

**WORLD METEOROLOGICAL ORGANIZATION**

---

CBS/OPAG-IOS/WxR\_EXCHANGE/3.1.6

**COMMISSION FOR BASIC SYSTEMS**  
OPEN PROGRAMME AREA GROUP  
ON INTEGRATED OBSERVING SYSTEMS

28.03.2013

---

**WORKSHOP ON RADAR DATA EXCHANGE**

ITEM: 3.1

EXETER, UK, 24-26 APRIL 2013

Original: ENGLISH

### **Current status of Weather Radar data exchange**

Regional Report on the current status of the exchange of weather radar data – RA VI  
(Submitted by *Nicolas Gaussiat, OPERA delegate, Met Office, United Kingdom*)

---

### **SUMMARY AND PURPOSE OF DOCUMENT**

To report on the status of Weather Radar data exchange in Region VI.

---

### **ACTION PROPOSED**

Workshop participants are invited to note the information contained in the document.

---

## WEATHER RADAR DATA EXCHANGE IN EUROPE

### 1. EUMETNET, OPERA and BALTRAD

**EUMETNET** is a body that National Met Services (NMSs) have created for themselves within Europe to share ideas and best practices, as well as the cost of major infrastructure investments. It also provides a collective 'voice' for its members when communicating with the EU agencies, the government bodies and the private sector. EUMETNET has 30 members and 4 cooperating countries (see figure 1)

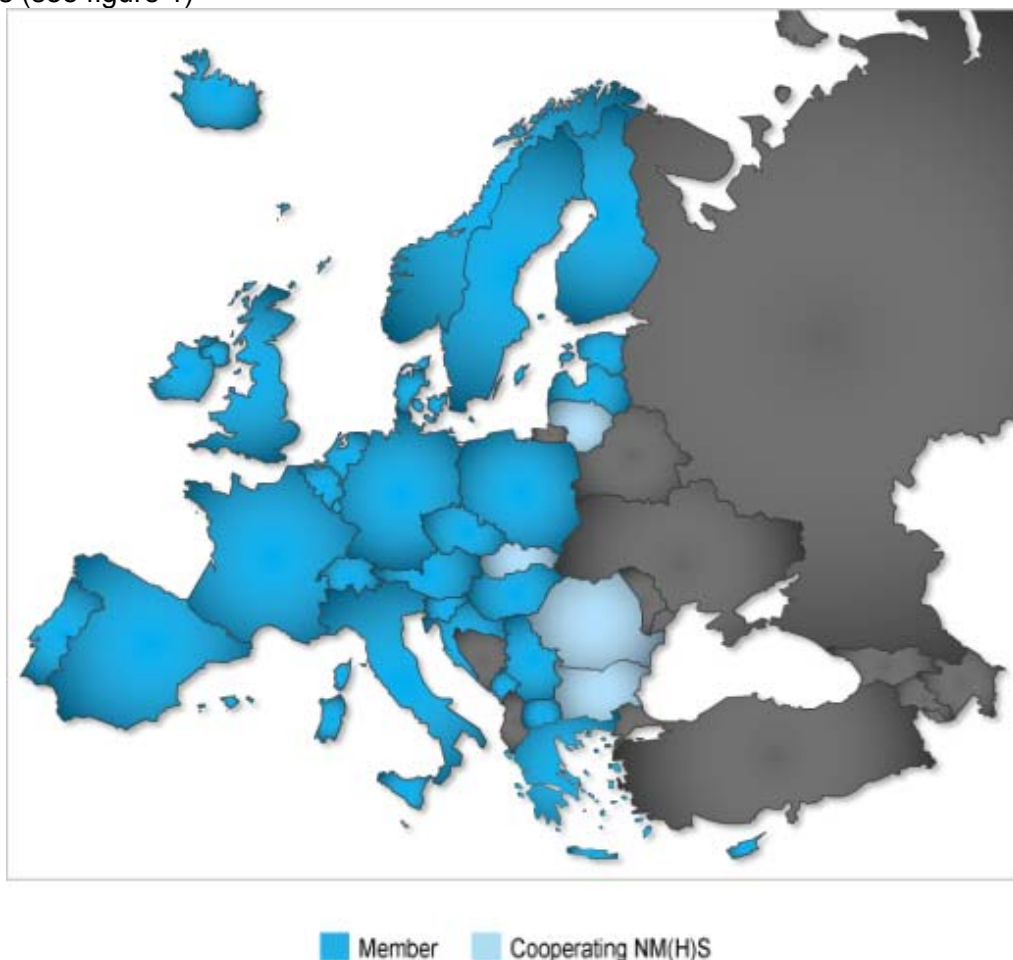


Figure 1: EUMETNET: the network of Meteorological Services in Europe.

