

Name	<b>Bruno COMBAL</b>
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Nationality	French
Date of birth	30/10/1972

### Work experience

Dates	April 2010 to now
Position	Independent consultant, Paris, France
<ul style="list-style-type: none"> <li>• Expertise linked to the use of remote sensing for monitoring and assessing the environment</li> <li>• Training African staff to the use and administration of the eStation and writing documentation, 2010, Toulouse, France</li> <li>• Training African thematic expert to the exploitation of EumetCast data with the eStation for environmental assessment, 2010, Nairobi, Kenya</li> <li>• Support to EC/JRC for the development of eStation 1.2 (a Eumetcast processing system, see next section) and local support to the regional implementation centres, 2010, JRC, Nairobi, Kinshasa, Gaborone, Mauritius</li> <li>• Training experts for sea monitoring and fishery applications with eStation and PML (Plymouth Marine Lab) data, 2011, Mauritius</li> <li>• Training experts (fishery), 2011, Cape Verde</li> <li>• Computing sea surface temperature fronts, chlorophyll content, for finding potential fishing zones in Indian Ocean, Mauritius, 2012</li> <li>• Contribution to European Commission's eStation End User Requirements for version 2.0 (June-October 2012)</li> </ul>	

Dates	August 2004 to April 2010
Employer	Institute for Environment and Sustainability, Global Environment Monitoring Unit, Joint Research Centre, European Commission, Ispra, Italy
Position	Contractual agent, researcher
<p>I developed indicators and systems for monitoring environment from Earth Observation satellite data, i.a. for Africa</p> <p>Main projects: GMES/Geoland1&amp;2, VGT4Africa, DevCoCast, VGT@Work, AMESD</p> <ul style="list-style-type: none"> <li>- Indicators for assessing the environment developed from users requirements (African partners, EC DG-Aidco), definition of environmental indicators and development of a system for producing them (eStation) and allowing collaborative reports writing.</li> <li>- Monitoring Earth with satellites: definition and development (tests, coding and production) of production chains for monitoring vegetation, surface water and fires. Chains in production for DevCoCast at VITO</li> <li>- Development of the eStation: automatic system for ingesting Earth Observation data (i.a. broadcasted by EumetCast) and generating environmental indicators. Management of a team of informatics engineers. The system is delivered to AMESD project and installed in 47+ African countries</li> <li>- Training and building capacity for African partners, i.a. to Kenya (ICPAC), Botswana (DFRR, DMS), Niger (Agrhymet), Congo (CICOS) and Haitian trainees</li> <li>- Definition of scientific products, coordination of work between institutions, including CEDEAO, CEMAC, IGAD and SADC representatives</li> <li>- Managing and organising work of engineers and students</li> </ul>	

Dates	February 2002 to July 2004
Employer	SCOT (subsidiary of CNES), Toulouse, France
Position	Expert in Earth Observation and modelling

Project leading  
 Precision farming: development of a SPOT/HRV processing chain (atmospheric correction, crop development stages, ...), organisation of field calibration campaigns.  
 Many projects for agriculture: water resources management, land degradation assessment...  
 Development of new offers (high and medium resolution): detection of sunflowers in Ukraine, early detection of nitrate capturing plant in Britain...  
 Installation of a L/HRPT receiving station in Saudi Arabia (AVHRR/VEGETATION/FENG-YUN)  
 Supervision of trainees and technicians

Dates	December 1999 to November 2001
Employer	CNES (Centre National des Etudes Spatiales), Toulouse, France
Position	Postdoc at INRA (Institut National de la Recherche Agronomique), Avignon
Development of algorithms for retrieving vegetation biophysical variables from satellite hyperspectral data: inverse problem regularisation with ancillary information, estimate of uncertainties sources. Development of different type of algorithms (minimisation, lookup tables, neural networks). Participation to CALVAL field campaigns. Supervision of students.	

## Education and training

Dates	September 1996 to August 1999
Employer	CNRS (Centre National de la Recherche Scientifique)
Position	PhD at LaMP (Laboratoire de Météorologie Physique), Clermont-Ferrand
Modelling radiative transfer in vegetation growing on a slope. Definition of the optimal observing conditions for a satellites (angles and wavelengths) for extracting vegetation biophysical parameters: analysis of theoretical aspects (information theory) and technical aspects (design and coding of algorithms).	

