GloboLakes

Global Observatory of Lake Responses to Environmental Change

Workshop 10th to 12th December 2012

NATURAL ENVIRONMENT RESEARCH COUNCIL

Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

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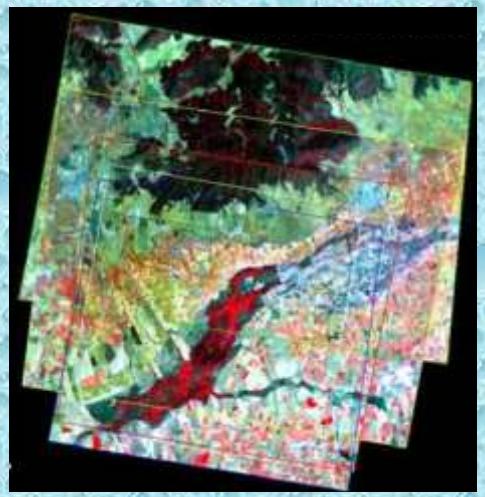
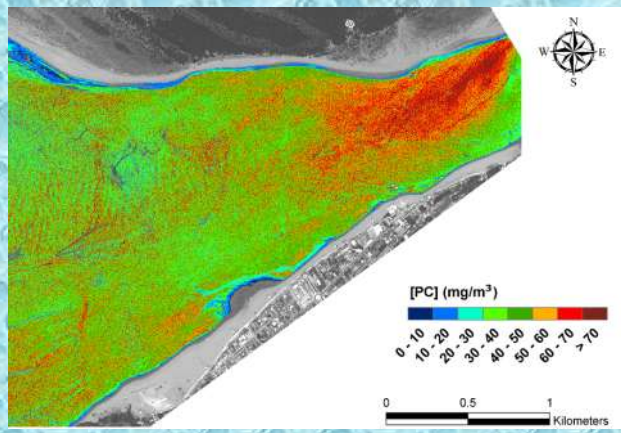
Lakes
Lagoons
Ponds

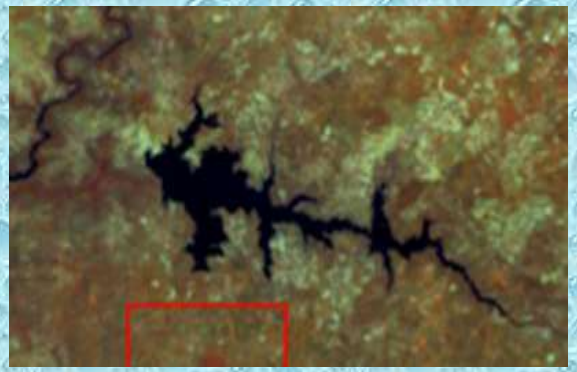
Wetlands



Rivers



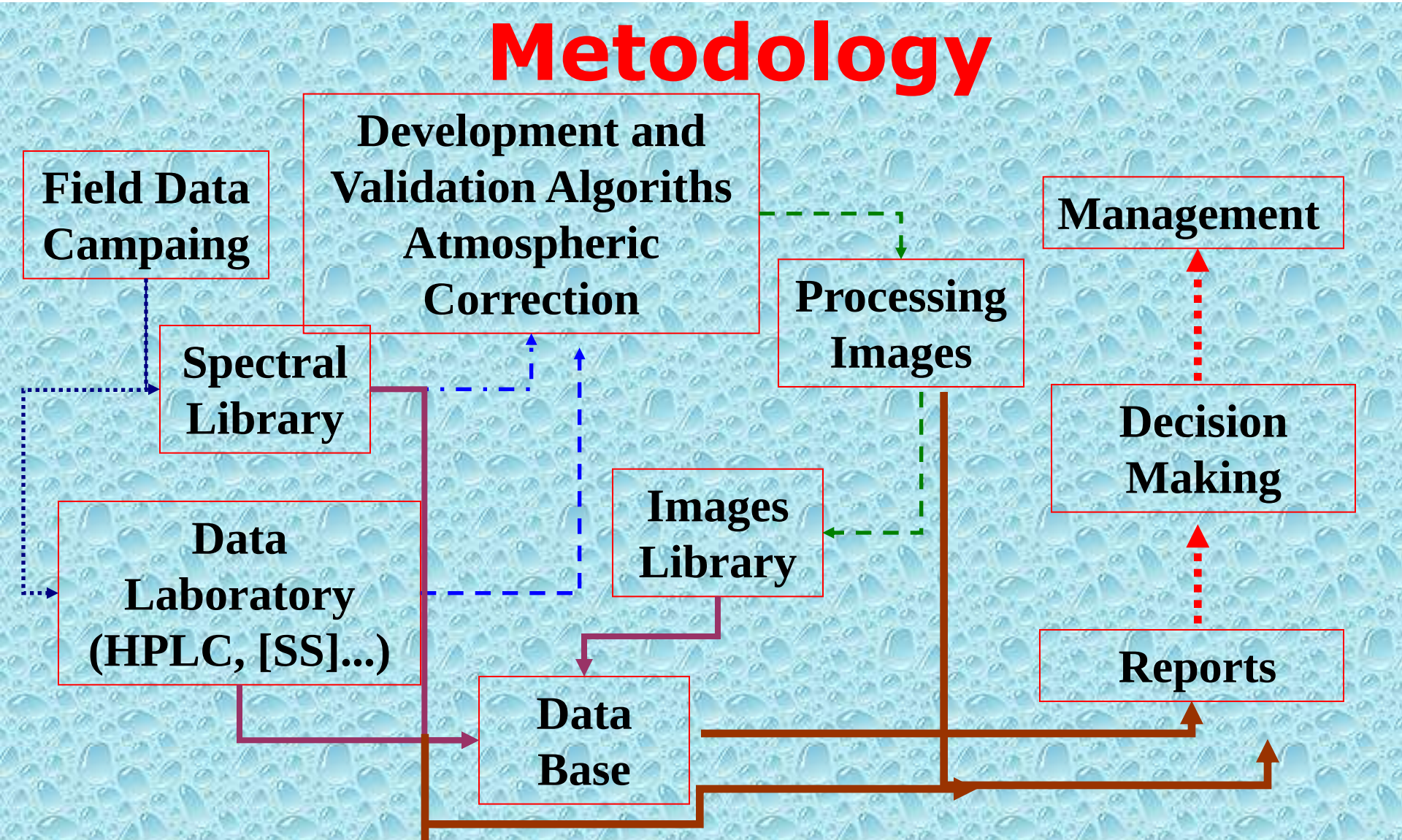
Reservoirs



Coastal Areas

Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

Metodology



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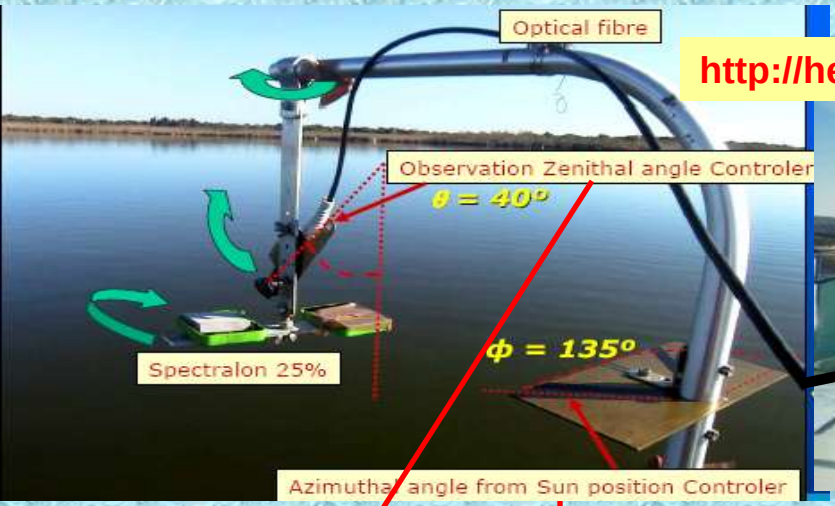
Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