**OPERA** (Operational Programme for the Exchange of weather RADar information) is a EUMETNET program to stimulate the exchange of radar knowledge and expertise between members. 27 members and 3 cooperating members contribute to the OPERA Programme. (<http://www.eumetnet.eu/opera>).

The OPERA program:

1. Create opportunities for European NMS to share experiences by organising regular workshops (Expert Team meetings)
2. Sponsor work packages performed by various NMSs
3. Promote standard radar production practices
4. Help define common data format standards
5. Organize and support Radar Data protection, e.g. wind farms and frequency interference
6. Support the development and operations of Odyssey (see section 3) a centralised processing capability to generate pan-European composites.

The OPERA community has developed several software packages to enable exchange of radar data from different sources and manufacturers.

**BALTRAD** is an EU funded project to develop an advance weather radar network around the Baltic Sea (<http://www.baltrad.eu>).

The approach taken by BALTRAD is original in the sense that the network is decentralized, preserving the partnerships transnational integrity. In practice this means that each partner exchanges data from its weather radars with other partners on equal terms. A so-called BALTRAD “toolbox” is currently being populated with processing modules and can be used by each partner to process all data according to national needs and priorities. The software is produced under the open source principle and is available for everybody at <http://git.baltrad.eu>.

The partnership comprises all the weather services of the Baltic Sea Region except that in Russia (See table 1). The EU programme for the Baltic Sea Region (INTERREG IV B) has invested EUR 1,9 million in the continuation of the project (BALTRAD+), which run for 2,5 years (2011-2014). The main scope of BALTRAD+ is the transformation of the developments in BALTRAD to fully-operational regional infrastructure.

Most Baltrad members are also OPERA members and a strong collaboration exists between BALTRAD and OPERA around the development of the Opera Data Centre (Odyssey).

State	NMS	EUMETNET	OPERA	BALTRAD	Other*	Radars
Albania	The Hydrometeorological Institute					
Armenia	Armenian State Hydrometeorological and Monitoring Service					
Austria	Central Institute for Meteorology and Geodynamics	Y	Y			5
Azerbaijan	National Hydrometeorological Department					2
Belarus	Department of Hydrometeorology			Y	Y	3
Belgium	Institut Royal Météorologique	Y	Y			3
Bosnia and Herzegovina	Meteorological Institute					
Bulgaria	National Institute of Meteorology and Hydrology	Coop	Y			3
Croatia	Meteorological and Hydrological Service	Y	Y			2
Cyprus	Meteorological Service	Y	Y			1
Czech Republic	Czech Hydrometeorological Institute	Y	Y			2
Denmark	Danish Meteorological Institute	Y	Y	Y		4
Estonia	Estonian Meteorological and Hydrological Institute	Y	Y	Y		2
Finland	Finnish Meteorological Institute	Y	Y	Y		8
France	Météo-France	Y	Y			24
Georgia	Department of Hydrometeorology					
Germany	Deutscher Wetterdienst	Y	Y	Y		17
Greece	Hellenic National Meteorological Service	Y	Y			4
Hungary	Meteorological Service of Hungary	Y	Y			3
Iceland	Icelandic Meteorological Office	Y	Y			1
Ireland	The Irish Meteorological Service	Y	Y			2
Israel	Israel Meteorological Service					1
Italy	Servizio Meteorologico	Y	Y			24
Jordan	Jordan Meteorological Department					1
Kazakhstan	Kazhydromet				Y	1

