

Charles Troupin

Engineer in Physics – PhD in Sciences (Oceanography)

1 – Contact data & networking

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2 – Experience & projects

Summary

Since 2006, I have been involved in several internal, national and European projects dealing with data analysis and management, operational oceanography or numerical modelling. For most of the projects, my contributions consists of inputs to the project proposals, preparation of the deliverables, support to users through manual writing and training workshop organisation, and participation to the meetings of the technical task group and steering committees.



2017/01–present | **Senior researcher** | GeoHydrodynamics and Environment Research (**GHER**), University of Liège

European projects:

2019–ongoing **BlueCloud** (H2020)

Analysis of Continuous Plankton Recorder data and deployment of DIVAnd interpolation tool in a Virtual Research Environment (VRE).

Participation to webinars and support to the VRE users.

2019–ongoing **PHIDIAS** (CEF Telecom)

Deployment and testing of DIVAnd tool in a HPC environment.

Optimisation of data reading and writing.

Contributions to outreach activities (podcast, flyers, webpage).

2019–2021 **EMODnet Physics**: Creation of velocity maps by interpolating drifter and high-frequency radar measurements.

2018–ongoing **EOSC-Hub**: Development of a data analytics platform for marine data.

2017–ongoing **EMODnet Biology**: Creation of gridded fields based on species counts and observations.

2017–ongoing **EMODnet Chemistry**

Creation of gridded field for chemical variables.

Visualisation of the products using the OceanBrowser tool.

Preparation of merged products combining all the regional components.

Generation of XML records for the data catalog.

2017–ongoing **EMODnet Data Ingestion**: Development on new gridded products using the data obtained in the frame of the project.

2017–ongoing **SeaDataCloud** (H2020): Further developing the pan-European infrastructure for marine and ocean data management

Improvement and testing of the DIVAnd software tool.

Development of a user interface for Diva on a Virtual Research Environment.

Preparation of the new regional climatologies.

National projects:

2019–2021 [Multisync](#): combination of satellites measurements at different resolutions to reconstruct suspended particular matter in the North Sea.

2014/03–2017/01 | **Head of Data Centre** | Balearic Islands Coastal Ocean Observing and Forecasting System ([SOCIB](#))

General tasks:

Management of the projects and staff.

Relations with external users (national and European), data providers and other facilities.

Development of applications for the access and visualisation of oceanographic data.

Forecasting of extreme sea level events (*rissaga*) using time series.

Acquisition and processing of satellite, remote-sensing data
(wind, salinity sea surface temperature, chlorophyll concentration).

Analysis and interpretation of multi-platform observations
(High-frequency radar, satellite, stations, mobile platforms).

European projects:

2015–2017 [JERICO-NEXT](#) (H2020): Data management best practices; glider data processing and calibration.

2015–2017 [ODIP 2](#) (H2020): (Ocean Data Interoperability portal)

Analysis of software citation tools.

Test of new standards in data and metadata management .

Data visualisation tools.

2015–2017 Copernicus Marine Environment Monitoring Service, In Situ Thematic Assembly Center (INSTAC):

Elaboration of the Ocean State Report.

Coordinator of the outreach, training and communication activities.

Preparation and participation to the regional user training workshops.

National projects:

2014–2017 BlueFin Tuna: combination of observations and models to understand and predict tuna abundance.

2014–2017 Grumers: Database for jellyfish observations around the Balearic Islands.

2014–2017 [Medclib](#) (Oceanographic data in the Mediranean Sea at one click): Providing access to SOCIB sensors data.

2014–2015 SeaTurtle: Development of a viewer showing turtle trajectories in real-time.

2013/03–2014/03 | **Post-doctoral researcher** | Mediterranean Institute for Advanced Studies ([IMEDEA](#))

European projects:

2013–2014 MyOcean 2, Ocean monitoring and forecasting infrastructure:

Preparation of high-resolution altimetry products in the Mediterranean Sea (MyOcean 2 project).