Field Data Campaign: Spectral Library.Reflectance

Protocolos NASA (Fargion & Muller 2000)

http://hercules.cedex.es/Ecosistemas/TeleCongresos/2wCHPa04.pdf



CEH-CEDEX Instruments

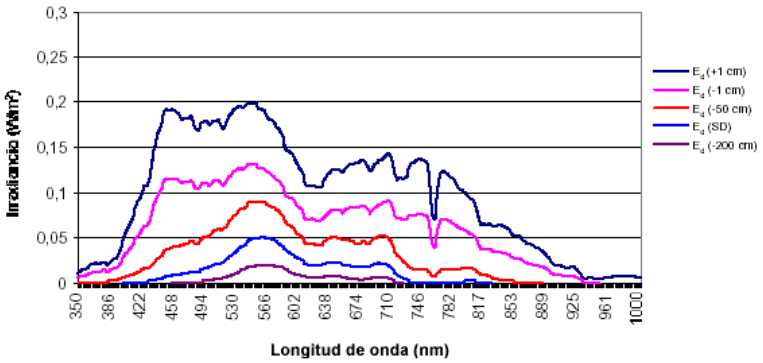
Environment Water Andalusian Agency (AMAYA) Instruments

http://www.aet.org.es/revistas/revista36/Numero36_07.pdf

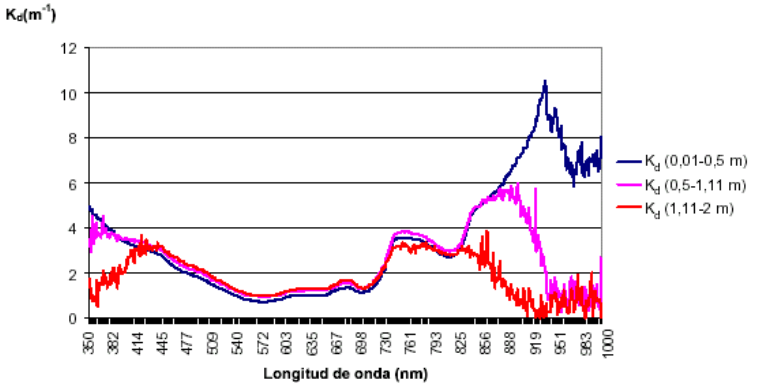
Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

Field Data Campaign: Spectral Library. Kd, Ku

Lambert-Beer Law : $(E_d(\lambda,z)=E_d(\lambda,0)\exp(-k_d(\lambda)z))$

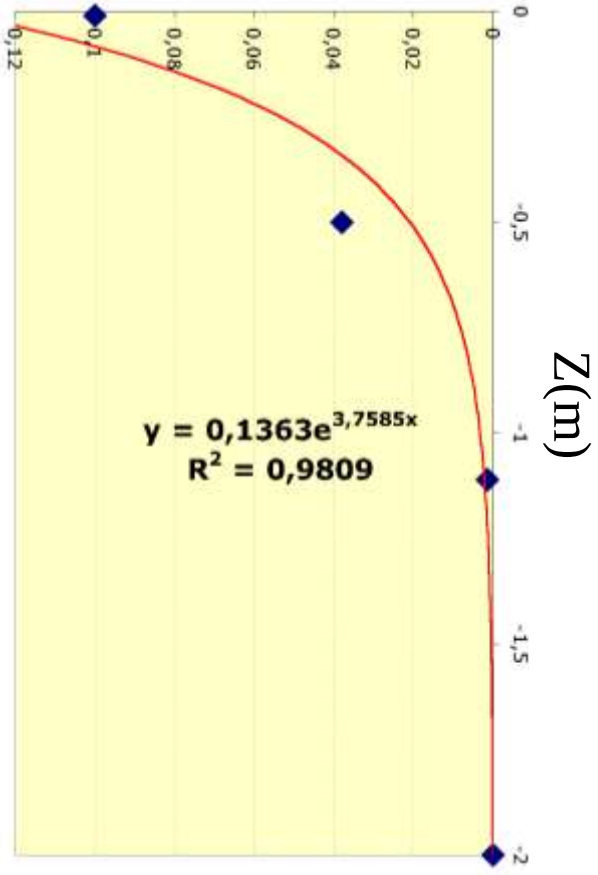


Irradiancia solar en el punto 5 de la laguna de El Campillo (31 de julio de 2000).



Coeficiente de atenuación vertical difusa incidente en el punto 5 de la laguna El Campillo (31 de julio de 2000).

Ed(W/m²) (λ=430nm)



Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

Field Data Campaign: Spectral Library. Kd, Ku

SARGAL porject (Vigo 2008)

Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

Field Data Campaign: Spectral Library. Kd, Ku

Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

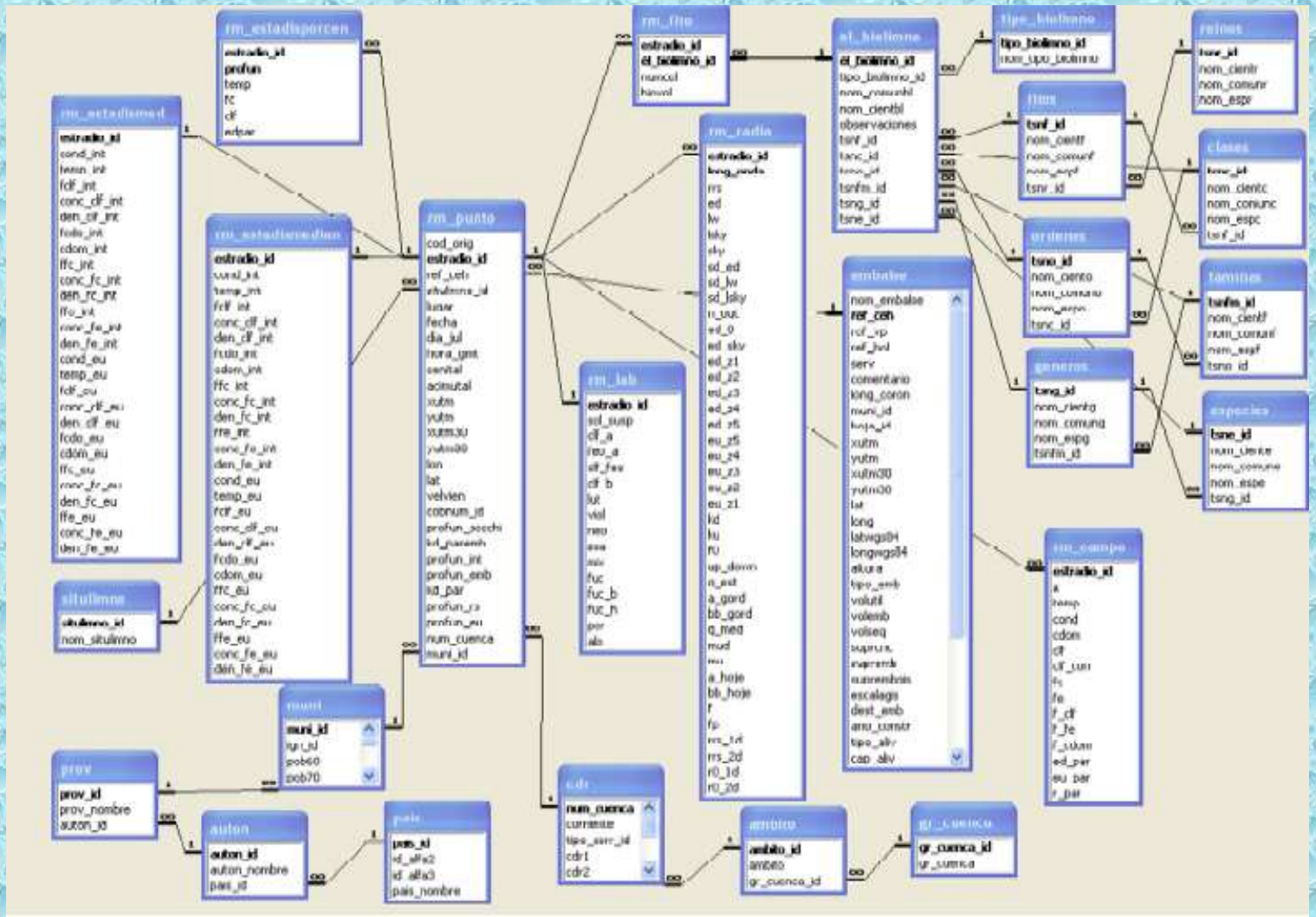
Field Data Campaign:Data Laboratory (HPLC, [SS]...)



http://hercules.cedex.es/Ecosistemas/Laboratorios.htm

Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

DATA BASE



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Global Observatory of Lake Responses to Environmental Change

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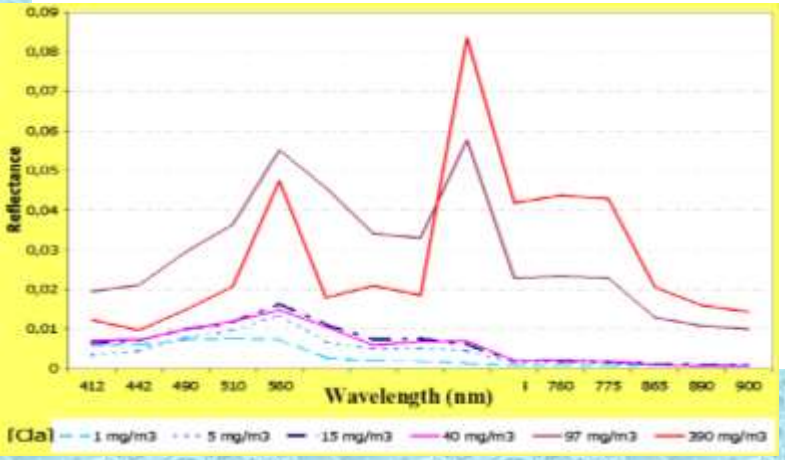
Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