State	NMS	EUMETNET	OPERA	BALTRAD	Other*	Radars
Latvia	Latvian Environment, Geology and Meteorology Agency	Y	Y	Y		1
Lebanon	Service Météorologique					
Lithuania	Lithuanian Hydrometeorological Service	Coop		Y		
Luxembourg	Administration de l'Aéroport de Luxembourg	Y	Y			
Malta	Meteorological Office	Coop				
Monaco	Mission Permanente de la Principauté de Monaco					
Montenegro	Hydrometeorological Institute of Montenegro	Y				
Netherlands (the)	Royal Netherlands Meteorological Institute	Y	Y			2
Norway	Norwegian Meteorological Institute	Y	Y	Y		9
Poland	Institute of Meteorology and Water Management	Y	Y	Y		8
Portugal	Instituto de Meteorologia	Y	Y			2
Romania	National Meteorological Administration	Coop	Y			8
Republic of Moldova	Serviciul Hidrometeorologic de Stat Moldova					
Russian Federation	Russian Federal Service for Hydrometeorology and Environmental Monitoring				Y	16
Serbia	Republic Hydrometeorological Service of Serbia	Y	Y			15
Slovakia	Slovak Hydrometeorological Institute	Coop	Y			2
Slovenia	Meteorological Office	Y	Y			1
Spain	Agencia Estatal de Meteorología	Y	Y			15
Sweden	Swedish Meteorological and Hydrological Institute	Y	Y	Y		12
Switzerland	MeteoSwiss	Y	Y			3
Syrian Arab Republic	Ministry of Defence Meteorological Department					
The former Yugoslav Republic of Macedonia	Republic Hydrometeorological Institute	Y				2
Turkey	Turkish State Meteorological Service					10
Ukraine	Ukrainian Hydrometeorological Center				Y	9
United Kingdom of Great Britain and Northern Ireland	Met Office	Y	Y			16
<b>Total</b>						<b>244</b>

Table 1: WMO region VI countries membership to EUMETNET, OPERA, BALTRAD and Other with for each country the number of radars.

Not all WMO Region VI countries belong to EUMETNET, OPERA or BALTRAD. However some have network ready weather radars. Russia, Belarus, Ukraine and Kazakhstan have installed MARS radars at international airport and the data could be potentially made available to all WMO GTS members. (Source IRAM web: <http://www.iram.ru>)

In January 2013, the EUMETNET/OPERA radar network has 175 radars most are C-band, 152 are Doppler and 34 are polarimetric (Figure 2).

