

Updated on 26 April 2020

## CURRICULUM VITAE

### Gilberto Câmara

Prof. Dr. Gilberto Câmara is a Brazilian researcher in Geoinformatics, GIScience, Spatial Analysis, and Land Use Modelling, who works at Brazil's National Institute for Space Research (INPE). He is internationally recognized for promoting free access for geospatial data and for setting up an efficient satellite monitoring of the Brazilian Amazon rainforest. After retiring from INPE in June 2016 after 35 years of work, he continues to conduct R&D activities at INPE as a Senior Research Fellow.

Gilberto was INPE's assistant director for Earth Observation from October 2001 to December 2005, and INPE's director general from December 2005 to May 2012. During his term in as INPE's director general, the institute's budget grew from US\$ 90 million in 2004 to US\$ 250 million in 2010. Under his guidance, INPE's team achieved big advances in land change monitoring using remote sensing, leading to a major decrease in the deforestation in Amazonia. The leading scientific journal *Nature* called this reduction in deforestation to be "*the biggest environmental success story in decades*".

Gilberto led the Brazilian team which, working together with researchers from IIASA (International Institute for Applied System Analysis), developed the technical studies that supported the land use component of Brazil's Nationally Determined Contribution (NDC) to the Paris Agreement on Climate Change.

Gilberto has advised 25 PhD dissertations and 28 Master thesis and published 125 peer-reviewed papers that have been cited more than 12,500 times (Google Scholar, April 2020). He was a member of the Scientific Steering Committee of Global Land Project from 2006 to 2011. From June 2013 to May 2015, he was the Brazil Chair at the University of Münster (Germany), with support from the Brazilian agency CAPES.

As recognition for his work, he was inducted as a *Doctor honoris causa* from the University of Münster (Germany) and as a *Chevalier (Knight)* of the *Ordre National du Mérite of France*. He received the Global Citizen Award of the *Global Spatial Data Infrastructure Association*. He is also a Fellow of the Faculty of Geoinformation Science and Earth Observation (ITC) of the University of Twente (Netherlands) and a Senior Member of the Association for Computing Machinery (ACM). He received the William T. Pecora award from NASA and USGS for "*leadership to the broad and open access to remote sensing data*".

From 2015 to 2018, he represented the São Paulo Research Foundation (FAPESP) in the Belmont Forum of funding agencies for global change research, and was one of a co-chairs of the Belmont Forum (2016-2017).

He has been appointed Director of the Secretariat of the Group on Earth Observations (GEO), for the period July 2018 to June 2021. As director for GEO Secretariat, he applies his vision on open knowledge to help developing nations to best use Earth observation data for improving societal well-being and sustainable development practices.

## PERSONAL DATA

Born in Fortaleza (Brazil), 29.03.1956.

Married com Vera Lúcia Guimarães, with one daughter (Anita).

## INTERNET

e-mail: [gilberto.camara@inpe.br](mailto:gilberto.camara@inpe.br)

homepage: <http://www.dpi.inpe.br/gilberto>

ORCID ID: [orcid.org/0000-0002-3681-487X](http://orcid.org/0000-0002-3681-487X)

ResearcherID (ISI): K-2845-2012

Google Scholar: [scholar.google.com/citations?user=0b8sNIIAAAAJ&hl=en](https://scholar.google.com/citations?user=0b8sNIIAAAAJ&hl=en)

Research Gate: [www.researchgate.net/profile/Gilberto\\_Camara2](http://www.researchgate.net/profile/Gilberto_Camara2)

## ACADEMIC DEGREES

BSc in Electronic Engineering, ITA (Aeronautics Technology Institute), 1979.

MSc in Computer Science, INPE, 1982. Thesis: "Methods for Image Interpolation using FIR Filters" (advisor: Prof. Dr. Nelson D.A. Mascarenhas).

PhD in Computer Science, INPE, 1995. Dissertation: "Models, Languages and Architectures for Geographical Databases" (advisor: Prof. Dr. Marco Casanova).

## PROFESSIONAL EXPERIENCE

1980-2016	Researcher, Image Processing Division, INPE
1990	Consultant, European Weather Centre, Reading, UK
1991-1996	Head of Image Processing Division, INPE
1997	Consultant, European Weather Centre, Reading, UK
1998–2001	Coordinator of Geoinformatics Research Program, INPE
2001-2005	Director for Earth Observation, INPE
2005-2012	Director General, INPE
2013-2015	Brazil Chair at the Institute for Geoinformatics at the University of Münster (Germany)
2016-present	Senior research fellow, INPE
2016-2018	Co-chair, Belmont Forum of Research Funding Agencies
2018-present	Director of the Secretariat of the Group on Earth Observations (GEO)