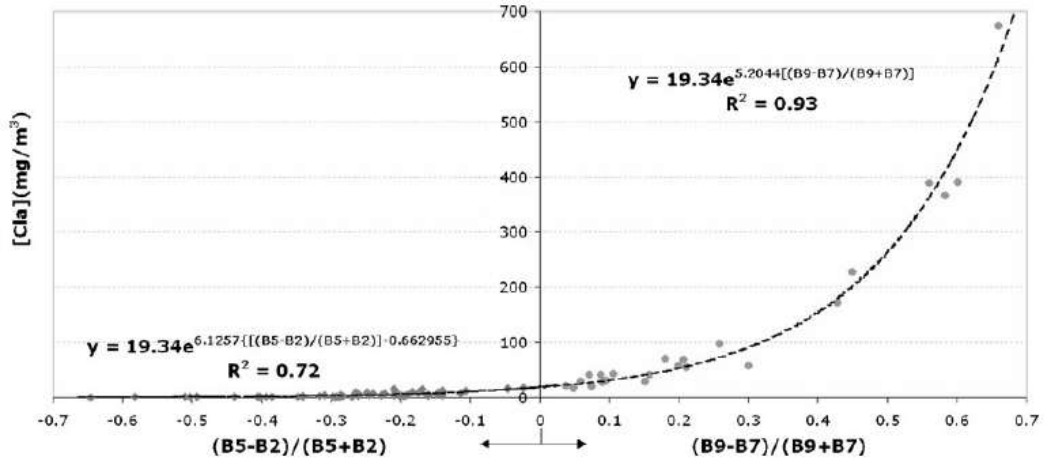
DEVELOPMENT AND VALIDATION ALGORITHMS

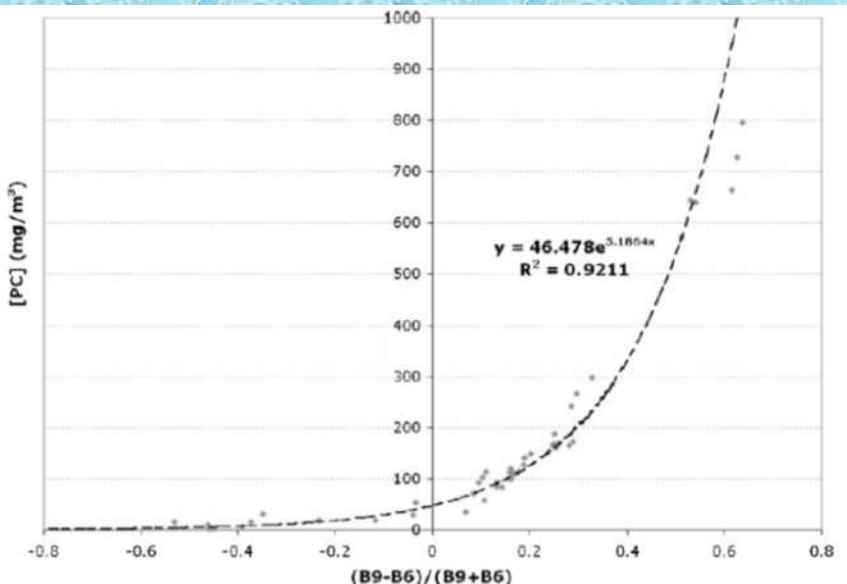
MERIS Reflectance bands



Environ Monit Assess
DOI 10.1007/s10661-010-1831-7

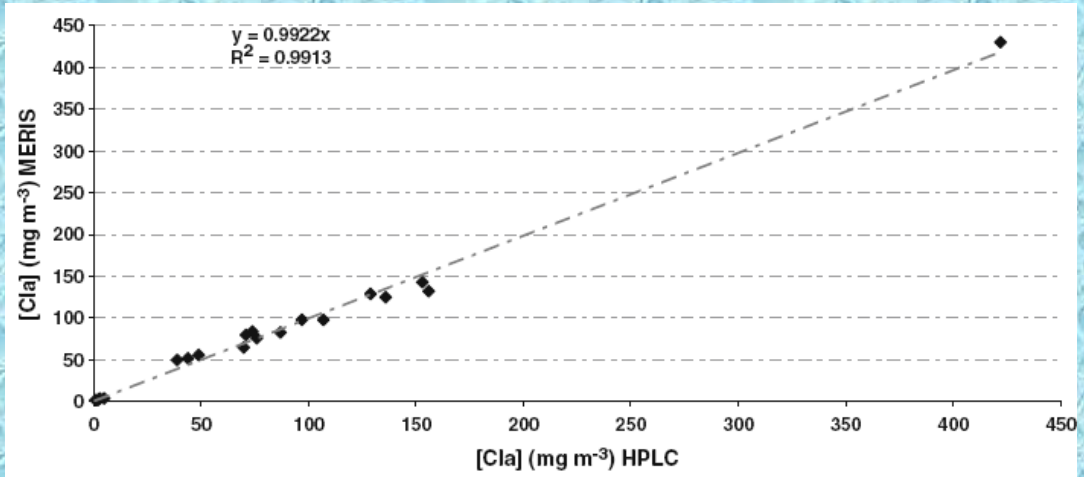
Remote sensing as a tool for monitoring water quality parameters for Mediterranean Lakes of European Union water framework directive (WFD) and as a system of surveillance of cyanobacterial harmful algae blooms (SCyanoHABs)





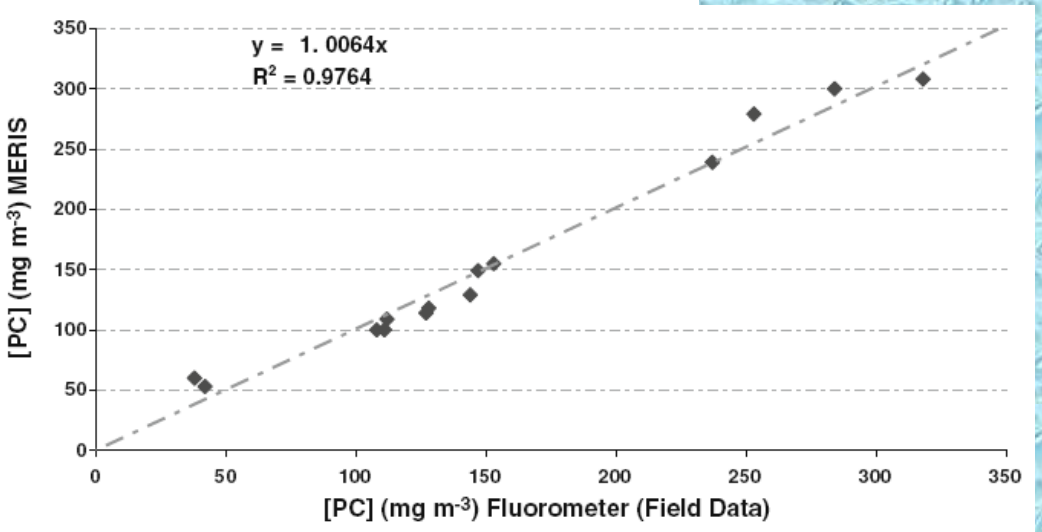
Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

DEVELOPMENT AND VALIDATION ALGORITHMS



Comparison of chlorophyll-a HPLC (Field Data) and chlorophyll-a MERIS imagery ($n = 19$, $p < 0.001$)

Comparison of [PC] fluorometer measurements (Field Data) and [PC] MERIS imagery ($n = 14$, $p < 0.001$)

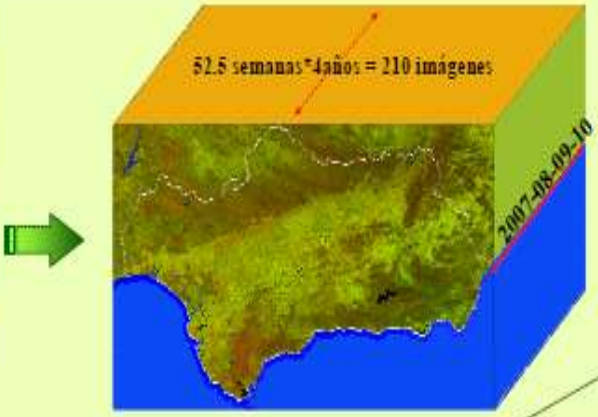


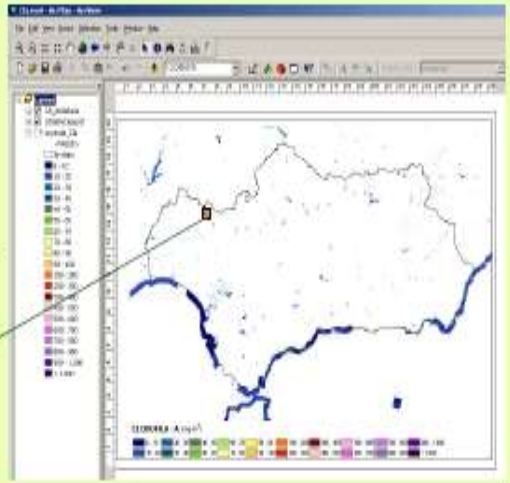
Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

