



ORFEO program

GT1 – Thematic Group on Sea and coastal areas

70% of ORFEO observation will be above marine waters

Toulouse, 10th of June, 2008

Philippe Garnesson (ACRI-ST)

GT1 – Thematic Group on Sea and coastal areas –

1. Group Composition
2. Relevance of VHR satellite imagery
3. Phase I: What is useful for WG: "synthetic products"
4. Thematic Studies, first results
5. Next steps and milestones



GT1 – Thematic Group on Sea and coastal areas – Composition

Fabrice Arduin – SHOM

Pierre Boissery – Agence de l'Eau

Sébastien Colas – Observatoire du littoral (Ifen)

Bart Deronde – VITO

Antoine Mangin – ACRI-ST

Carlos Oliveros - BRGM

François Parthiot – CEDRE

Jacques Populus – Ifremer

Aurélie Sand / Hélène de Boissezon / Selma Cherchali - CNES



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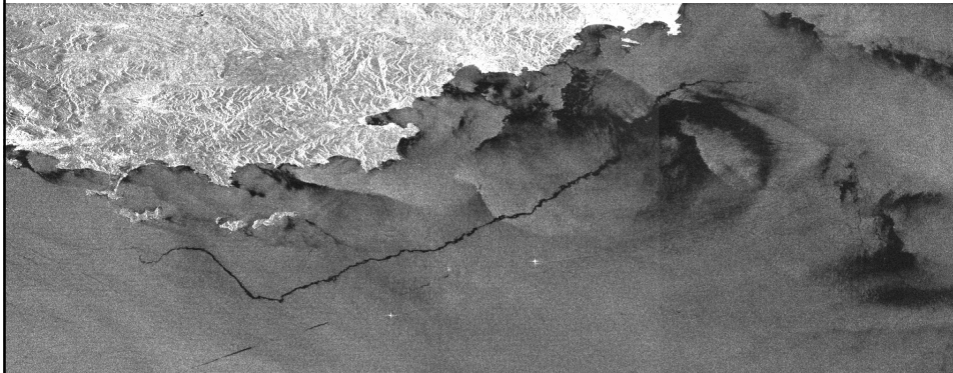
Preamble – the heritage

Space imagery generally used for marine and coastal applications is mainly based on

1. SAR techniques

Fluctuations in surface roughness:

physical constraints – wind, waves, internal waves
change in sea surface characteristics – oil spill



Preamble – the heritage

Space imagery generally used for marine and coastal applications is mainly based on

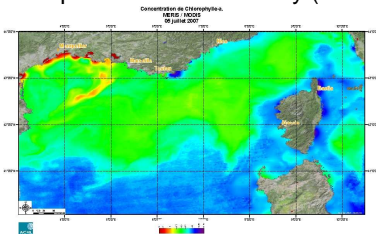
1. SAR techniques

Fluctuations in surface roughness:

physical constraints – wind, waves, internal waves
change in sea surface characteristics – oil spill

2. Super/hyper spectral observation in visible

Exploitation of radiometry (mainly ratio of reflectances) to derive

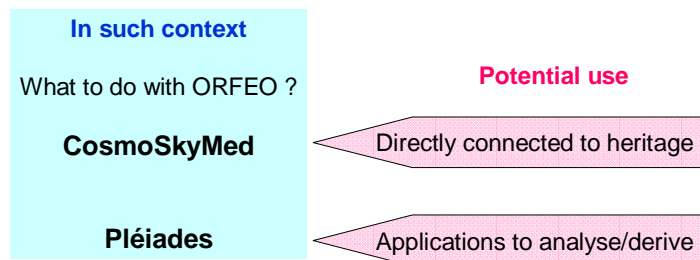


Chlorophyll-a pigments
Suspended Particulate Matter
Coloured Dissolved Organic Material

Preamble – the heritage and its link with ORFEO

But also...

3. **Altimetry techniques and TIR soundings for SST**
more and more for modeling inputs
4. Very marginal use of **high resolution visible** (SPOT-like) on terrestrial coastal areas



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Preamble – opportunity offered by ORFEO

Further thoughts

1. The Pleiades blue band allows better penetration into the water column and so, potentially, characterisation of the water composition and sea bottom observation.
2. The very high spatial resolution should allow a better monitoring of the interfaces between human activities (small scale pressure such as shipping) and natural environment
3. The very high resolution and the coverage of CosmoSkyMed are very promising enhanced inputs for all already operational marine activities using SAR.