## RESEARCH PRODUCTION INDICATORS

Peer-reviewed scientific papers	125
Edited books	6
Book chapters	38
Citations (Google Scholar – 26/April/2020)	12,620
H-index (Google Scholar - 26/April/2020)	47
MsC thesis advised	28
PhD dissertations advised	25

## AWARDS

1. Commander of the Order of Rio Branco, Brazilian Foreign Service, 2007.
2. Fellow, Faculty of Geo-Information Science and Earth Observation (ITC), University of Twente (Holanda), 2009.
3. Doutor Honoris Causa, Geosciences Faculty, Westfälische Wilhelms-Universität Münster (Germany), 2011.
4. Senior Member, Association for Computing Machinery, 2011.
5. Commander of the Order of Aeronautic Merit, Brazilian Air Force, 2011.
6. Medal for Legislative Merit, Brazilian National Congress, 2011.
7. Commander of the Order of Scientific Merit, Brazil, 2012.
8. Global Citizen Award, Global Spatial Data Infrastructure Association. 2012.
9. Pecora Award for contributions to Remote Sensing, NASA/USGS, 2012.
10. Chevalier of the Ordre National du Mérite of France, 2012.

## RESEARCH GRANTS

OBS: Grant values are given in R\$ (in the grant period) and have been converted to Euros, after adjusting for inflation and considering equivalent costs for projects in US and Europe.

### 1. Geoinformatics: Systems and Techniques (1994-1997)

Funding: CNPq (National Research Council of Brazil).

Objective: Research on spatial interoperability and geographical databases.

Participants: IBM Brazil, PETROBRÁS, EMBRAPA, UFRJ, TELEBRAS, UNICAMP, UFPE, UFGO, INPE, PUC-RJ.

Role in Project: Adjunct co-ordinator.

Grant: R\$ 1,650,000 (1994) – current value: € 2,800,000.

### 2. NSF-CNPq Collaborative Research on Integrating Geospatial Information (1999-2002)

Funding: CNPq and NSF/EUA.

Objective: Cooperative research in Geoinformatics.

Role in project: Principal investigator.

Participants: PUC-RJ, INPE, UNICAMP, Univ Maine (USA).

Grant: R\$ 250,000 (1999) – current value: € 400,000.

- 3. Social Dynamics, Environmental Quality and Intraurban Spaces in São Paulo: A Socio-spatial Analysis (2002-2004)**  
Funding: FAPESP (São Paulo Research Foundation)  
Objective: Research on spatial indicators of inequality and social exclusion.  
Role in project: Associate investigator.  
Participants: PUC-SP, INPE.  
Grant: R\$ 450,000 (2002) – current value: € 450,000.
- 4. TerraLib (2003-2004).**  
Funding: CNPq (National Research Council of Brazil).  
Objective: An open source library to support innovative Geoinformatics R&D.  
Role in project: Principal investigator.  
Participants: PUC-RIO, INPE, PRODABEL.  
Grant: R\$ 1,300,000 (2003) – current value: € 950,000.
- 5. GeoWeb (2004-2005)**  
Funding: FINEP (Brazilian Foundation for Innovation)  
Objective: R&D in geospatial web services.  
Role in project: Associate investigator.  
Participants: PUC-RIO, INPE.  
Grant: R\$ 249 000 (2004) – current value: € 200,000.
- 6. eduGILA – Latin American Network for Education in Geoinformatics (2002-2007).**  
Funding: European Commission – ALFA program.  
Objective: International cooperations in teaching and research in Geoinformatics.  
Rôle in project: Coordinator of the Brazilian team.  
Participants: Univ Münster (Germany), Univ Jaume I (Spain), Univ Nova de Lisboa (Portugal), INPE, UFPE (Brasil), Univ Toluca (Mexico), Univ Concepcion (Chile).  
Grant: € 350,000.
- 7. Open Modeller (2005-2009)**  
Funding: FAPESP (São Paulo Research Foundation)  
Target: R&D in ecological niche modelling for biodiversity research.  
Coordinator: Vanderlei Canhos (CRIA – Environmental Informatics Centre).  
Role in project: Associate investigator.  
Participants: CRIA, INPE, USP.  
Grant: R\$ 1 750 000 – current value: € 940,000.
- 8. Land use change in Amazonia: institutional analysis and modeling at multiple temporal and spatial scales (2010-2014)**  
Funding: FAPESP (São Paulo Research Foundation)  
Target: Modelling human-environment interactions in the Brazilian Amazonia.  
Role in project: Principal investigator.  
Participants: INPE, UFPA (Univ Pará), Goeldi Research Museum.  
Grant: R\$ 1,870,000 – current value: € 820,000.

**9. TerraME: Multiscale Modelling of Human-Environment Interactions (2011-2014)**

Funding: CNPq (National Research Council of Brazil).

Role in project: Principal investigator.

Target: R&D in software for environmental modelling and land change modelling.

Participants: INPE, UFOP (Univ Ouro Preto), UFMG (Univ Minas Gerais).