PROCESSING IMAGES

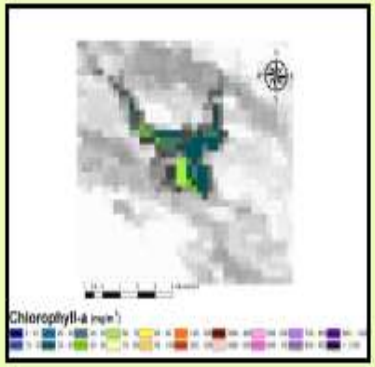
2º Congreso Ibérico de Cianotoxinas — Sevilla 7 y 8 de Julio de 2011

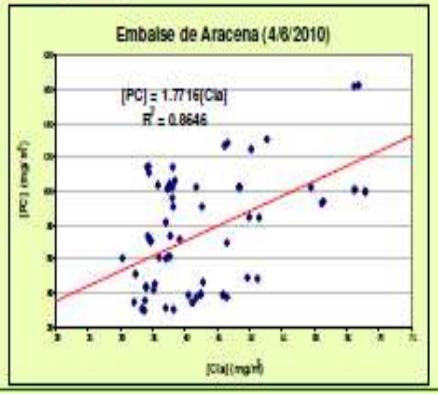
PROCESAMIENTO DE IMÁGENES MERIS: 2007 - 2010

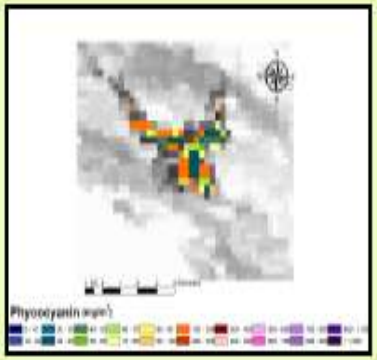




EMBALSE DE ARACENA (4/6/2010)

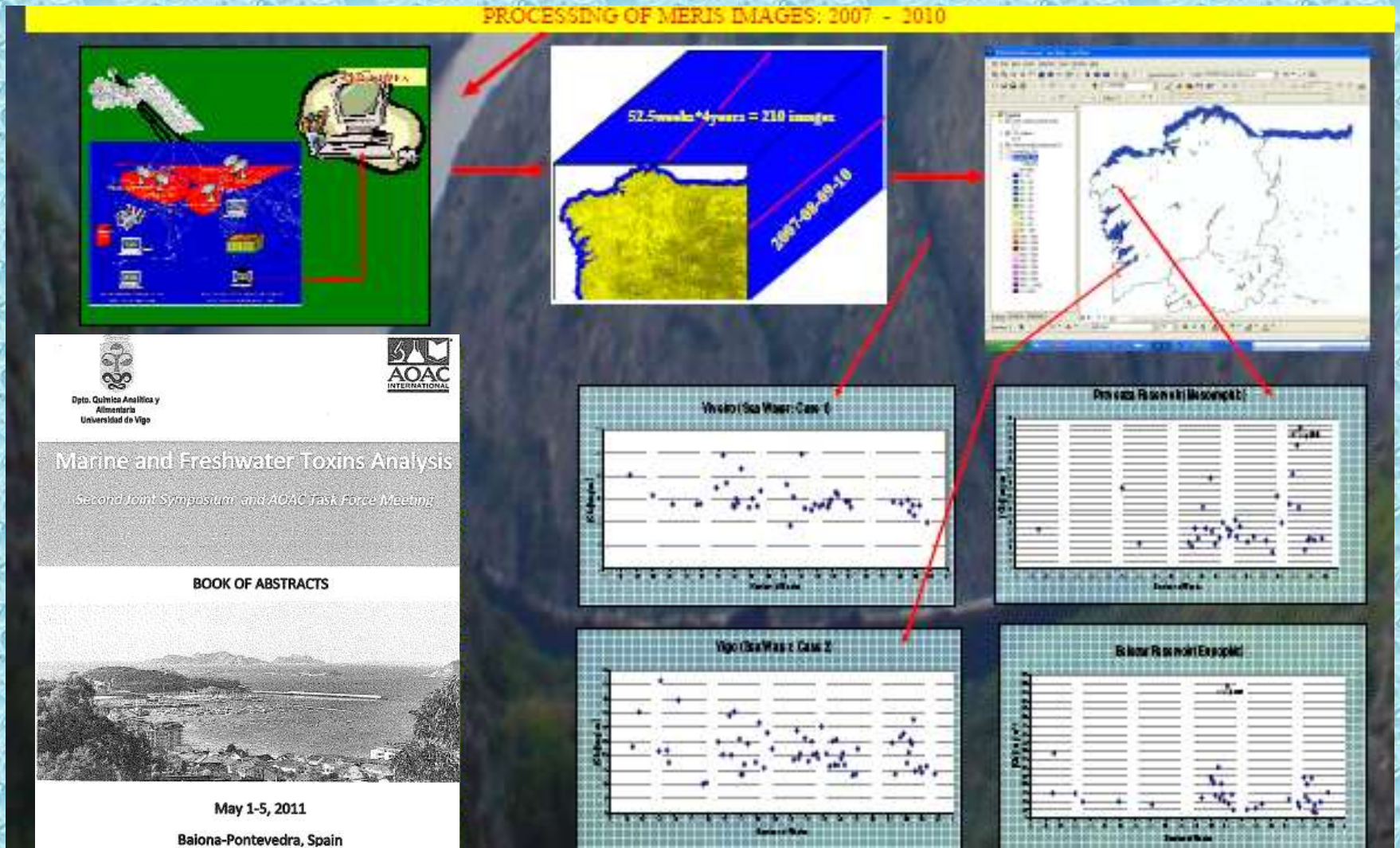






Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

PROCESSING IMAGES



Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

RESULTS: RESERVOIRS

UAM UNIVERSIDAD AUTONOMA DE MADRID

GOBIERNO DE ESPAÑA · MINISTERIO DE FOMENTO · MINISTERIO DE MEDIO AMBIENTE Y MEDIO RURAL Y MARINO

CEDEX CENTRO DE ESTUDIOS Y EXPERIMENTACIÓN DE OBRAS PÚBLICAS

"Monitoring by remote sensing the ecological state of different Spanish inland water bodies through the mapping of photosynthetic pigments characteristics of cyanobacteria"

European Master of Inland Water Quality Assessment
Master Thesis 2008/2009
CLARA ARANCÓN ALONSO

Professional tutor: Jose Antonio Domínguez Gómez
Academic tutor: Antonio Quesada de Corral

http://hercules.cedex.es/Ecosistemas/09Dic.pdf

Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

RESULTS: RESERVOIRS

OECD trophic classification and "Expanded OECD trophic classification"

TROPHIC STATE (OCDE CLASSIFICATION)	
	Chl-a (mg/m3)
Ultraoligotrophic	< 1
Oligotrophic	1-2,5
Mesotrophic	2,5-7,9
Eutrophic	8-25
Hypereutrophic	> 25

EXPANDED OECD TROPHIC CLASSIFICATION	
	Suggested boundaries Chl-a (mg/m3)
Ultraoligotrophic	< 1
Oligotrophic	1-2,5
Mesotrophic	2,5-7,9
Eutrophic	8-25
Hypereutrophic-1	25,1-50
Hypereutrophic-2	50-100
Hypereutrophic-3	100,1-200
Hypereutrophic-4	> 200

