input type="checkbox"/>	20	Long. 1	Longitude solution 1
<input type="checkbox"/>	21	Lat. 1	Latitude solution 1
<input type="checkbox"/>	22	Long. 2	Longitude solution 2
<input type="checkbox"/>	23	Lat. 2	Latitude solution 2
<input type="checkbox"/>	24	Loc idx	Index de localisation
<input type="checkbox"/>	25	Nopc	Nombre de contrôles de qualité validés
<input checked="" type="checkbox"/>	26	Rayon d'erreur	Rayon d'erreur
<input checked="" type="checkbox"/>	27	Demi-grand axe	Demi-grand axe
<input checked="" type="checkbox"/>	28	Demi-petit axe	Demi-petit axe
<input checked="" type="checkbox"/>	29	Angle d'ellipse	Angle d'ellipse
<input checked="" type="checkbox"/>	30	GDOP	GDOP
<input type="checkbox"/>	31	Alarme	Alarme

☒ Données diagnostic

Télécharger

Contact:

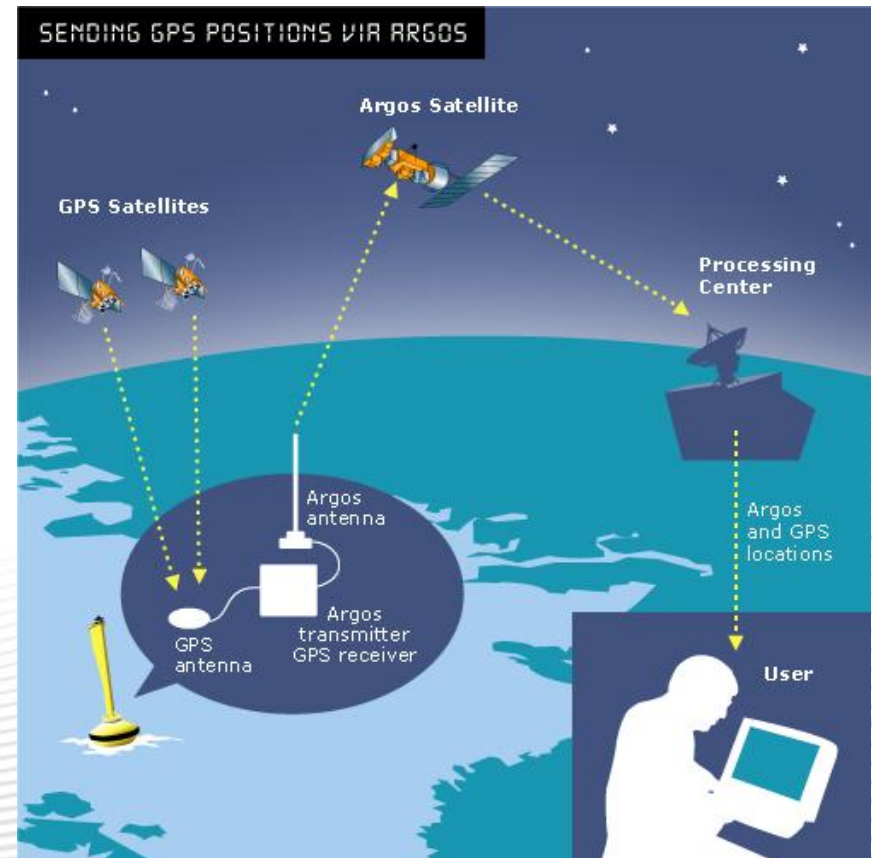
useroffice@cls.fr

Simuler

- GPS decoding

With the manufacturer format we can process & display the GPS positions

- All localisations will be available on the same support
- Accessible on Google Earth



Argos Dedicated Services : ARGOS MONITOR



Transmission ArgosMonitor.

- *Is the transmitter still working?*



→ Transmission ArgosMonitor sends you an alert when no message has been received from your platform for a pre-defined time period.