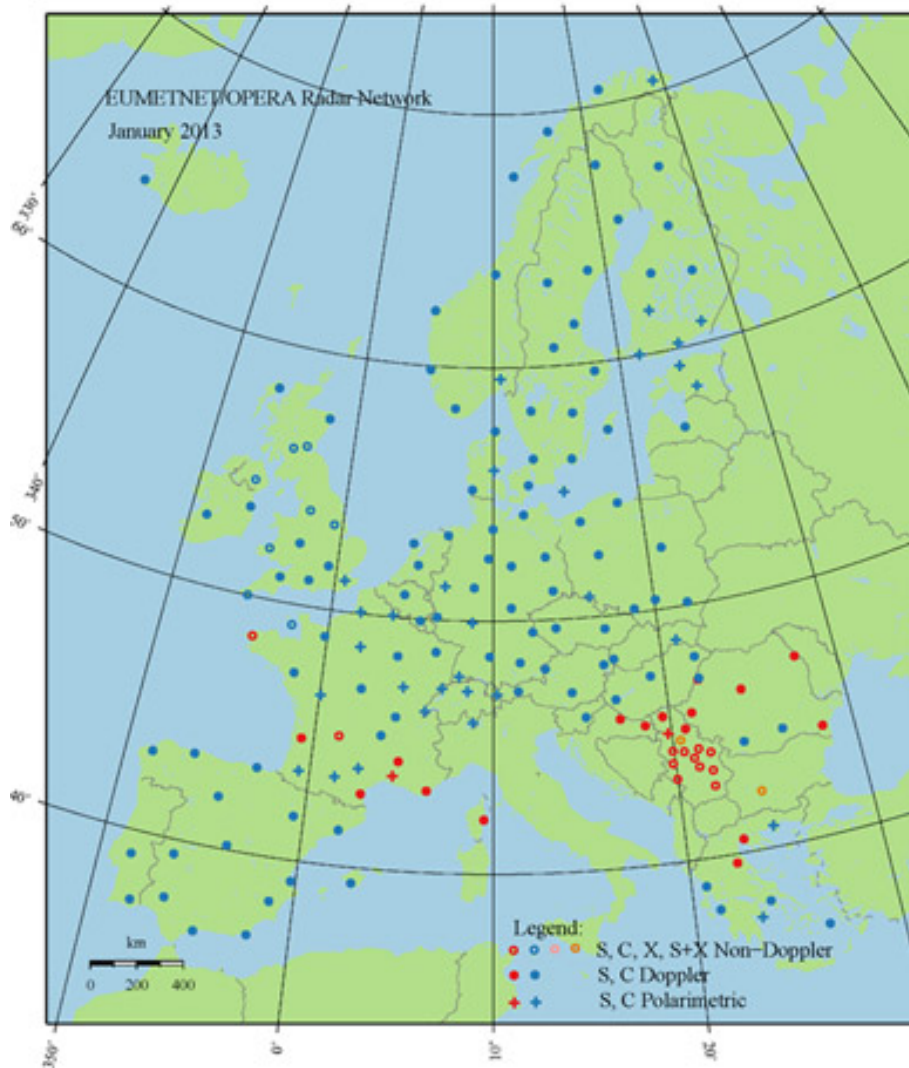


Figure 2: The EUMETNET/OPERA radar network in January 2013.

## 2. ODIM (OPERA Data Information Model)

The exchange of radar data in Europe has greatly been enhanced by the adoption of a common data information model ODIM. The information model was pioneered by Swedish (SMHI) and Danish (KNMI) NMSs and progressively adopted by the entire OPERA community and the radar manufacturers in Europe.

The general concept of data model is that the same building blocks are used to organise and store the information regardless of its form (time series, individual scan, composite image, palette etc...). The ODIM information model is built following a hierarchical approach that is particularly suited to modern formats like HDF and XML but can be potentially encoded to any data formats. Two encoded versions of ODIM have been developed ODIM-HDF5 and ODIM-BUFR.

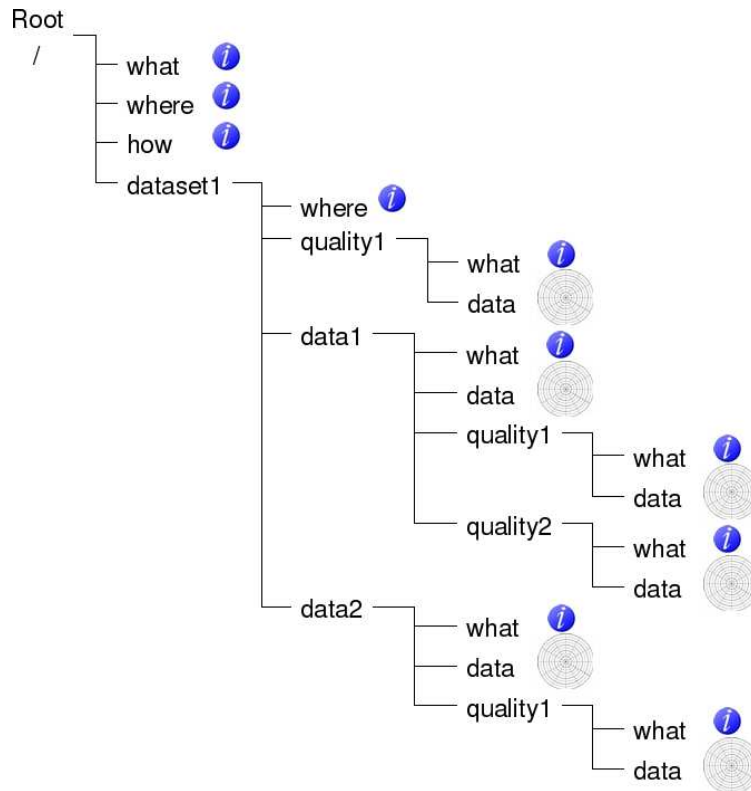


Figure 3: ODIM representation of a polar scan containing two parameters and associated quality metrics.

As shown by figure 3, in ODIM, quality information can be incorporated using the same building blocks as ones used for the data.

### 3. ODYSSEY (OPERA Data Centre)

In 2009/2010 EUMETNET commissioned the development of Odyssey, a centralised capability to produce pan-European composites. Odyssey was developed in collaboration between Meteo France and The UK Met Office and became operational in January 2011. The data centre receives data from about 160 radars and produce directly from the polar data 2km resolution Europe wide composites of rainfall intensity, maximum reflectivity and hourly accumulation every 15 minutes.