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What is useful for GT1 – “synthetic products”

Required observations	Thematic / rationale
Vessel position	Security (1), Direct or chronic pollution (2)
Coastline delineation	Environmental monitoring
Survey of benthic typologies	Environmental monitoring, preservation of the biodiversity
Water composition in coastal areas	Survey of water quality
Cartography of coastal habitats	Preservation of the biodiversity
Mapping of artificial infrastructures at coast	Pressure on the environment
Oil pollution detection and follow-up	Environmental monitoring, regulation
Nomad tourism mapping	Pressure on the environment, security
Nomad moorings mapping	Pressure on the environment, security
Land use on the MPD (Maritime Public Domain)	Pressure on the environment, regulation
Characterisation of areas to be classified as “espaces remarquables”	Pressure on the environment, regulation

What is useful for GT1 – “synthetic products”

Required observations	Thematic / rationale
Port extension (sea/land)	<i>Pressure on the environment</i>
Urban expansion along the coast	<i>Pressure on the environment, regulation</i>
Monitoring of oil at coast	<i>Environmental crisis management</i>
Sea state spectrum	<i>Environmental and meteorological monitoring</i>
Wind speed and wind stress	<i>Environmental and meteorological monitoring</i>
Surface current velocity	<i>Environmental and meteorological monitoring</i>
Bathymetry	<i>Navigation, environmental survey, sedimentary processes</i>
Coral reefs ecosystems mapping	<i>Environmental monitoring</i>
Coastal sea floor classification	<i>Environmental monitoring</i>
Macro-waste detection and follow-up	<i>Pollution monitoring</i>
Sea mammals detection	<i>Bio diversity monitoring</i>

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Expectancies for “synthetic products” from ORFEO

Required observations	Source	
	CSM	Pléiades
Vessel position	Red	Dark Green
Coastline delineation	Magenta	Dark Green
Survey of benthic typologies		Bright Green
Water composition in coastal areas		Light Green
Cartography of coastal habitats		Light Green
Mapping of artificial infrastructures at coast	Magenta	Dark Green
Oil pollution detection and follow-up	Red	Dark Green
Nomad tourism mapping		Bright Green
Nomad moorings mapping		Bright Green
Land use on the MPD		Dark Green
Characterisation of “espaces remarquables”		Bright Green
Port extension (sea/land)	Magenta	Dark Green
	Methodology exists	Methodology exists
	Potential for	Potential for
	Methodology to develop	Methodology to develop

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Expectancies for “synthetic products” from ORFEO

Required observations	Source	
	CSM	Pléiades
Urban expansion along the coast	Methodology exists	Methodology exists
Monitoring of oil at coast	Potential for	
Sea state spectrum	Methodology to develop	
Wind speed and wind stress		
Surface current velocity		
Bathymetry		Potential for
Coral reefs ecosystems mapping		
Coastal sea floor classification		
Macro-waste detection and follow-up		Methodology exists
Sea mammals detection		Potential for
Coastal infrastructure evolution	Methodology exists	Methodology to develop

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 - Cannes
 - Marseille
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Case studies

There is still no case study on common use of CSM and Pléiades

Two cases studies have been proposed related to explore Pléiades capabilities to help environmental regulation (WFD) and bio-diversity survey

1. Anthropic pressure and environmental monitoring on Cannes site (ACRI)
2. Anthropic pressure and environmental monitoring on Marseille site (AERMC)

Three cases studies related to CSM have been submitted to ASI in the frame of CSM AO

Final number next July





Objectives of the Cannes case study.