Analysis of in situ and remote-sensed data in the Balearic Sea.

2011–2015 PERSEUS (Policy-oriented marine Environmental Research for the Southern European Seas)

Processing (interpolation, filtering) and interpretation of multi-sensor measurements
(High-frequency radar, underwater glider, altimeter).

Operational production of regional altimetry maps (satellite imagery).

2010/10–2013/02 | **Research assistant** | [University of Liège](#)

Supervisor of the laboratory "Microscopes" for undergraduate students
(laboratory sessions for 60-80 students, evaluation).

Analysis of total-suspended matter images on the North Sea.

Spatio-temporal interpolation of satellite wind data.

Improvement and testing of DIVA interpolation software tool.

National projects:

2011–2013 HiSea (High-resolution merged satellite Sea surface temperature fields): EOF analysis of satellite images improved with numerical model outputs.

2006/10–2010/09 | **PhD Candidate** | Fund for Research Training in Industry and Agriculture ([National Fund for Scientific Research](#), Belgium), GeoHydrodynamics and Environment Research ([GHER](#), University of Liège)

Projects:

2012–2013 [ODIP](#) (FP7): Establishing and operating an Ocean Data Interoperability Platform
Definition of standards for the data and metadata exchange.

2009–2013 [EMODnet – Chemistry](#): Pilot component for a final operational European Marine Observation and Data Network:

Improvement to the DIVA tool.

Development of the DIVA web-interface.

2009–2013 [SeaDataNet 2](#): Infrastructure for ocean and marine data exchange.

User training

Software development and testing

2008–2009 CAIBEX (Study of the Exchanges between continental shelf and ocean in the Canaries-Iberian marine ecosystem):

Study of the upwelling filament off Cape Ghir (Northwest Africa).

Hydrographic climatology for the North-East Atlantic Ocean.

Implementation of the ROMS model at high-resolution around Cape Ghir and design of process-oriented experiments.

Participation to the CAIBEX cruise onboard *Sarmiento de Gamboa* (summer 2009) off Cape Ghir and processing of the cruise data.

2006–2011 [SeaDataNet](#): Infrastructure for ocean and marine data exchange:

Contribution to the project proposal.

Development, documentation and testing of DIVA software tool.

Organization of the user training workshops.

2010/08–2010/09 | **Trainee** | NATO Undersea Research Center, La Spezia (Italy)

2010/08 REP10 (Recognized Environmental Picture): Analysis and reconstruction of incomplete satellite images on the Ligurian Sea.

Development of an operational, multivariate processing for the reconstruction of incomplete satellite images.

Pre-processing of remote-sensed data (chlorophyll concentration, sea surface temperature).

2005/10–2005/12 | **Research Engineer** | University of Liège

Modeling of Coccolithophore blooms in the Bay of Biscay using a 1-dimensional model (GOTM)

③ – Main research interests

Data visualisation in environmental sciences

Spatial interpolation techniques applied to geophysical data

Processing and analysis of satellite images

High-resolution numerical modelling in coastal areas

Air-sea interactions and influence of physical processes on biology

④ – Education

2006–2011 | PhD in Sciences – Oceanography | University of Liège and University of Las Palmas de Gran Canaria: *Study of the Cape Ghir upwelling filament using variational data analysis and regional numerical model*

👤 Supervisors: J.-M. Beckers and P. Sangrà

📅 Lecture date: 15 September 2011

🔗 <http://hdl.handle.net/2268/105400>

2005–2006 | Advanced Master in Modelling of the Marine Environment | University of Liège and University of Las Palmas de Gran Canaria

Final project: *Simulation of annual cycles of phytoplankton, zooplankton and nutrients using a mixed layer model coupled with a biological model*

👤 Supervisor: P. Sangrà

🔗 <http://hdl.handle.net/2268/112587>

2000–2005 | Civil Engineer in Physics | University of Liège

Final project: *Structuring in granular media*

👤 Supervisors: P.C. Dauby and N. Vandewalle (ULg)