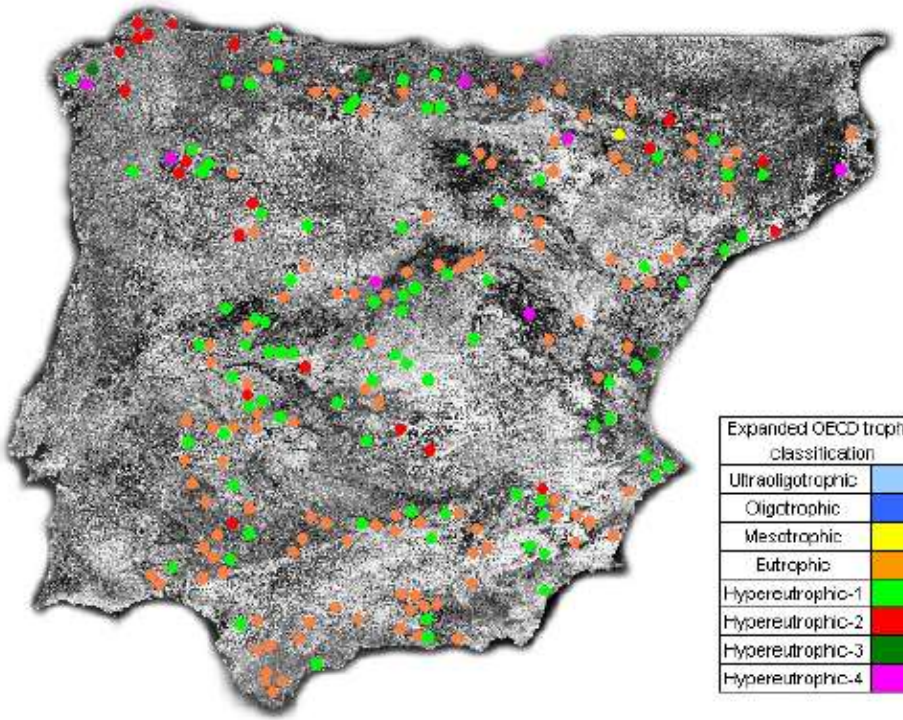
http://hercules.cedex.es/Ecosistemas/09Dic.pdf

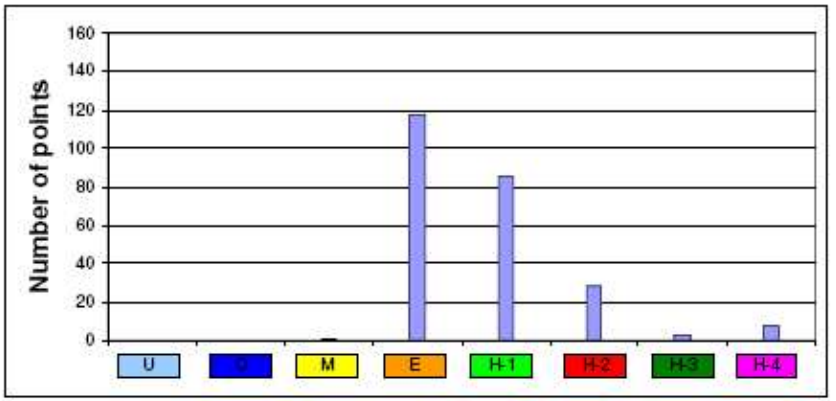
Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

RESULTS: RESERVOIRS

Distribution map of the Trophic state found at each water body

http://hercules.cedex.es/Ecosistemas/09Dic.pdf



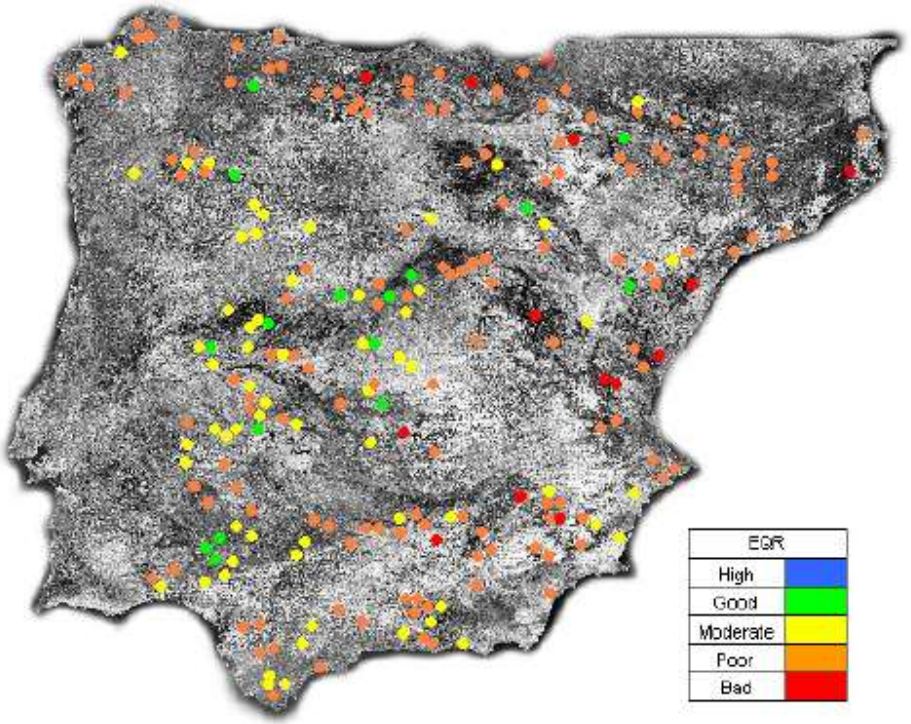


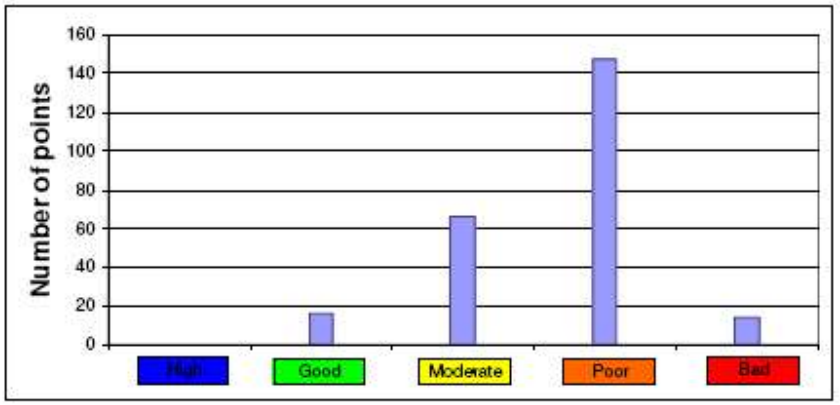
Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

RESULTS: RESERVOIRS

Distribution map of the EQR found at each water body

http://hercules.cedex.es/Ecosistemas/09Dic.pdf

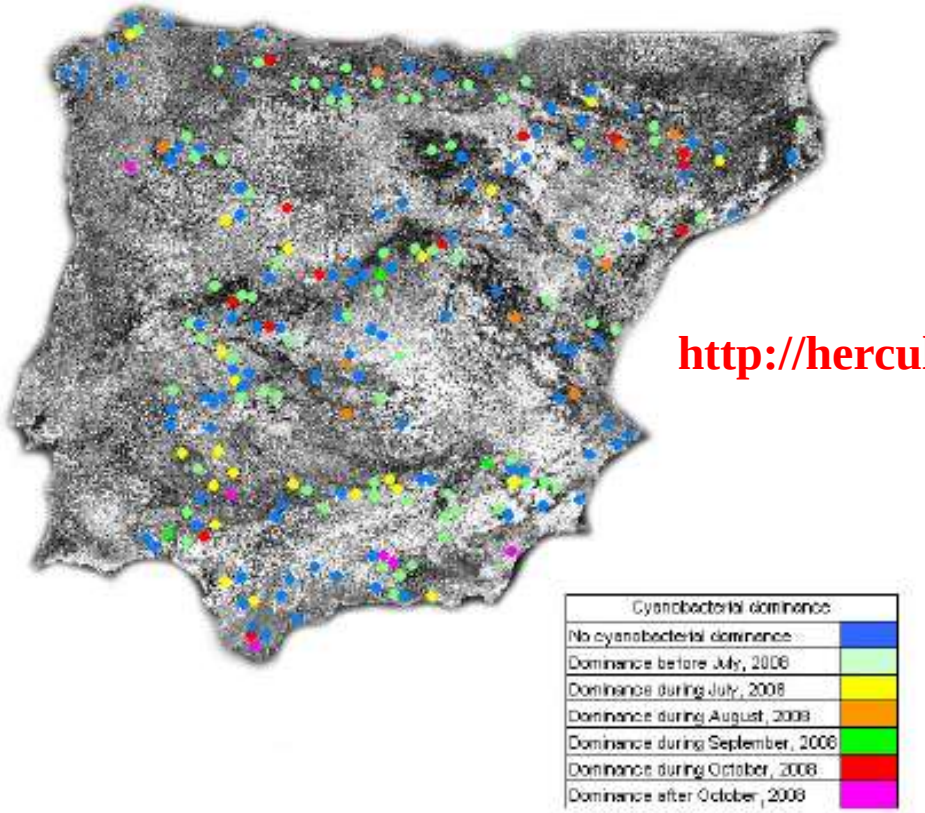




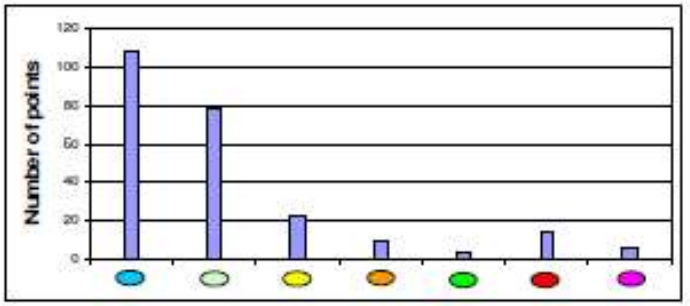
Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