Dates	September 1995 to September 1996
Employer	Laboratoire d'Aérodynamique, Univ. Paul Sabatier, Toulouse, France.
Modelling conditions triggering lightnings: modelling, developing algorithms, coding, writing articles and conference papers. Military service as "scientifique du contingent"	

Date	1995
Establishment	Laboratoire de Météorologie Physique, Univ. Blaise Pascal, Clermont-Fd.
Main subjects	Atmospheric physics & chemistry, radiative transfer (atmosphere, clouds, vegetation), scientific informatics. Internship: INRA of Avignon; using a micro-wave sensor for estimating wheat biomass and water content
Diploma	DEA (Diplôme d'Études Approfondies) in "Sciences de la Terre et de l'atmosphère". Mention "Bien", ranked 1 <sup>st</sup> .

Date	1994
Establishment	Univ. Blaise Pascal, Clermont-Ferrand.
Diploma	Master in fundamental physics

## Personal skills and competencies

Languages	
<b>French</b>	Mother tongue
<b>English</b>	Fluent in Listening, reading and spoken interaction

<b>Italian</b>	Average
<b>German</b>	Beginner

Technical skills	
<i>Professional</i>	Modelling physical processes, algorithm Processing satellite images and data, Geographic Information Systems Strong expertise in remote sensing, in particular for low/medium resolution / high repetitivity sensors (Vegetation, AVHRR, Modis, Meris, ...)
<i>Informatics</i>	Software: ArgGis, ArcView, ENVI/IDL, Matlab, Erdas Imagine, windisp, Quantum GIS Langages: C/C++, Python, gdal, Fortran, IDL, PV-Wave, postgresQL, shell (csh, bash, ksh...), php, javascript, plugins for Quantum GIS (PyQT) Sounded experience in designing processing system and leading small teams Radiative transfer models: Sail, Prospect, SMAC, 6S, RPV, ... Operating systems: Unix/Linux, Windows, Mac OSX

Other activities	Since 2002: reviewer for "Remote Sensing of Environment" 1999-2001: co-investigator for AdeosII/GLI (computation, reports)
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## Main Publications

### 2010

Combal B., Bartholomé E., Brivio P.A., Boschetti M., Stroppiana D. and Martini M., 2010, *The NARMA-geoland2 e-station an Earth Observation based decision support system tool for real time environmental monitoring in Africa*, ISPRS GI4DM Remote Sensing And Geo-Information For Environmental Emergencies, Torino (Italy), 2-4 February 2010, CD, ISBN 978-88-903132-3-3

### 2009

Combal and Bartholomé, 2009, *Retrieving Phenological Stages from Low Resolution Earth Observation Data* in Optical Observation of Vegetation Properties and Characteristics, Maselli F., Menenti M. & Brivio P. A. editors, Research Signpost, Trivandrum, Kerala, India

Brivio P.A., Boschetti M., Stroppiana D., Combal B., Bartholomé E, 2009, *La Qualità delle Osservazioni nelle Analisi di Serie Temporal di Dati NDVI a Scala Regionale in Africa*, 13a Conferenza Nazionale ASITA, 01-04/12/2009

Combal B, Noël J., 2009, *Projection of Meteosat Images into World Geodetic System WGS-84 Matching Spot/Vegetation Grid*. EUR 23945 EN. Luxembourg (Luxembourg): OPOCE; JRC52438

Combal B, Haas E, Bartholomé E., 2009, *Detection of Surface Water with Spot/Vegetation. Monitoring and Assessing CILSS Countries Surface Water Availability*. EUR 23934 EN. Luxembourg (Luxembourg): OPOCE; JRC51712

Combal B, Haas E, Andigué J, Nonguierma A, Bartholomé E., 2009, *Operational Monitoring of Water Bodies in Arid and Semiarid Regions with SPOT/VEGETATION Satellite: Contribution of EUMETCAST and Recent Research Projects*. Sécheresse 20 (1); p. 48-56. JRC47410

Atzberger C, Klisch A, Combal B, Vrieling A, Udelhoven T., 2009, *Linked SST and NDVI Anomalies - First Preliminary Results*. Oral presentation in: The 33rd International Symposium on Remote Sensing of Environment; 04 May 2009; Stresa (Italy); ISPRS (Organiser). JRC52136

Combal B, Haas E, Bartholomé E., 2009, *Detection of Surface Water with Spot/Vegetation. Monitoring and Assessing CILSS Countries Surface Water Availability*. EUR 23934 EN. Luxembourg (Luxembourg): OPOCE; JRC51712

Dubois G, Combal B, Nelson A., 2009, *On the Possible Use of Indicator Variograms for Building Ecological Indicators*. In Conference Proceedings: Proceedings of the 33rd International Symposium on Remote Sensing of Environment (ISRSE). Tucson (United States of America): International Center for Remote Sensing of Environment; p. 1-4.