🔗 <http://hdl.handle.net/2268/112588>

4.1 – Training

2019/11/29 Professional software dedicated to research, ULiège (3h), J. Fays, R. Hoyoux

2019/11/29 Software development strategy, ULiège (3h), J. Fays

2018/01/21 Managing an international research team, ULiège (3h), I. Halleux

2016/07 [Big Data: Data Visualisation](#), 2 weeks / 2 hours per week, Queensland University of Technology

2016/06 [SQL: Table Transformation](#), Code Academy

2016/06 [Learn SQL](#), Code Academy

2016/01 [Tropical Mesoscale Convective Systems](#), 1.5 hour, Comet MedEd

2016/01 [Using Scatterometer Wind and Altimeter Wave Estimates in Marine Forecasting](#), 2 hours, Comet MedEd

2015/12 [Monitoring Climate from Space](#), 5 weeks / 3 hours per week, European Space Agency

December 2015 [Google's Python Class](#), 2 days, Google for Education

2012/11/06 Interview in English, Gembloux (1 day), J.-P. Hermann

2012/10/26 Understanding the factors of success and failure in the first year of university, ULg (1/2 day), L. Leduc and B. Mérenne

2012/10/24 Keys and main principles of team management, ULg (1/2 day), L. Maréchal

2012/05/10 Efficient slides and graphics, ULg (2h), J.-L. Doumont (Principiæ)

2011 Structuring written documents, ULg (2h), J.-L. Doumont (Principiæ)

⑤ – Skills and Competencies

5.1 – Technical skills

Data analytics Quality control, Time series analysis, Singular events, Filtering, Data mining, Statistics, Predictive modelling

Engineering Fluid mechanics, Aerodynamics, Finite-Element Method, Atmospheric Physics, Numerical simulations, Numerical analysis, Signal processing, Optimization, High-performance computing

Physical Oceanography Spatial interpolation, Time-Series Analysis, Principal Component Analysis, Process-oriented modelling, Database Management, Satellite Image Processing

5.2 – Soft skills & management

Projects and management Planning and monitoring, scientific and technical reports, teamwork, deadline-conscious, specification documents, applications for grants and supports.

Communication

Oral presentations at international conferences (in English, Spanish or French).

Social networking (outreach) and management of group accounts on twitter (@GHER_ULiege, @SOCIB_data [discontinued]).

Design of conference flyers.

Conference organisation

Main organiser of several editions of the user training workshop for DIVA (participants from European research centres on average).

Member of the organising committee of the 48th International Liège Colloquium on Ocean Dynamics (200 participants from 40 countries).

Member of the scientific committee of several conferences.

5.3 – Languages

Summary

English for the communication with the project partners and for the writing of technical document. Spanish, English and Catalan in the previous working environments.

French Native speaker

Spanish Highly proficient (speaking and writing)

English Highly proficient (speaking and writing)

Catalan Limited working proficiency

German Limited working proficiency

Italian Elementary proficiency

Dutch Elementary proficiency (basic course for beginners)

5.4 – IT skills

</> Programming

Functional programming

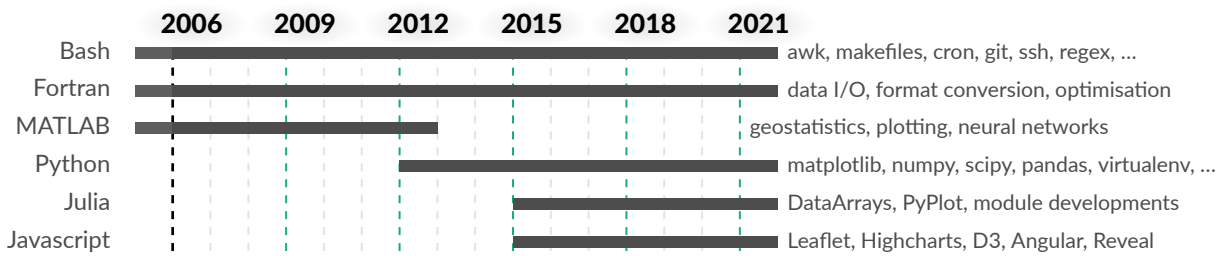
Object oriented programming

Test-oriented development

Control version system (git, svn)