Grant: R\$ 262,700 – current value: € 100,000.

**10. REDD-PAC: REDD+ Policy Assessment Center (2012-2015)**

Funding: Germany International Climate Initiative.

Objective: Identify REDD+ policies that are economically efficient and socially fair.

Role in project: Co-ordinator of the Brazilian team.

Participants: IIASA (leader), INPE, IPEA, UNEP/WCMC, COMIFAC.

Grant: € 670,000 (Brazilian part) – total budget is € 2,500,000.

**11. e-sensing: Big Earth observation data analytics for land use and land cover change information (2015-2018)**

Funding: FAPESP – São Paulo Research Foundation.

Objective: Build and deploy a new type of knowledge platform for organization, access, processing and analysis of big Earth Observation data.

Role in project: Principal investigator.

Grant: equivalent to € 1,200,000.

**12. RESTORE+: Addressing Landscape Restoration on Degraded Land in Indonesia and Brazil (2017-2022)**

Funding: Germany International Climate Initiative.

Objective: land use planning capacity in relation to degraded and marginal lands in Indonesia and Brazil.

Role in project: Co-ordinator of the Brazilian team.

Grant: € 1,300,000 (Brazilian part) – total budget is € 7 000 000.

**LANGUAGE PROFICIENCY (CEFR SCALE)**

1. English – C2
2. French – C1
3. Spanish – B2
4. Italian – B1
5. German – A1

**SOFTWARE DEVELOPMENT SKILLS**

Proeficient: R, C++, C, Haskell.

Familiar: python, FORTRAN, PHP, PASCAL, PostgreSQL.

## **OPEN SOURCE SOFTWARE DEVELOPED WITH PERSONAL LEADERSHIP**

- 1. SITIM (Image Processing System) - SGI (Geographical Information System) (1984-1991)**  
SITIM/SGI was a PC/MS-DOS image processing and GIS software written in C. My rôle in project was in project coordination and software development. SITIM/SGI was installed in more than 150 universities and R&D labs in Brazil.
- 2. SPRING – Object-oriented image processing and GIS (1992-present)**  
SPRING is standalone image processing and GIS open source software written in C++ with more than 1,5 million lines of code. It has reached more than 250.000 unique registered users. My rôle in the project was to be project coordination (1992-1996), and responsible for designing SPRING’s object-oriented data modelling and its map algebra language.
- 3. TerraLib – Library for large scale enviromental databases (2001-present)**  
TerraLib is a library to support environmental research and applications, including mapping and monitoring deforestation and land use change, written in C++. My role in the project was to be the principal software architect (2001-2005). TerraLib supports Brazil’s Amazonia monitoring systems. Registered in Brazil’s IP Institute (BR 51 2019 000876-6).
- 4. SITS – Satellite Image Time Series Analysis (2016-present)**  
SITS is an R package for satellite image time series analysis. My role in the project is to be chief developer. The package is available at <https://github.com/e-sensing/sits>

## **TEACHING – COURSES IN MSC AND PHD PROGRAMS**

### **GRADUATE-LEVEL COURSES IN BRAZIL (INPE – National Institute for Space Research)**

(NB. INPE has MSc and PhD graduate programs, including Computer Science, Earth System System and Remote Sensing; INPE has no undergraduate programs).