→ An alert message will also be sent if no location has been calculated.

Alert can be an email or a sms.

Argos Dedicated Services : ARGOS MONITOR



GEO ArgosMonitor.

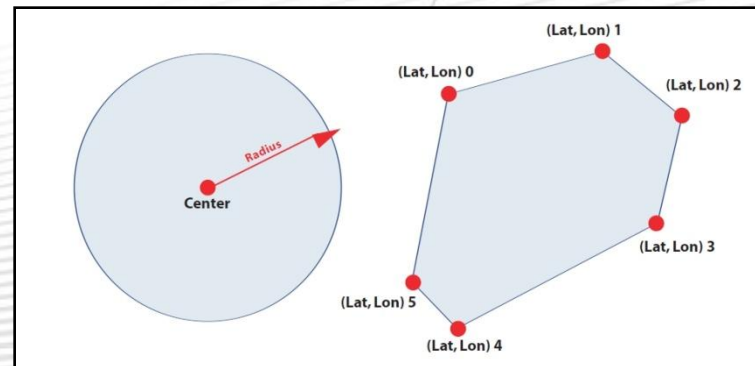


Has the animal I am tracking entered a wintering zone? returned to its nest? crossed a border?

Has my platform entered/left an area of interest?



→ GEO ArgosMonitor sends you an alarm message when a platform enters or leaves a defined zone.



Argos Dedicated Services : ARGOS MONITOR



Sensor ArgosMonitor.

Is the animal still alive (are heart rate, temperature measurements normal)?

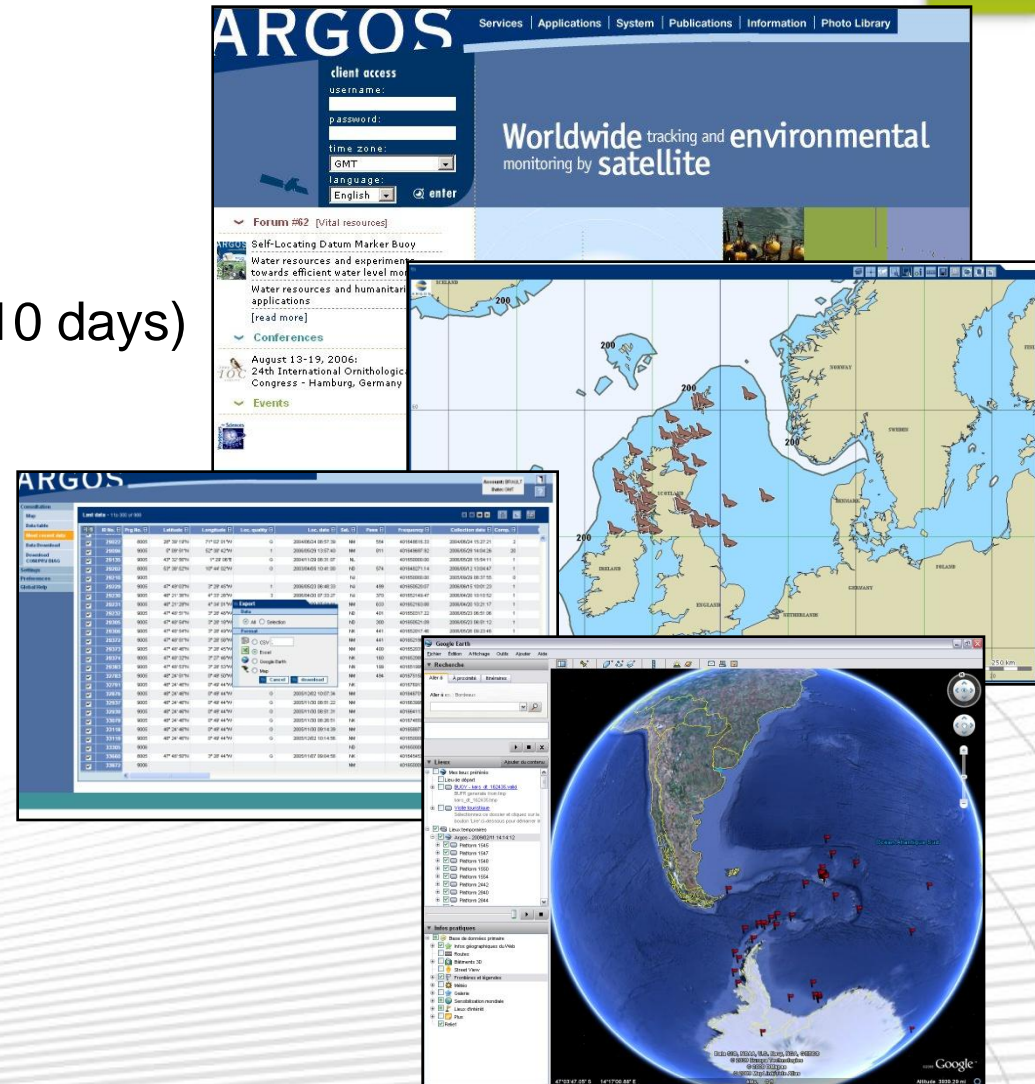
How is my platform performing (battery level, light sensor, etc.)?