Unit testing
 Continuous integration
 Software citation and reproducibility
 Containerisation (Docker, Singularity)

Languages



Tools

Visualisation: bokeh, matplotlib, folium, plotly, leaflet, cartopy

Data bases: MySQL, PostgreSQL

Operating systems: Linux (Mint, Ubuntu) · Experience with Mac OS X Lion, Microsoft Windows

Image processing: Darktable, GIMP, Inkscape, ImageJ, ffmpeg, Hugin, ImageMagick

Oceanography software: Ocean Data View, DIVA (spatial interpolation), DINEOF (spatio-temporal interpolation of satellite images)

Website: WordPress, Jekyll

Misc: QGIS

5.5 – Teaching and Training

Summary

My experience of training at the University is complemented by several training courses given in the frame of European projects or invited lectures.

2019/10/28–30 *Introduction to scientific Python. Application to Oceanography*, University of Cádiz, Facultad de Ciencias del Mar y Ambientales: Graduate students, researchers and professors.

2017/11/15–17 *Open Sea Lab Workshop*, De Serre, Antwerp: Participant coaching for the EMODnet data access and usage.

2017/04 *Geophysical Fluid Dynamics*, University of Liège, Faculté des Sciences: Master students.

2016/01/27–29 *Introduction to scientific Python. Application to Oceanography*, University of Cádiz, Facultad de Ciencias del Mar y Ambientales: Graduate students, researchers and professors.

2015/12/10–11 CMEMS Regional User Training Workshop dedicated to the Atlantic European South West Shelf Ocean, Lisbon (Portugal): data and tools of the In Situ Thematic Assembly Center (INSTAC).

2015/12/03–04 CMEMS Regional User and Training Workshop dedicated to the Mediterranean Sea, La Spezia (Italy): data and tools of the In Situ Thematic Assembly Center

Manipulation of netCDF files.

Discovery and access to data.

Use of Python and Ocean Data View to process oceanographic data.

2010/10–2013/02 *Physics laboratory (optics)*, University of Liège, Faculty of Medicine and Faculty of Veterinary Medicine: Undergraduate students.

2007–2013 *Physical Oceanography, Risk Management, Marine Meteorology* (assistant), University of Liège, Faculty of Sciences: Undergraduate students.

⑥ – Research stays

3 September - 31 October 2018 Analysis of surface currents in the Gulf of Trieste using high-frequency radar, Marine Biology Station Piran, National Institute of Biology (NIB), Piran (Slovenia).

5 August - 5 September 2010 Analysis of satellite images in the Ligurian Sea, NATO Undersea Research Centre (NURC), La Spezia (Italy).

15 July 2009 - 30 September 2009 Preparation and participation to CAIBEX cruise, Las Palmas (Spain) and Cape Ghir (Morocco).

5 January 2009 - 31 March 2009 Diagnostics on model outputs, ULPGC, Las Palmas de Gran Canaria (Spain).

30 May - 30 August 2008 High-resolution configuration for the model, ULPGC.

5 December 2007 - 5 March 2008 Diagnostics on model outputs, ULPGC.

21 May - 24 August 2007 Design of process-oriented numerical experiments, ULPGC.

5 January - 15 March 2007 Implementation of ROMS numerical model, ULPGC.

⑦ – Scientific contributions

Summary

In the frame of international projects, I authored or co-authored several works published in peer-reviewed journal and mainly focused on data analysis and tools.