**Research Methods** – Earth System Science and Computer Science Graduate Programs (2003-present).

**Introduction to Geoinformatics** – Computer Science and Remote Sensing Graduate Programs (1998-2005).

**Spatial Analysis** – Computer Science and Remote Sensing Graduate Programs (2001-2005).

**Geographical Databases** - Computer Science Graduate Programs (2001-2006).

**Advanced Software Engineering** – Computer Science in INPE (2001-2007).

**Introduction to Earth System Science Modelling** - Earth System Science and Computer Science (2007-2018).

### **GRADUATE-LEVEL COURSES IN GERMANY (Inst for Geoinformatics, Univ of Münster)**

**Spatial Data Analysis** - Winter Semester 2005/2006.

**Spatial Dynamical Modelling** - Winter Semester 2006, Summer Semester 2008.

**Spatio-Temporal Information for Society** - Winter Semesters 2013-2014, 2014-2015, and 2015-2016.

**Introduction to Geographical Information Science** - Summer Semester 2014, Summer Semester 2015.

## DOCTORATE STUDENTS ADVISED

1. Bianca Pedrosa, “TerraML: uma linguagem para modelagem dinâmica em espaços celulares generalizados” (*TerraML: A Language for Dynamic Modelling in Cell Spaces*). PhD in Computer Science, INPE, 2003.
2. Cláudia Almeida, “Spatial dynamic modelling as a planning tool: simulation of land use change in Bauru and Piracicaba (SP), Brazil”. PhD in Remote Sensing, INPE, 2003 (jointly advised with Antônio Miguel Monteiro).
3. Silvana Amaral, “Geoinformação para estudos demográficos: representação espacial de dados de população na Amazônia brasileira” (*Geoinformation for demographic studies: spatial representation of population data in brazilian Amazonia*). PhD in Spatial Information Systems, University of São Paulo, 2003 (jointly advised with José Roberto Quintanilha).
4. Marcos Neves, “Algoritmos eficientes de regionalização de dados socioeconômicos em bancos de dados geográficos” (*Efficient algorithms for regionalisation of socioeconomic data*). PhD in Remote Sensing, INPE, 2003. (jointly advised with Corina Freitas).
5. Marcelino Pereira Santos Silva, “Mineração de padrões de mudanças em imagens de sensoriamento remoto” (*Data mining of land use change patterns in remote sensing images*). PhD in Computer Science, INPE, 2006.
6. Lúbia Vinhas, “Um subsistema extensível para armazenamento de geo-campos em bancos de dados geográficos” (*An extensible system for image management in geographical databases*). PhD in Computer Science, INPE, 2006.
7. Ana Paula Dutra de Aguiar, “Modeling land use change in the Brazilian Amazon: exploring intra-regional heterogeneity”. PhD in Remote Sensing, INPE, 2006.
8. Tiago Garcia de Senna Carneiro, “Nested-CA: a foundation for multiscale modelling of land use and land cover change”. PhD in Computer Science, INPE, 2006.
9. Fernando Reiner Gibotti da Silva, “Geodiscover: mecanismo de descoberta de dados geográficos na web” (*Geodiscover: finding geographic data on the web*). PhD in Computer Science, INPE, 2006.
10. Taciana Lemos Dias, “Modelagem computacional de mudanças incrementais de objetos espaciais da realidade social” (*Computational modeling of change in socioeconomic spatial objects*). PhD in Computer Science, INPE, 2007.
11. Rodrigo Lilla Manzione, “Regionalized spatio-temporal modelling of water table depths in the Brazilian Cerrado”. PhD in Remote Sensing, INPE, 2007.
12. Ilka Reis, “Data suppression in sensor networks: improving the quality of estimates and the robustness to aberrant readings”. PhD in Remote Sensing, INPE, 2008.
13. Karla Fook, “WBCMS – A service oriented web architecture for enhancing collaboration in biodiversity: the case of species distribution modelling community”. PhD in Computer Science, INPE, 2009 (jointly advised with Antônio Miguel Monteiro).
14. Evaldinolia Gilbertoni Moreira, “Dynamic coupling of multiscale land change models”. PhD in Computer Science, INPE, 2009 (jointly advised with Ana Aguiar).
15. Joice Seleme Mota, “Eliciting the evolution of spatiotemporal objects with case-based reasoning”. PhD in Computer Science, INPE, 2009 (jointly advised with Leila Fonseca).
16. Olga Regina Fradico de Oliveira, “Algebraic modelling of land change objects: understanding change in Amazônia”. PhD in Computer Science, INPE, 2009 (jointly advised with Lúbia Vinhas).

17. Pedro Ribeiro de Andrade Neto, "Game theory and agent-based modelling for the simulation of spatial phenomena". PhD in Computer Science, INPE, 2010 (jointly advised with Antonio Miguel Monteiro).
18. Giovana Mira de Espíndola, "Spatiotemporal trends of land use change in the brazilian amazon". PhD in Remote Sensing, INPE, 2012 (jointly advised with Ana Aguiar).
19. Thales Sehn Körting, "Geographical data mining in image databases". PhD in Remote Sensing, INPE, 2012 (jointly advised with com Leila Fonseca).
20. Karine Reis Ferreira, "An algebra for geospatial data: from observations to events". PhD in Computer Science, INPE, 2012 (jointly advised with Antonio Miguel Monteiro).
21. Sérgio Souza Costa, "Regional scale agent-based modelling of land change: evolving institutional arrangements in frontier areas". PhD in Computer Science, INPE, 2012 (jointly advised with Ana Aguiar).
22. Gilberto Ribeiro de Queiroz, "Cell DB: uma arquitetura de software para modelagem ambiental em espaços celulares com grandes volumes de dados" (*Cell DB: A software architecture for environmental modelling in large cellular spaces*). PhD in Computer Science, INPE, 2012.
23. Victor Wegner Maus, "Land use and land cover monitoring using remote sensing image time series". PhD in Earth System Science, INPE, 2016.
24. Nanki Sidhu, "Fitness for use of global land cover products to detect land change". PhD in Geoinformatics, University of Münster (Germany), 2017 (co-advised with Prof. Dr. Edzer Pebesma).
25. Adeline Maciel, "Spatiotemporal interval logic for reasoning about land use change dynamics". PhD in Computer Science, INPE, 2017.