→ Sensor ArgosMonitor can alert users when an unusal/critical value for a particular sensor is reported.

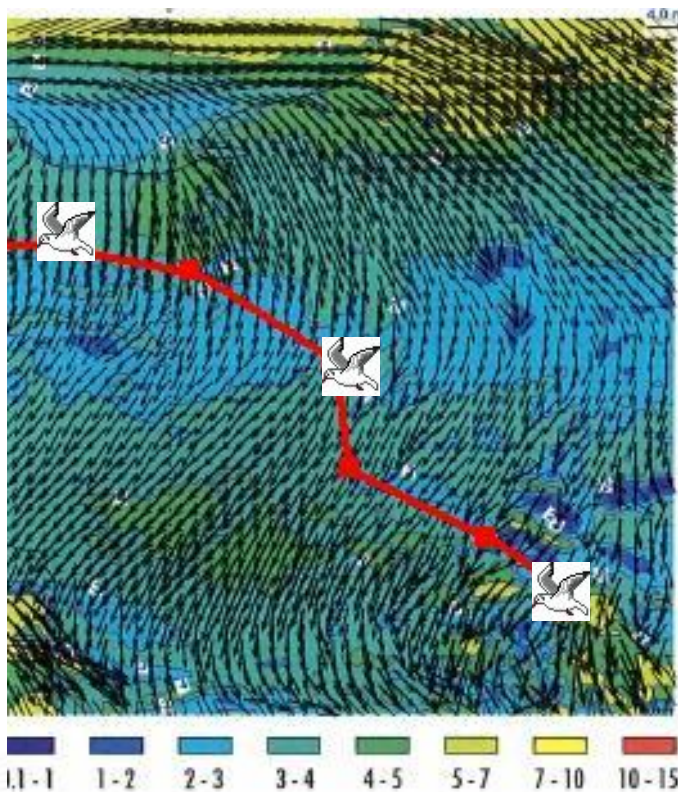


A single web to:

- ✓ View all localisations on map (10 days)
- ✓ View your messages & data
- ✓ Download data
- ✓ Export on Google Earth
- ✓ Manage your settings
- ✓ Put on copy other users
- ✓ ...