30+
Papers in peer-review
journals

100 +
Presentations at
international conferences

Reviewer for
7 journals

📄 Articles

- [1] A. Barth, A. Alvera-Azcárate, C. Troupin, and J.-M. Beckers, 2022. DINCAE 2: multivariate convolutional neural network with error estimates to reconstruct sea surface temperature satellite and altimetry observations. *Geoscientific Model Development Discussions*, 2021:1–26. [doi 10.5194/gmd-2021-353](https://doi.org/10.5194/gmd-2021-353). URL <https://gmd.copernicus.org/preprints/gmd-2021-353/>.
- [2] A. Alvera-Azcárate, D. Van der Zande, A. Barth, C. Troupin, S. Martin, and J.-M. Beckers, Sep 2021. Analysis of 23 Years of Daily Cloud-Free Chlorophyll and Suspended Particulate Matter in the Greater North Sea. *Frontiers in Marine Science*, 8. ISSN 2296-7745. [doi 10.3389/fmars.2021.707632](https://doi.org/10.3389/fmars.2021.707632). URL <http://dx.doi.org/10.3389/fmars.2021.707632>.
- [3] A. Alvera-Azcárate, D. Van der Zande, A. Barth, J. F. Cardoso dos Santos, C. Troupin, and J.-M. Beckers, Feb 2021. Detection of shadows in high spatial resolution ocean satellite data using DINEOF. *Remote Sensing of Environment*, 253:112229. ISSN 0034-4257. [doi 10.1016/j.rse.2020.112229](https://doi.org/10.1016/j.rse.2020.112229). URL <http://dx.doi.org/10.1016/j.rse.2020.112229>.
- [4] A. Barth, C. Troupin, E. Reyes, A. Alvera-Azcárate, J.-M. Beckers, and J. Tintoré, 2021. Variational interpolation of high-frequency radar surface currents using DIVAnd. *Ocean Dynamics*. [doi 10.1007/s10236-020-01432-x](https://doi.org/10.1007/s10236-020-01432-x). URL <http://hdl.handle.net/2268/253954>. In press.
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- [8] A. Barth, A. Alvera-Azcárate, M. Licer, and J.-M. Beckers, Mar 2020. DINCAE 1.0: a convolutional neural network with error estimates to reconstruct sea surface temperature satellite observations. *Geoscientific Model Development*, 13(3):1609–1622. ISSN 1991-9603. doi 10.5194/gmd-13-1609-2020. URL <https://gmd.copernicus.org/articles/13/1609/2020/>.
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- [13] A. Iona, A. Theodorou, S. Watelet, C. Troupin, J.-M. Beckers, and S. Simoncelli, Jul 2018. Mediterranean Sea Hydrographic Atlas: towards optimal data analysis by including time-dependent statistical parameters. *Earth System Science Data*, 10(3):1281–1300. ISSN 1866-3516. doi 10.5194/essd-10-1281-2018. URL <https://www.earth-syst-sci-data.net/10/1281/2018/>.
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- [22] C. Troupin, A. Pascual, G. Valladeau, I. Pujol, A. Lana, E. Heslop, S. Ruiz, M. Torner, N. Picot, and J. Tintoré, 2015. Illustration of the emerging capabilities of SARAL/AltiKa in the coastal zone using a multi-platform approach. *Advances in Space Research*, 55(1):51–59. doi 10.1016/j.asr.2014.09.011. URL <http://www.sciencedirect.com/science/article/pii/S0273117714005754>.
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7.1 – Invited Editor

Ocean Dynamics: Special Issue for the 50th Liège Colloquium on Ocean Dynamics,  [10.1007/s10236-020-01421-0](https://doi.org/10.1007/s10236-020-01421-0)
 Ocean Dynamics: Special Issue for the 48th Liège Colloquium on Ocean Dynamics,  [10.1007/s10236-018-1173-5](https://doi.org/10.1007/s10236-018-1173-5)

7.2 – Reviewer

Earth System Science Data, Ocean Science, Ocean Dynamics, Ocean Engineering, Journal of Marine Systems, Journal of Geophysical Research – Ocean, Remote Sensing of Environment