RESULTS: RESERVOIRS

Distribution map of the Cyanobacterial dominance found at each water body



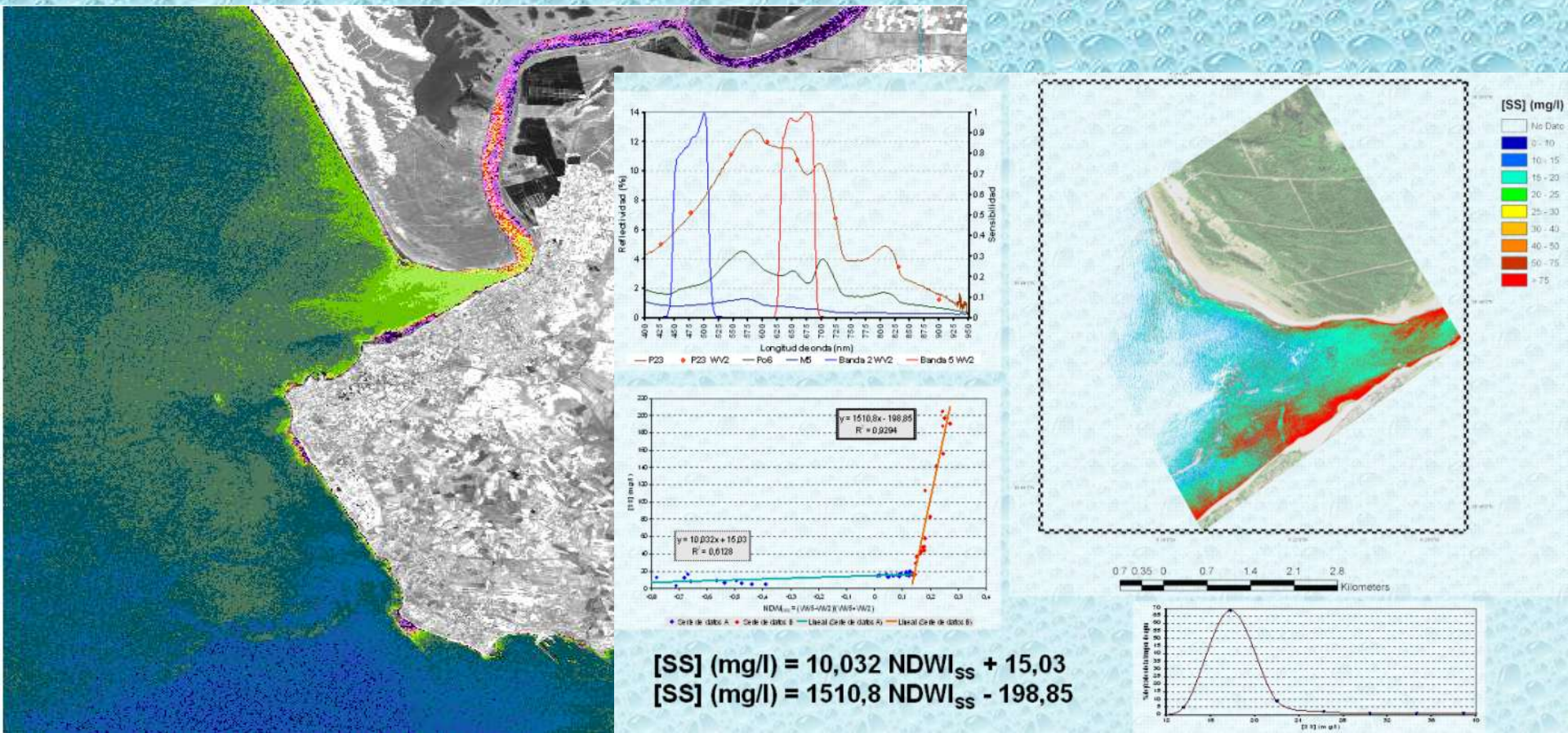
http://hercules.cedex.es/Ecosistemas/09Dic.pdf



Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

RESULTS: RIVERS

MONITORING GUADALQUIVIR RIVER: LANDSAT and WORD VIEW 2



Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

RESULTS: WETLANDS

IGARSS2008 BOSTON
2008 IEEE International Geoscience & Remote Sensing Symposium
July 6-11, 2008 | Boston, Massachusetts, U.S.A.

http://hercules.cedex.es/Ecosistemas/IGARSS2008.pdf

APPLYING MULTI-ANGLE HYPERSPECTRAL DATA TO DETECT HUMAN-INDUCED CHANGES CAUSING WETLAND DEGRADATION IN SEMI-ARID AREAS (NATIONAL PARK LAS TABLAS DE DAIMIEL, SPAIN)

Thomas Schmid[1], José Antonio Domínguez[2], Jesús Solana[3], José Gumuzzio[3] and Magaly Koch[4]

[1]CIEMAT, Av. Complutense 22, 28040, Madrid, Spain.
[2]Center for Hidrographic Studies CEDEX, Paseo Bajo de la Virgen del Puerto, 3, 28005 Madrid, Spain.
[3]Autonomous University of Madrid, Science Faculty, Madrid, Spain.
[4]Centre for Remote Sensing, Boston University, Boston, MA, USA.
thomas.schmid@ciemat.es

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Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

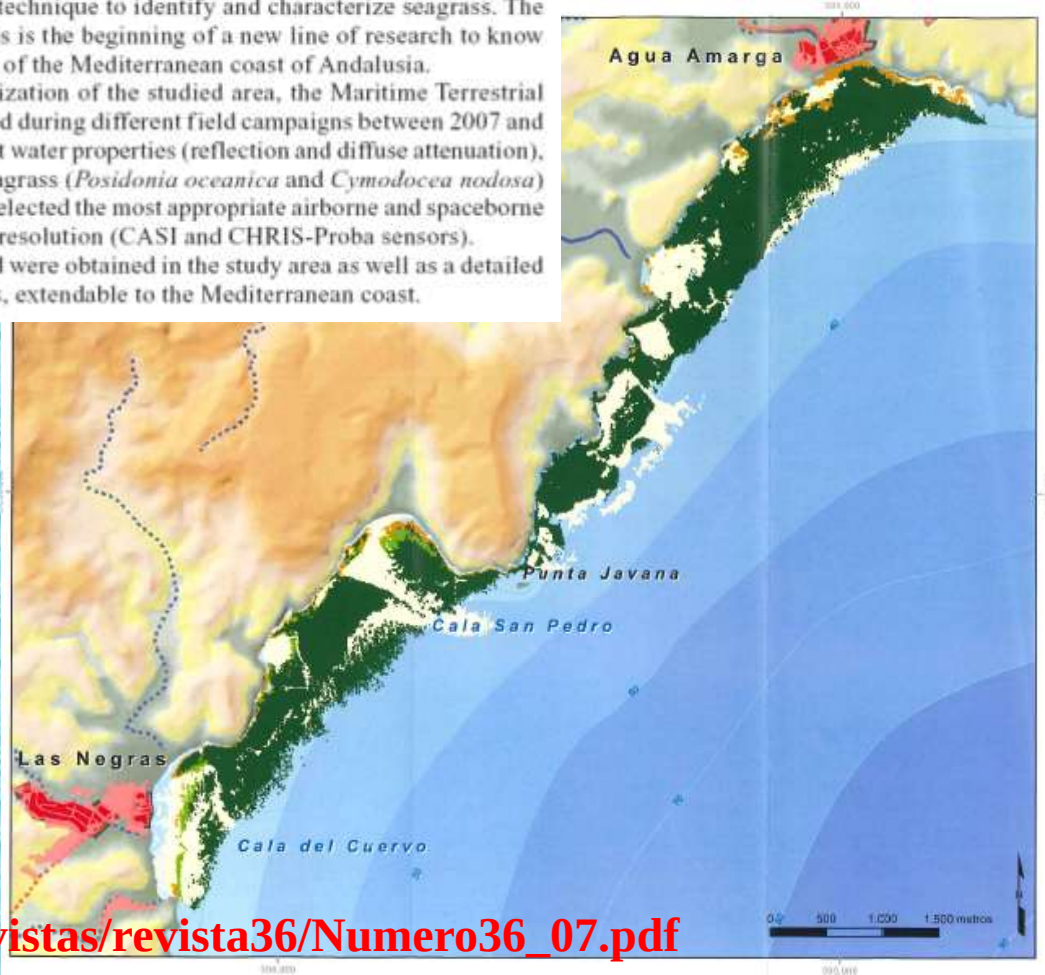
RESULTS: COASTAL AREAS

Development of a methodology for the characterization of seagrass on the andalusian coast using remote sensing techniques with hiperspectral sensors

Remote sensing is considered a non-invasive technique to identify and characterize seagrass. The evaluation of the use of images and their analysis is the beginning of a new line of research to know the best way for mapping the ma-rine ecosystem of the Mediterranean coast of Andalusia.