#### **MASTER STUDENTS ADVISED**

1. Amauri Destri, "Modelos digitais de terreno" (*Digital terrain models*). MSc in Systems Engineering, IME (Military Engineering Institute), 1987.
2. Cláudio Clemente Faria Barbosa, "Álgebra de mapas e suas Aplicações em Sensoriamento Remoto e Geoprocessamento" (*Map algebra applied to Remote Sensing*). MSc in Remote Sensing, INPE, 1997.
3. Lauro Hara, "Técnicas de Apresentação de Dados em Geoprocessamento" (*Visualization Techniques in GIS*). MSc in Remote Sensing, INPE, 1997.
4. Rogério Thomé, "Interoperabilidade em Geoprocessamento: Conversão entre modelos conceituais de sistemas de informação geográfica e comparação com o padrão Open GIS" (*Interoperability in GIS: Conversion of conceptual models in GIS and comparison with Open GIS*). MSc in Computer Science, INPE, 1998.
5. Ivan Soares de Lucena, "Projeto de interfaces para álgebra de mapas em Geoprocessamento no ambiente SPRING" (*Interfaces for Map Algebra in SPRING*). MSc in Computer Science, INPE, 1998.
6. Missae Yamamoto, "Rotulação cartográfica em sistemas de informação geográfica" (*Cartographic point labelling in GIS*). MSc in Computer Science, INPE, 1998 (jointly advised with Luiz Lorena).
7. José Roberto Osses, "Arquiteturas cliente-servidor para disseminação de dados geográficos" (*Client-server architectures for dissemination of geographical data*). MSc in Computer Science, INPE, 2000.



8. Fábio Roque Moreira, “Integração e análise espacial de dados em pesquisa Mineral” (*Spatial data analysis for mineral research*). MsC in Remote Sensing, INPE, 2001 (jointly advised with Raimundo Almeida). First place award for best graduate thesis in Geoinformatics, GeoBrasil Conference, 2002.
9. Simone Bönisch, “Geoprocessamento ambiental com tratamento de Incerteza: Zoneamento pedoclimático para a soja em Santa Catarina (*Environmental modelling with uncertainty mapping: Soil mapping in Santa Catarina*)”. MsC in Remote Sensing, INPE, 2001 (jointly advised with Antonio Miguel Monteiro). Second place award for best graduate thesis in Geoinformatics, GeoBrasil Conference, 2002.
10. Carlos Frederico de Sá Volotão, “Geração e avaliação de ortoimagens para aplicações urbanas (*Generation and evaluation of orthoimages for urban applications*). MsC in Remote Sensing, INPE, 2001.
11. Paulo Lima, “GeoBR: Intercâmbio sintático e semântico de dados geográficos” (*Syntactic and semantic interoperability of geographical data*). MsC in Computer Science, INPE, 2002.
12. Frederico Roman Ramos, “Análise espacial de estruturas intra-urbanas: O caso de São Paulo” (*Spatial analysis of intraurban spaces: the case of São Paulo*). MsC in Remote Sensing, INPE, 2001 (jointly advised with Antônio Miguel Monteiro).
13. Patrícia Genovez, “Território e desigualdades: Análise espacial intra-urbana no estudo da dinâmica de exclusão/inclusão Social no espaço urbano em São José dos Campos - SP” (*Spatial analysis of social inclusion and social exclusion in the urban area of São José dos Campos*). MsC in Remote Sensing, INPE, 2002 (jointly advised with Antônio Miguel Monteiro). Second place award for best graduate thesis in Geoinformatics, GeoBrasil Conference, 2003.
14. Karine Reis Ferreira, “Interface para consultas espaciais em bancos de dados geográficos” (*Interface for spatial queries in geographical databases*). MsC in Computer Science, INPE, 2003 (jointly advised with João Argemiro Paiva).
15. Gilberto Ribeiro de Queiroz, “Algoritmos geométricos para bancos de dados geográficos: da teoria à prática na TerraLib” (*Computational geometry for spatial databases*). MsC in Computer Science, INPE, 2003 (jointly advised with João Argemiro Paiva).
16. Flávia de Fonseca Feitosa, “Índices espaciais para mensurar a segregação residencial (*Spatial indexes of urban segregation*). MsC in Remote Sensing, INPE, 2005 (jointly advised with Antônio Miguel Monteiro).
17. Giovana Espínola, “Seleção de parâmetros em algoritmos de segmentação de imagens por crescimento de regiões com autocorrelação espacial” (*Parameter selection for image segmentation by region growing*). MsC in Remote Sensing, INPE, 2006.
18. Sérgio Costa, “Integration of functional programming and spatial databases for GIS application development”. MsC in Computer Science, INPE, 2006.
19. Danilo Palomo, “An algebra for OpenGIS coverages”. MsC in Computer Science, INPE, 2007.
20. Frederico Bede, “Comparação do desempenho dos índices R-tree, grades fixas, e curvas de Hilbert para consultas espaciais em bancos de dados geográficos” (*Performance analysis of R-tree, grid files and Hilbert curves for spatial queries in geographical databases*). MsC in Computer Science, INPE, 2008.