7.3 – Doctoral thesis tribunal

2017/09/25 Bàrbara Barceló-Llull (ULPGC, Spain)

Shedding light into mesoscale dynamics and vertical motion through synthetic and in situ observations

2017/09/16 Yeray Santana Falcón (ULPGC, Spain)

Transport, Respiration, and Sequestration of Organic Carbon in the Canary Current Ecosystem: Relevance within the Global Carbon Cycle

7.4 – Undergraduate student training

2020-2021 Hugo Romanelli (ULiège), supervision

2012/05/12–2012/05/19 Joaquim Pereira Bento (Uni-Kiel, Germany)

In situ and satellite data interpolation

2011/09–2011/11 Nikolaos Zarokanellos (HCMR, Greece)

Data interpolation for the Eastern Mediterranean Sea

2009/01–2009/05 Marc Piedeleu (ULPGC, Spain)

Analysis of in situ observations south of the Canary Islands

2008/11–2008/12 Anna Rabitti (OGS, Italy)

Spatial interpolation of in situ data in the Adriatic Sea

7.5 – Organisation of conferences

Summary

From 2006 on, I have organised several editions of a training workshop about an interpolation software tool (DIVA) and helped in the organisation of the International Liège Colloquium on Ocean Dynamics. In 2016, I co-organised the 48th Edition on *Submesoscale processes*, which gathered over 200 scientists from 40 countries.

2021/04/12-14 IMDIS Conference (online): member of the Scientific Committee and co-chair of the "Products" session.

2020/05/4-8 EGU General Assembly 2020 (online): Co-convener of the session "Open session on ocean processes and techniques".

2016/05/23–27 48th International Liège Colloquium on Ocean Dynamics on *Submesoscale Processes: Mechanisms, Implications and new Frontiers* (Liège, Belgium)

Invitation of keynote speakers.

Applications for sponsorship.

Preparation of the scientific program.

Design of the conference flyer.

Organisation of social events.

2012/10/08–12 6th Diva workshop (Roumaillac, France)

Scientific content.

Invitation of the participants.

Logistic: meeting venue, transportation from/to the airport.

2010/11/03–06 5th Diva workshop (Calvi (France)

2009/10/23–26 4th Diva workshop (Calvi, France)

2008/10/15–17 3rd Diva workshop (Calvi, France)

2007/11/04–06 2nd Diva workshop (Calvi, France)

2006/11/13–15 1st Diva workshop (Liège, Belgium)

Workshop program.

General logistics.

⑧ – Misc

8.1 – Grants and funding

2011/04 & 2015/04 EGU Young Scientist's Travel Award

2008/05–2008/09 Travel grant (French Community of Belgium)

2006/10–2010/09 Fund for Research Training in Industry and Agriculture (National Fund for Scientific Research, Belgium)

2006/02–2006/09 *Erasmus* travel grant (European Commission)

2005/09–2005/12 *Pisart* supervision grant: creation of the presentation support for the course *Thermodynamics of continuous media* in LaTeX

2004/02–2004/06 State grant: writing of the course notes for the course *Further Study of Digital Analysis (Equations with Partial Derivatives)*

8.2 – Representation

2019–ongoing Delegate at the Faculty of Sciences for the scientific staff

2017–ongoing Delegate at the Department Council (Astrophysics, Geophysics and Oceanography, ULiège)

2015–2016 Member of the Monitoring Committee of the Framework Agreement between AEMET and SOCIB

2003–2005 Student delegate

2011–2013 Delegate at the Department Council (Astrophysics, Geophysics and Oceanography, ULiège)

8.3 – Memberships

European Geosciences Union (EGU)

American Geophysical Union (AGU)


Cloud Appreciation Society

8.4 – Personal interests

 **Running:** trails, mountain races, track

 **Photography:** landscape, portraits, time-lapse, astro-photography

 **Travel blogging**

 **Road cycling**