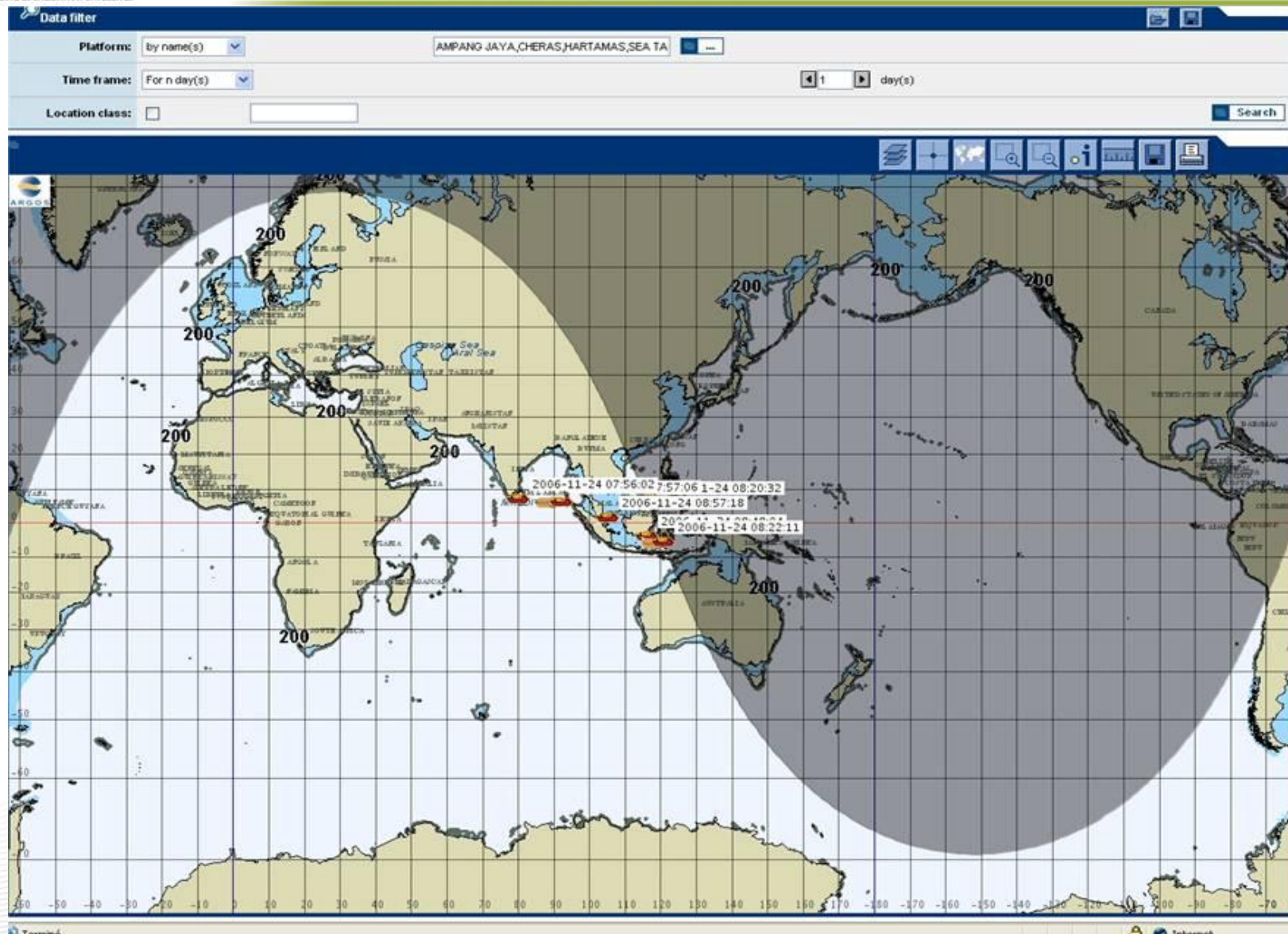
METEOROLOGICAL DATA MIXED WITH ARGOS DATA ?



CLS is thinking of :

- 1st level of service : env. Data in real time at a reference altitude.
- What is your altitude of reference ?
- 2nd level of service : databank with
- meteorological data, more precise.
- Additional requested environmental Maps.

DATA RETRIEVAL





•Animals



Under Argos Eyes