21. Vanessa Souza, "Serviços cooperativos de centros de imagens de Sensoriamento Remoto" (*Cooperative services for Remote Sensing data centres*). MsC in Computer Science, INPE, 2008.
22. Alexandre Copertino Jardim, "Integração semântica de dados geográficos para estudos em modelagem de distribuição de espécies" (*Semantic integration of spatial data for species distribution modelling*). MsC in Computer Science, INPE, 2010 (jointly advised with Lúbia Vinhas).
23. Thomas Piribauer, "Land-use change modeling in the Brazilian Amazon - Exploring the impact of environmental factors". MsC, Institut für Geoinformation und Kartographie Technische Universität Wien, 2010 (jointly advised with Andrew U. Frank and Ana Aguiar).
24. Mário Pettinati, "Simplificação de subdivisões planares derivadas de processamento digital de imagens de Sensoriamento Remoto" (*Simplification of planar subdivisions derived from Remote Sensing image processing*). MsC in Computer Science, INPE, 2011 (jointly advised with Lúbia Vinhas).
25. Talita Assis, "Modelagem de processos de mudanças de uso da terra" (*Modelling land use change processes*). MsC in Computer Science, INPE, 2012 (jointly advised with Ana Aguiar).
26. Luiz Gustavo Veras, "Análise de erros de alocação de modelos de uso e cobertura da terra na Amazonia" (*Analysis of allocation errors in land use and land cover change models in Amazonia*). MsC in Computer Science, INPE, 2013 (jointly advised with Pedro Andrade).
27. Merret Buurman, "Regionalisation of the Brazilian Amazon basin for improved land change modelling". Master in Geoinformatics, Institute for Geoinformatics, University of Münster, 2014 (jointly advised with Edzer Pebesma).
28. Christopher Stephan, "Automating near real-time deforestation monitoring with satellite image time series". Master in Geoinformatics, Institute for Geoinformatics, University of Münster, Alemanha (jointly advised com Edzer Pebesma), maio 2015.

#### **DATASETS PUBLISHED IN OPEN ACCESS REPOSITORIES**

1. Gilberto Câmara, Michelle Picoli, Adeline Maciel, Rolf Simoes, Lorena Santos, Pedro Andrade, Karine Ferreira, Rodrigo Begotti, Ieda Sanches, Alexandre Carvalho, Alexandre Coutinho, Julio Esquerdo, Joao Antunes, Damien Arvor, "Land cover change maps for Mato Grosso State in Brazil: 2001-2017 (version 3)". *PANGAEA*, <https://doi.org/10.1594/PANGAEA.899706>.
2. Gilberto Câmara, Merret Buurman, Aline Soterroni, Alexandre Carvalho, Fernando Ramos, Pedro Andrade, Giovana Espíndola, Ricardo Souza, Adriano Affonso, Mariba Pena (2016). "Projections for Land Use Change in Brazil: 2000-2050, links to files in ArcGIS shapefile format". *PANGAEA*, <https://doi.org/10.1594/PANGAEA.866363>.
3. Aline Soterroni, Marluce Scarabello, Fernando Ramos, Aline Mosnier, Alexandre Carvalho, Gilberto Câmara, Michael Obersteiner, Pedro Andrade, Ricardo Souza, Rebecca Brock, Johannes Pirker, Florian Kraxner, Petr Havlik, Valerie Kapos, Erasmus zu Ermgassen, Hugo Valin (2018). "Future environmental and agricultural impacts of Brazil's Forest Code with GLOBIOM-Brazil, links to files in ArcGIS shapefile format". *PANGAEA*, <https://doi.org/10.1594/PANGAEA.895608>.

4. Gilberto Câmara, Rolf Simoes, Michelle Picoli, Pedro Andrade, Ana Rorato, Lorena Santos, Adeline Maciel, Ieda Sanches, Alexandre Coutinho, Julio Esquerdo, Joao Antunes, Damien Arvor, Rodrigo Begotti Alber Sanchez, Gilberto Queiroz, Karine Ferreira (2020). "Land use and land cover maps for Amazon biome in Brazil for 2001-2019 derived from MODIS time series". *PANGAEA*, <https://doi.pangaea.de/10.1594/PANGAEA.911560>.