Study of capabilities of Pléiades-like data to fulfil some of the monitoring requirements that are:

- Classification of the sea bottom coverage (First objective)
- Use of coloured waters (quantification/qualification of water column load) (Complementary objective)
- Anthropic pressure on the environment – e.g. survey of seasonal moorings (Complementary objective)

.... and by extension all what can be extracted from the data

Tasks – scholar approach – first objective

Classification of sea bottom and sea composition (spectro/radiometric approach)

- Analysis of available spectral informations (type and radiometric quality)
- Analysis of discriminations capabilities and rule between algae type within the « visible » water depth
- Application of the rules to the whole image (wherever appropriated).
- Validation and dissemination toward final users

Tasks – scholar approach – other objective

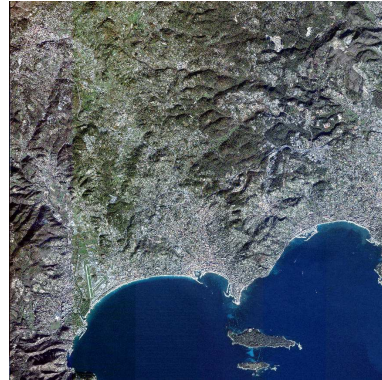
Anthropic pressures on the environnement – (more morphologic approach)

- Analysis of the outflows: plumes and macro-waste (litters)
- Analysis of population pressure (number of people on the coast – numbering of ships navigating and/or at seasonal moorings)
- Others : monitoring of geo/morphologic evolution of artificial and natural features along the coastline.

Means

One quickbird image (2003, December 23rd)

- Level 1 for all bands (B,G,R,IR) + panchromatic
- Level 3 for all bands (B,G,R,IR)



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First conclusions for Cannes

Radiometry

Radiometry appeared to be an issue – But this has been demonstrated to be an artefact from QB images (compression) that should not appear with Pléiades. A deeper evaluation is on-going with Pelican data.

Morphology

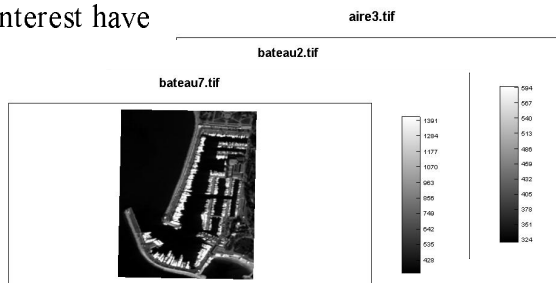
Imagettes of objects of interest have database.

Focus on three specific

- Areas surface computation

- Isolated ships

- Grouping of ships



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- Cannes
- **Marseille**

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Feasibility study for the coastal area of Marseille

Partners:

 Agence de l'eau, Ifremer,
Centre d'océanologie de Marseille, Université de Saint Jérôme

 Ville de Marseille, CUM, CEEP, CR PACA, CG13, AGAM,
observatoire MEDAM



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Study objectives

 **General context** : monitoring plan for rade de Marseille, METROC program, Water Framework Directive

 **Needs expressed by local actors** :

1. Urbanisation: situation and trends,
2. Coastal usages (pressures) : bathing areas frequentation, nomad moorings, maritime traffic : situation and trends,
3. release to the sea : location, following up of urbans plumes, especially in case of heavy rains,
4. Dynamic of water masses (WFD) : especially waves and surface currents



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Marseille study - Preliminary-conclusion...

1. - Urbanisation : situation & trends,
2. - Coastal pressure : bathing area frequentation nomad moorings, maritime traffic situation & trends
3. - Release to the sea : location, urban plumes monitoring heavy rains cases
4. - Dynamics of water masses : waves and surface currents



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Feedback...

« Complicated use » with files heavily useable,
(orthophotos easy to use and free),

Coastal infrastructures census : problem of coastline and its
reference; what about geographical coverage?

Still waiting for feedback from ville de Marseille + région
PACA to come,

Apart from that : use for WFD is found relevant

*-Mitigated interest for management at local scale, more
interest for studies at supra-scale.*

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Conclusions of GT1 for today

Pléiades

1. Effort of feasibility have been launched and conducted: Pléiades offers real opportunity to assess pressure on the environment (products sheet + updated indicators from Observatoire du Littoral) on the terrestrial part of the maritime domain, but also on the oceanic one. However this new use/capabilities deserves some education to new users (lost between historic spatial community and of the aerial one).
2. Access to data and actual spatial and temporal coverage is still not well perceived – clear message needed.
3. Equation (complexity/benefit/cost) still not solved

Next steps

1. *Completion of Pléiades case studies (some effort will be put to renew investigation on Cannes with products derived from Pelican)*
2. *New “final” users are made aware of these studies*
3. *Fresh blood will come with CSM data – potential for common use with Pléiades as well*
4. *One TM will be organised in the second half of 2008*

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Thanks for attention

Philippe Garnesson (ACRI-ST)