JRC51435

Haas E, Bartholomé E, Combal B., 2009, *Time Series Analysis of Optical Remote Sensing Data for the Mapping of Temporary Surface Water Bodies in Sub-Saharan Western Africa*. Journal of Hydrology 370 (1); p. 52-63. JRC49048

## 2008

Haas E, Bartholomé E, Combal B., 2008, *A Map of Seasonal Recurrence of Temporary Small Water Bodies (TSWB) for Sub-Saharan Western Africa*. Ispra (Italy): European Communities - Joint Research Centre; JRC47444

Haas E, Bartholomé E, Combal B., 2008, *A Map of Humid Areas for Sub-Saharan Western Africa*. Ispra (Italy): European Communities - Joint Research Centre; JRC46983

Haas E, Bartholomé E, Combal B., 2008, *A Temporary Small Water Bodies (TSWB) Map for Sub-Saharan Western Africa*. Ispra (Italy): European Communities - Joint Research Centre; JRC46884

Combal B, Bartholomé E., 2008, *Near Real Time Monitoring of Africa Land Surfaces*. Oral presentation in: The 2nd Workshop on Livestock and Rangeland Monitoring Systems; 07 May 2008; Ispra (Italy); IPSC (Organiser). JRC45503

Balzter H, Gerard F, Weedon G, Grey W, Combal B, Bartholomé E, Bartalev S, Los S., 2008, *Changes of the Arctic Oscillation, Vegetation Phenology and Forest Fires in Siberia*. Poster presentation in: The EGU General Assembly 2008; 13 April 2008; Wien (Austria); European Geosciences Union (Organiser). JRC44973

Nelson A., Bartholomé E., Combal B., Brivio P.A., Boschetti L., Stroppiana D. and Balzter H., 2008, *SPADA User Manual - First Edition*, Joint Research Centre, JRC Scientific and Technical Research series, Office for Official Publication of the European Communities, Luxembourg, EUR 23509 EN FR, 2008

## 2007

Balzter H., Gérard F., George C., Weedon G., Grey W., Combal B., Bartholomé E., Bartalev S. and Los S., 2007, *Coupling of vegetation growing season anomalies and fire activity with hemispheric and regional-scale climate patterns in central and east Siberia*, Journal of Climate, 20:15(3713 -3729)

## 2006

Haas E., Combal B. and Bartholomé E., 2006, *A map of temporary water bodies in Western Africa*, European Space Agency Special Publication ESA SP 634

Combal B., Identifying phenology-related features from temporal vegetation activity signal, 7-10 February 2006, Vienna (Austria)

Combal B., Bartholomé E., Bicheron P., Borstlap G., Bydekerke L., Gontier E., Grégoire J.-M., Jacobs T., Leroy M., Piccard I., Baltzer H., Bartalev S., Rowland C., 2006, *Near real time detection of seasonal changes of vegetation phenology, small water bodies and fires*, GOLD-GOFC, 13-17 October 2006, Moscow (Russia)

## 2004

Di Bella C., Faivre R., Ruget F., Seguin B., Guéris M., Combal B., Weiss M. and Rebella C., 2004, *Use of remote sensing data to improve STICS-Prairie simulated data of pastures production in France*, Agronomie 24: 437-444.

Di Bella C., Faivre R., Ruget F., Seguin B., Guéris M., Combal B., Weiss M. and Rebella C., 2004, *Remote sensing capabilities to estimate pasture production in France*, International Journal of Remote Sensing 25 (23): 5359-5372. (IF: 0.99)

Di Bella C., Faivre R., Ruget F., Seguin B., Guéris M., Combal B., Weiss M. and Rebella C., 2004, *Use of SPOT 4- VEGETATION satellite data to improve pasture production simulated by STICS-Prairie included in the ISOP French system*, Agronomie, 24, 437-444.

## 2003

Coquillat S., Combal B. and Chauzy S., 2003, *Corona emission from raindrops in strong electric fields as a possible discharge initiation: comparison between horizontal and vertical field configurations*, J. Geophys. Research, 108, 4205

## 2002

Combal B., Baret F. and Weiss M., 2002, *Improving canopy variables estimation from remote sensing data by exploiting ancillary information. Case study on sugar beet canopies*, *Agronomie*, 22, pp. 205-215.