#### PAPERS PUBLISHED IN ISI INDEXED JOURNALS

*NB. All journals listed in this section are indexed by Science Citation Index Expanded and/or Social Sciences Citation Index.*

1. Gilberto Câmara, Ricardo Souza, Ubirajara Freitas, Juan Garrido, "SPRING: Integrating Remote Sensing and GIS with object-oriented data modelling". *Computers and Graphics*, 15(6): 13-22,1996. DOI:10.1016/0097-8493(96)00008-8.
2. Gilberto Câmara, Miguel Monteiro, "Geocomputation techniques for spatial analysis: are they relevant to health data?" *Cadernos de Saúde Pública (Reports on Public Health)*, 17(5):1059-1081, set/out. 2001. DOI: 10.1590/S0102-311X2001000500002.
3. Missae Yamamoto, Gilberto Câmara, Luiz Lorena, "Tabu search heuristic for point-feature cartographic label placement". *GeoInformatica*, 6(1):77-89, 2002. DOI: 10.1023/A:1013720231747.
4. Fred Fonseca, Max Egenhofer, Peggy Agouris, Gilberto Câmara. "Using ontologies for integrated GIS". *Transactions on GIS*, 6(3):231-257, 2002. DOI: 10.1111/1467-9671.00109.
5. Fred Fonseca, Max Egenhofer, Clodoveu Davis, Gilberto Câmara. "Semantic granularity in ontology-driven geographic information systems". *Annals of Mathematical and Artificial Intelligence*, 36(1-2):131-151, 2002. DOI: 10.1023/A:1015808104769.
6. Claudia Almeida, Michael Batty, Miguel Monteiro, Gilberto Câmara, Britaldo Soares-Filho, Gustavo Cerqueira, Cássio Pennachin, "Stochastic cellular automata modelling of urban land use dynamics: empirical development and estimation". *Computers, Environment and Urban Systems*, 27(5): 481-509, 2003. DOI: 10.1016/S0198-9715(02)00042-X.
7. Fred Fonseca, Clodoveu Davis, Gilberto Câmara, "Bridging ontologies and conceptual schemas in geographic information integration". *GeoInformatica*, 7(4): 355-378, 2003. DOI: 10.1023/A:1025573406389.
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12. Lúbia Vinhas, Ricardo Souza, Gilberto Câmara, "Image data handling in spatial databases". *V Brazilian Symposium on Geoinformatics (GeoInfo 2003)*. Campos do Jordão, Brazil, 2003.
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18. Fernando Gibotti, Gilberto Câmara, Renato Nogueira, "GeoDiscover – a specialized search engine to discover geospatial data in the Web." *VII Brazilian Symposium in Geoinformatics (GeoInfo 2005)*. Campos do Jordão, Brazil, 2005.
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20. Missae Yamamoto, Gilberto Câmara, Luiz Lorena, "Fast point-feature label placement algorithm for real time screen maps". *VII Brazilian Symposium in Geoinformatics (GeoInfo 2005)*. Campos do Jordão, Brazil, 2005.
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22. Karine Reis Ferreira, Lúbia Vinhas, Gilberto Queiroz, Gilberto Camara, Ricardo Souza, "The architecture of a flexible querier for spatio-temporal databases". *VII Brazilian Symposium in Geoinformatics (GeoInfo 2005)*. Campos do Jordão, Brazil, 2005.
23. Sérgio Souza Costa, Gilberto Câmara, Danilo Palomo, "TerraHS: Integration of functional programming and spatial databases for GIS application development". *VIII Brazilian Symposium in Geoinformatics (GeoInfo 2006)*. Campos do Jordão, Brazil, 2006.
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25. Olga Bittencourt, Gilberto Câmara, Lúbia Vinhas, Joice Mota, "Rule-based evolution of typed spatio-temporal objects". *IX Brazilian Symposium on Geoinformatics (GeoInfo 2007)*. Campos do Jordão, Brazil, 2007.
26. Pedro Andrade-Neto, Antônio Miguel Monteiro, Gilberto Câmara, "Entities and Relations for Agent-Based Modelling of Complex Spatial Systems". *2st Brazilian Workshop on Social Simulation (BWSS 2010)*. São Bernardo do Campo, 2010. IEEE Press, 2010.
27. Tiago Carneiro, Gilberto Câmara, Raian Maretto, "Irregular cellular spaces: Supporting realistic spatial dynamic modeling over geographical databases". *X Brazilian Symposium on Geoinformatics (GeoInfo 2008)*. Rio de Janeiro, Brazil, 2008.
28. Karla Fook, Silvana Amaral, Miguel Monteiro, Gilberto Câmara, Marco Casanova, "Sharing executable models through an open architecture based on geospatial web services: a case study in biodiversity modelling". *X Brazilian Symposium on Geoinformatics (GeoInfo 2008)*. Rio de Janeiro, 2008.
29. Paulo Fernando Pimenta, Andrea Coelho, Sergio Costa, Evaldinólia Moreira, Ana Aguiar, Gilberto Câmara, Roberto Araújo, Adagenor Ribeiro, "Land change modeling and institutional factors: heterogeneous rules of territory use in the Brazilian Amazonia". *X Brazilian Symposium on Geoinformatics (GeoInfo 2008)*. Rio de Janeiro, Brazil, 2008.
30. Evaldinolia Moreira, Ana Aguiar, Sérgio Costa, Gilberto Câmara, "Spatial relations across scales in land change models". *X Brazilian Symposium on Geoinformatics (GeoInfo 2008)*. Rio de Janeiro, Brazil, 2008.
31. Manoel Cardoso, Carlos Nobre, Gilvan Sampaio, Dalton Valeriano, Gilberto Câmara, "Modelling of the decrease of tropical-forest resilience in Amazonia as affected by deforestation and fires". *XIV Brazilian Symposium on Remote Sensing*. Natal, 2009.
32. Pedro Ribeiro de Andrade, Miguel Monteiro, Gilberto Camara, "Games on cellular spaces: na evolutionary approach". *EPIA'2009, Fourteenth Portuguese Conference on Artificial Intelligence*. Aveiro, Portugal, 2009. Lecture Notes in Computer Science, vol. 5816, pp. 535-546.
33. Mário Pettinati, Lúbia Vinhas, Gilberto Câmara, Júlio D'Alge, "The role of digital generalization in image segmentation". *XI Brazilian Symposium on Geoinformatics (GeoInfo 2010)*. Campos do Jordão, 2010.