The biophysical and environmental characterization of the studied area, the Maritime Terrestrial Natural Park of Cabo de Gata-Nijar was conducted during different field campaigns between 2007 and 2009, with the objective of measuring the apparent water properties (reflection and diffuse attenuation), the spectral response of the different types of seagrass (*Posidonia oceanica* and *Cymodocea nodosa*) and bottom substrate types. From these data, we selected the most appropriate airborne and spaceborne sensors for the study and its spectral and spatial resolution (CASI and CHRIS-Proba sensors).

As a result of this research, maps of the seabed were obtained in the study area as well as a detailed methodology for the characterization of seagrass, extendable to the Mediterranean coast.



http://www.aet.org.es/revistas/revista36/Numero36_07.pdf

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Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

RESULTS: COASTAL AREAS

Mar Biol
DOI 10.1007/s00227-012-1987-5

ORIGINAL PAPER

Assessment of AHS (Airborne Hyperspectral Scanner) sensor to map macroalgal communities on the Ría de vigo and Ría de Aldán coast (NW Spain)

G. Casal · N. Sánchez-Carnero · J. A. Domínguez-Gómez · T. Kutser · J. Freire

Received: 30 August 2011 / Accepted: 19 June 2012

Abstract Ría de Vigo and Ría de Aldán have high biological richness that is reflected in the number of environmental protection areas like the Atlantic Islands National Park and five places of community interest. Benthic algal communities play an important role in these ecosystems due to their ecological functions and support a great part of this biological richness. We tested by means of bio-optical modelling and Airborne Hyperspectral Scanner (AHS) images to what extent remote sensing could be used to map these communities in Ría de Vigo and Ría de Aldán (NW Spain). Reflectance spectra of dominating macroalgae groups were modelled for different water depths in order to estimate the separability of different bottom types based on their spectral signatures and the spectral characteristics of the AHS. Our results indicate that separation between three macroalgae groups (green, brown and red) as well as sand is possible when the bottoms are emerged during low tide. The spectra differences decrease rapidly with increasing water depth. Two types of classifications were carried out with the three AHS images: maximum likelihood and spectral angle mapper (SAM). Maximum likelihood showed positive results reaching overall accuracy percentages higher than 95 % and kappa coefficients higher than 0.90 for the bottom classes: *shallow sand*, *deep sand*, *emerged rock*, *emerged macroalgae* and *submerged macroalgae*. Sand and algae substrates were then separately analysed with SAM. These classifications showed positive results for differentiation between green and brown macroalgae until 5 m depth and high differences between all macroalgae and sandy substrate. However, differences between red and brown macroalgae are only detectable when the algae are emerged.

Introduction

Benthic algal communities play an important role in coastal ecosystems due to their ecological functions. These communities are essential for many organisms as habitat (e.g. Cacabelos et al. 2010), mating and nursery grounds (e.g. Shaffer 2003), feeding areas (e.g. Lorentsen et al. 2004) and refuge (e.g. Gotceitas et al. 1997). Another relevant

Estuarine, Coastal and Shelf Science 94 (2011) 281–290

Contents lists available at ScienceDirect

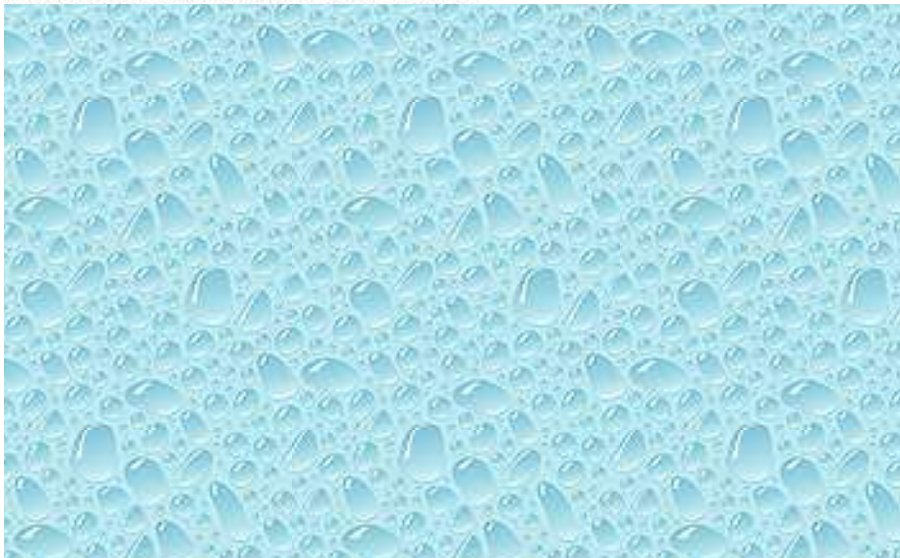
Estuarine, Coastal and Shelf Science

journal homepage: www.elsevier.com/locate/ecss

Mapping benthic macroalgal communities in the coastal zone using CHRIS-PROBA mode 2 images

G. Casal [a,*], T. Kutser [b], J.A. Domínguez-Gómez [c], N. Sánchez-Carnero [a], J. Freire [a]

[a] Grupo de Recursos Marinos y Pesquerías, Facultad de Ciencias, Universidad de A Coruña, Rúa da Fraga 10, 15008 A Coruña, Spain
[b] Estonian Marine Institute, University of Tartu, Mäealuse 14, Tallinn 12618, Estonia
[c] Centro de Estudios Hidrográficos (CEDEX), Paseo Bajo de la Virgen del Puerto 3, 28005 Madrid, Spain



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Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

REPORTS & PAPERS

http://hercules.cedex.es/Ecosistemas/teledeteccion.htm

MINISTERIO DE FOMENTO

CEDEX
CENTRO DE ESTUDIOS Y EXPERIMENTACIÓN DE OBRAS PÚBLICAS

Teledetección

Buscar en el CEH
Mapa del Web
Web master
Etc ...

Principal | Ecología de los Ecosistemas | Lab. Calidad de las Aguas | Teledetección | Calidad de los Ecosistemas | ISO 9001: 2008

- Sensores
- Informes
- Áreas de Actividad
- Directiva Marco del Agua
- INTA-ICC-ESA
- Universidades
- Publicaciones y Congresos
- Links

En 1976 la Sección Técnica de Teledetección de Centro de Estudios Hidrográficos inicia sus trabajos utilizando imágenes MSS de los satélites Landsat 1-3. Desde entonces ha desarrollado multitud de trabajos y proyectos de investigación encaminados a que la teledetección sea una herramienta útil en la gestión de los Ecosistemas Acuáticos Continentales (Actividades.pdf)