Combal B. and Isaka H., 2002, *The effect of small topographic variations on reflectance*, *IEEE Trans. Geosci. Remote Sens.*, vol. 40, no 3, pp. 663-670

Combal B., Baret F., Weiss M., Trubuil A., Macé D., Pragnère A., Myneni R.B., Knyazikhin Y. and Wang L., 2002, *Retrieval of canopy biophysical variables from bi-directional reflectance data. Using prior information to solve the ill-posed inverse problem*, *Remote Sens. Environ.*, vol. 84, pp.1-15.

Rochdi N., Baret F., Combal B., Bajolles O., Andrieu B. and Chelle M., 2002, *Inclusion of clumpiness within radiative transfer model*, first International Symposium, Recent Advances in quantitative remote sensing, 16-20 September 2002, Valencia (Spain)

## 2001

Combal B. and Baret F., 2001, *Estimation of chlorophyll content from remote sensing observations in the solar domain*, ISPRS, Physical Measurements and Signatures in Remote Sensing, 8-12 January 2001

Combal B., Baret F., Poilvé H. and Polvérini U., 2001, *Using multispectral reflectance to retrieve LAI and chlorophyll content of maize and soybean*, ISPRS, Physical Measurements and Signatures in Remote Sensing, 8-12 January 2001

Combal B. and Baret F., 2001, *Estimates of chlorophyll content from remote sensing data. Role of prior information*, ASPRS, Saint-Louis (USA), 23-27 April 2001

Di Bella C., Ruget F., Seguin B., Faivre R., Combal B., Weiss M. and Rebella C., 2001, *Utilización de la teledetección y la simulación numérica para la evaluación de la producción de praderas en Francia*, IX Congreso Nacional de Teledetección (19-21 septiembre 2001-Lleida-España)

Trotter C. and Combal B., 2001, *Development of Topographic Correction Algorithms for ADEOS-II GLI data*, FY2001 GLI Workshop, Tokyo, Japan, November 14-16

## 2000

Combal B., Isaka H. and Trotter C., 2000, *Extending a turbid medium BRDF model to allow sloping terrain and vertical plant stand*, *IEEE Trans. Geosci. and Remote Sens.*, vol. 38, no. 2, pp. 798-810

Combal B., Oshchepkov S., Sinyuk A.L. and Isaka H., 2000, *Statistical framework of the inverse problem in retrieval of vegetation parameters*, *Agronomie*, vol. 20, pp. 65-67

Baret F., M. Weiss, D. Troufleau, L. Prévot, B. Combal, 2000, *Maximum information exploitation for canopy characterisation by remote sensing*, Brysson R.J. et al. (ed.), Association of Applied Biology, Cirencester (GBR), Remote sensing in agriculture, Aspects of Applied Biology (GBR), vol. 60, 71-82, 26-28 June 2000

## 1999

Combal B., 1999 : Contributions à l'analyse du problème inverse : Détermination des caractéristiques de la végétation à partir de mesures de télédétection. Thèse de l'Université Blaise Pascal; spécialité : Physique de l'Atmosphère. Clermont-Ferrand, 177 p., Soutenue le 16 décembre 1999. (Directeur de Thèse ; Isaka, H. )

Combal B., Oshchepkov S., Sinyuk A. and Isaka H., 1999, *Information content of the remote sensing measurements in retrieval of vegetation parameters*, ALPS 99, Méribel (France), 18-22 January 1999.

Combal B., Oshchepkov S., Sinyuk A. and Isaka H., 1999, *Analysis of the information content of the remote sensing measurements in retrieval of vegetation parameters*, EGS, The Hague, Netherlands, 19-23 April 1999.

Coquillat S., Chauzy S., Georgis J.-F., Combal B. and Silvani X., 1999, *Discharge initiation by uncharged raindrops falling at terminal velocity in a horizontal electric field*, 11th international conference on atmospheric electricity, Guntersville, Alabama, USA, June 7-11 1999.

Trotter C.M., Combal B. and Pinkey E.J., 1999, *Characterising the topography effect at red and near-infrared wavelengths using juvenile trees on an orientable platform*, 25th annual conference of the remote sensing society, Cardiff, UK, September 1999.

## 1997

Combal B., Coquillat S. and Chauzy S., 1997, *Modelling of raindrop distortion in a horizontal electric field*, 3rd international workshop on physics of lightning, Saint Jean de Luz, France, 15–20 September 1997.

**1996**

Wigneron J.P., Combal B., Wegmuller U. and Matzler C., 1996, *Estimation of microwave parameters of crops from radiometric measurements*, International Journal of Remote Sensing, vol.17, no.14, pp. 2875–2880