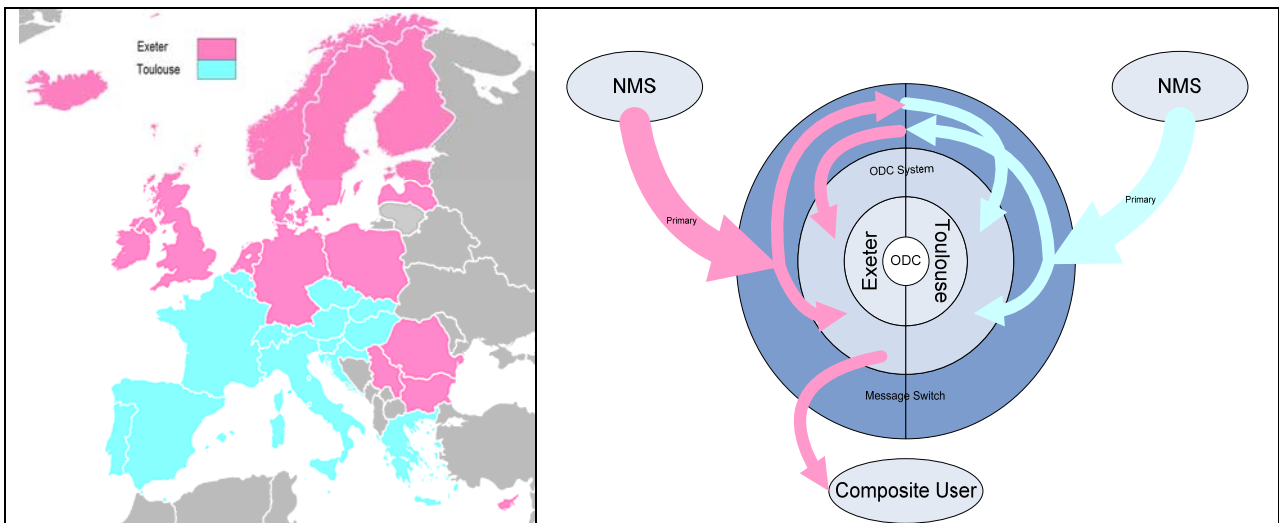


Figure 4: Odyssey Virtual Hub between UK Met Office in Exeter and Meteo France in Toulouse.

Odyssey runs operationally in Toulouse (France) and Exeter (United Kingdom), as shown in figure 4, processing the same data, using the same software and producing the same products. Only one centre disseminate products at any given time and routine (quarterly) switch of operational node are planned for upgrade and maintenance of the nodes. As a result the resilience of the system is very high. Any failure at one of the node can be simply resolved by an emergency switch to the other node. The availability of the Odyssey composites measured at DWD for 2011-2012 in Germany was 99.89% with an average delivery time of DT + 15.2 minutes with 99.25% of the composites received within DT + 20 minutes. The nodes are putting up very well with a large increase in data volume from the start of the service as shown in Figure 5.

The Odyssey code is built using ODIM and since January 2012, it incorporates a toolbox developed by BALTRAD to add pre-processing modules that will be used to QC the incoming data and improve the quality of the composite products.