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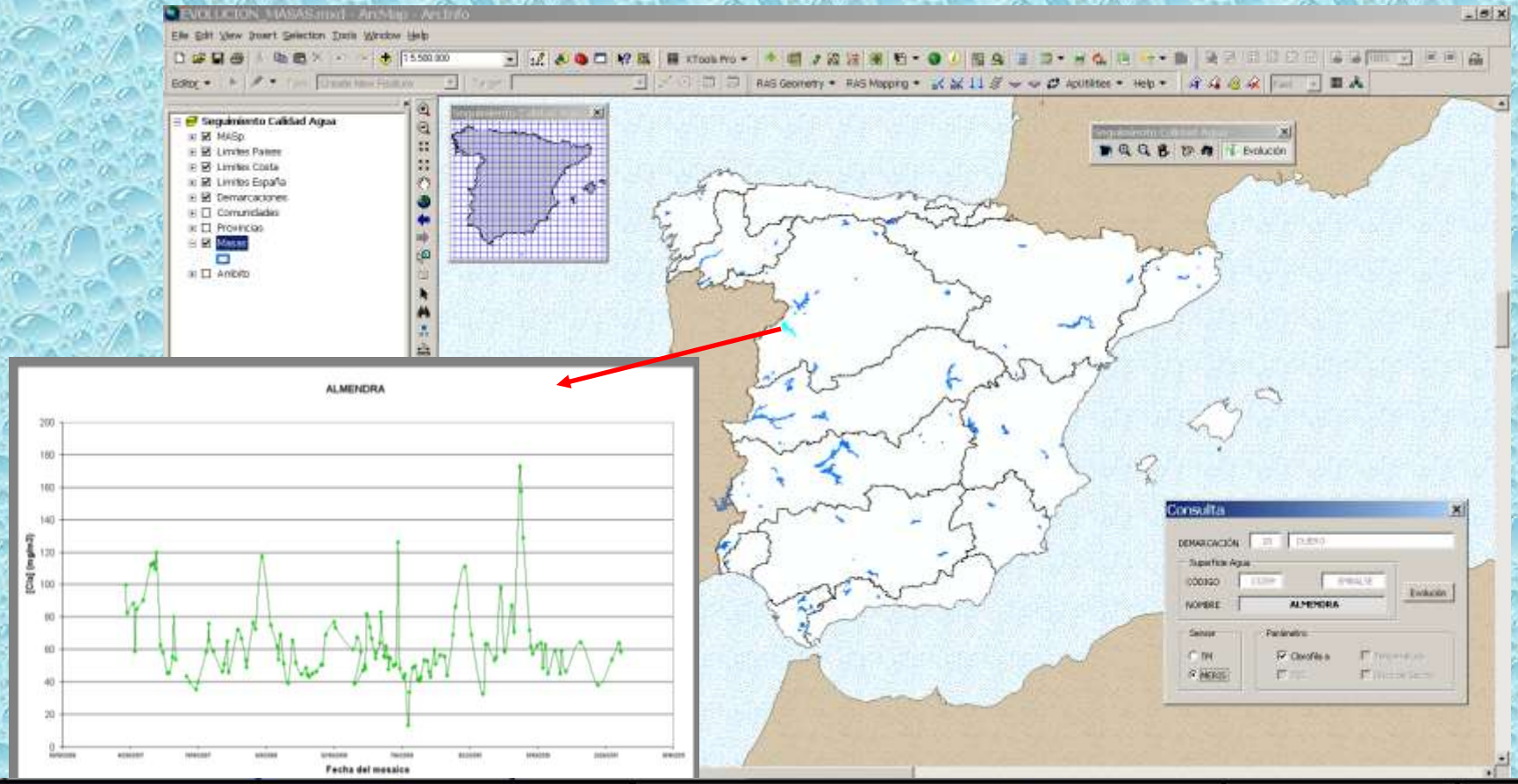
MANAGEMENT



MINISTERIO DE AGRICULTURA, ALIMENTACIÓN Y MEDIO AMBIENTE

SECRETARÍA DE ESTADO DE MEDIO AMBIENTE

DIRECCIÓN GENERAL DEL AGUA

ESTUDIO DE UTILIZACIÓN DE LA TELEDETECCIÓN COMO HERRAMIENTA DE IDENTIFICACIÓN, SEGUIMIENTO Y CONTROL DEL MEDIO HÍDRICO Y PROPUESTA DE NUEVAS APLICACIONES EN LA PLANIFICACIÓN HIDROLÓGICA.

DIRECCIÓN

SUBDIRECCIÓN GENERAL DE PLANIFICACIÓN Y USO SOSTENIBLE DEL AGUA

CONSULTOR:

AMBISAT INGENIERÍA AMBIENTAL

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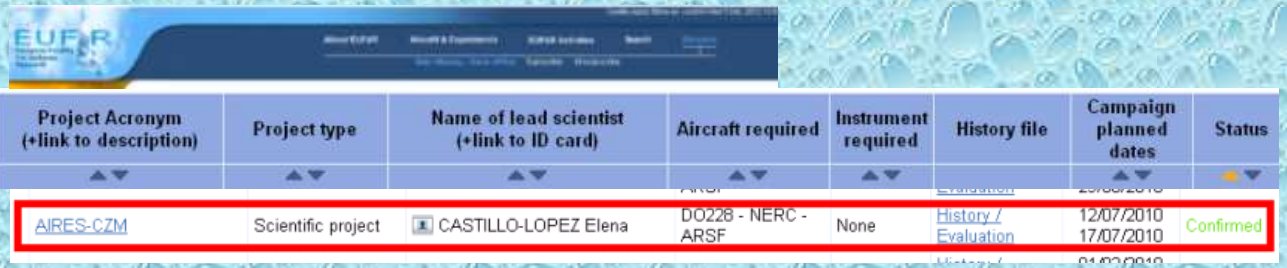
Global Observatory of Lake Responses to Environmental Change

NATURAL ENVIRONMENT RESEARCH COUNCIL

Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

NOW



Project Acronym (+link to description)	Project type	Name of lead scientist (+link to ID card)	Aircraft required	Instrument required	History file	Campaign planned dates	Status
AIRES-CZM	Scientific project	CASTILLO-LOPEZ Elena	DO228 - NERC - ARSF	None	History / Evaluation	12/07/2010 17/07/2010	Confirmed

AIRES-CZM EUFAR Project

HYPERSPECTRAL AISA-EAGLE IMAGES (18/07/2010)

PI: Dra Elena Castillo (elena.castillo@unican.es)

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Workshop 10th to 12th December 2012

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Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

FUTURE ?

Asociación Española de Teledetección

Inicio | Presentación AET | Área de Socios | Publicaciones AET | Grupos Temáticos | Red Nacional de Teledetección | Preguntas

Inicio de sesión

Principal

GRUPOS TEMÁTICOS

Docencia, Carlos Pérez

Algoritmos de tratamiento de imágenes, Mario Lillo Saavedra

Meteorología y Climatología, Francisco J. Tapiador

Teledetección marina, Carlos García Soto

Limnología y aguas continentales, Jose Antonio Domínguez Gómez

Cartografía temática y topográfica, integración de datos y actualización , Luis A. Ruiz

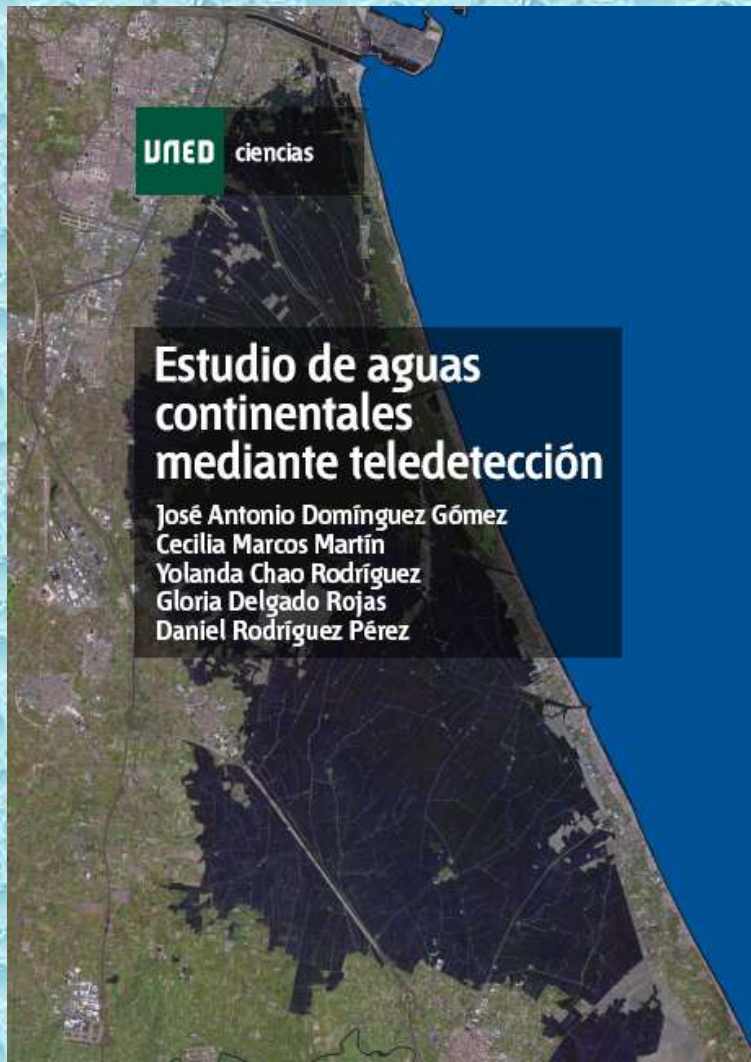
Aplicaciones agrarias, Alfonso Calera del Monte

Incendios forestales, Juan de la Riva

Espectroscopía de campo y laboratorio, Mª del Pilar Martín Isabel

Teledetección geológica, Juan P. Rigol Sánchez

Empresas e Industrias, Moisés Zalba Almándoz



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THANKS FOR YOUR ATTENTION