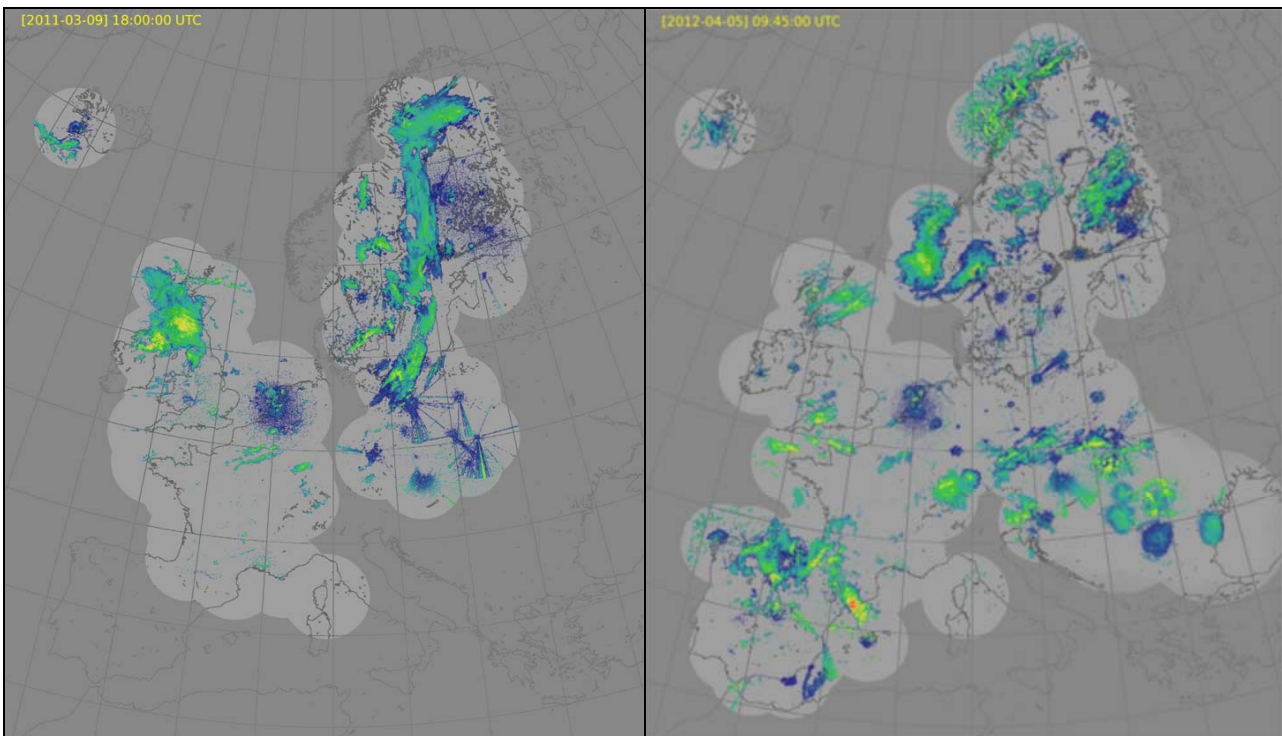


Figure 5: Increase in data coverage between March 2011 shortly after the operational service started and one year later in April 2012.

#### 4. OPERA IV Programme

A new consortium composed of FMI, SMHI, Meteo France, UK MetOffice and DHMZ was selected by EUMETNET in 2012 to lead the OPERA IV program and to carry on with the development of Odyssey. Odyssey generates pan-European precipitation composites with no-stitching and “uniform” product quality. The next challenge for the EUMETNET OPERA IV programme started in January 2013 is to:

- Produce a consistent framework for collecting and generating quality information from QC checks performed both at the generating NMSs and at the Odyssey nodes.
- Redistribute all the incoming polar volume data (i.e. Radar reflectivity, Radial velocity etc...) and the generated quality information to NWP centres assimilating radar data.
- Develop pre-processing modules to generate European composites of same or better quality than national composites.
- Develop 3D composites

## 5. ECOMET

The exchange of radar data between EUMETNET members are defined at the EUMETNET assembly. The data policy is still work in progress. But the commercialisation of the Odyssey composite data to the private sector has been agreed and is handled by ECOMET. The ECOMET is an Economic Interest Grouping under Belgian law which was created at the end of 1995 and currently has 25 Members. The grouping reinforces the traditional relationships amongst the NMSs, and the developing relationships with the private sector within the relevant EU regulations. With two main objectives:

- to preserve the free and unrestricted exchange of meteorological information between the NMSs for their operational functions within the framework of WMO regulations
- to ensure the widest availability of basic meteorological data and products for commercial applications.

## 6. Conclusions

Key points of this report:

- Most Radar Data Exchange activities in Europe are organised by EUMETNET under the OPERA program.
- Two sub-networks are emerging in the Baltic sea region and potentially between Russia and some of its western neighbouring countries.
- The exchange of data with OPERA is facilitated by a common data model called ODIM and available in two formats ODIM-HDF5 and ODIM-BUFR.
- A centralised processing capability called Odyssey was commissioned by EUMETNET and developed by Meteo France and Met Office generates pan-European composites operationally since January 2011.
- A new consortium was formed in 2012 to lead the OPERA IV program with two important objectives 1/ the development of a framework for adding quality information to the incoming volume radar data, 2/ the development of pre-processing modules to improve the quality of the Odyssey composite towards national standards.
- The Odyssey composite products will be available to the private sector on the ECOMET catalogue.