34. Pedro Andrade, Miguel Monteiro, Gilberto Câmara, “From input-output matrices to agent-based models: a case study on carbon credits in a local economy”. *Second Brazilian Workshop on Social Simulation (BWSS)*, 2010. IEEE Press, 2011.
35. Sérgio Costa, Ana Paula Aguiar, Gilberto Câmara Neto, Evaldinolia G. Moreira. “Common concepts in the development of the top-down models of land changes”. *XIV Brazilian Symposium on Remote Sensing*. Natal, 2009.
36. Sérgio Costa, Ana Aguiar, Gilberto Câmara, Tiago Carneiro, Evaldinolia Moreira, “Agent placement for land change models in frontier regions”. *XVI Brazilian Symposium on Remote Sensing*. Curitiba, 2013.
37. Luiz Gustavo Diniz, Merret Buurman, Pedro Andrade, Gilberto Camara, Edzer Pebesma, “Measuring allocation errors in land change models in Amazonia”. *XIV Brazilian Symposium on Geoinformatics (GeoInfo 2013)*. Campos do Jordão, 2013.
38. Carlos Romani, Gilberto Camara, Gilberto Queiroz, Karine Ferreira, Lúbia Vinhas. “Towards a query language for spatiotemporal data based on a formal algebra”. *XVIII Brazilian Symposium on Geoinformatics (GeoInfo 2017)*. Salvador, 2017.

#### **BOOK CHAPTERS IN ENGLISH**

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3. Peter Toledo, Ima Vieira, Gilberto Câmara, Carlos Nobre, “Integrating environmental and social agendas; the experience of the Amazonian networks LBA and GEOMA”. In: Holm Tiessen, Michael Brklacich, Gerhard Breulmann, Romulo Menezes (ed), “*Communicating Global Change Science to Society: An Assessment and Case Studies*”. Washington, Island Press, 2007 (ISBN:1-59726-176-9).
4. Gilberto Câmara, Lúbia Vinhas, Karine Ferreira, Gilberto Queiroz, Ricardo Cartaxo Souza, Miguel Monteiro, Marcelo Carvalho, Marco Casanova, and Ubirajara Freitas. “TerraLib: An open-source GIS library for large-scale environmental and socio-economic applications”. In B. Hall and M. Leahy (ed), *Open Source Approaches to Spatial Data Handling*. Berlin: Springer, 2008.
5. Marcelino Silva, Gilberto Câmara, Isabel Escada, “Image mining: Detecting deforestation patterns through satellites”. In: Hakikur Rahman (ed), *Data Mining Applications for Empowering Knowledge Societies*, pp. 55-75. New York, IGI Publishing, 2008.
6. Clodoveu Davis Jr., Frederico Fonseca, Gilberto Camara, “Understanding global change: The role of geographic information science in the integration of people and nature”. In: Timothy Nyerges, Helen Couclelis, and Robert McMaster (ed), *The SAGE Handbook of GIS and Society*, Thousand Oaks, CA, SAGE Publications 2009.
7. Rodrigo Manzione, Martin Knotters, Gerhard Heuvelink, Jos von Asmuth, G. Câmara, “Predictive risk mapping of water table depths in a Brazilian Cerrado area”. In: Alfred Stein, Wenzhong Shi, Wietske Nijker (ed), *Quality Aspects in Spatial Data Mining*, pp 73-89. Boca Raton, CRC Press, 2009.

8. Gilberto Câmara, Lúbia Vinhas, Clodoveu Davis, Fred Fonseca, Tiago Carneiro. "Geographical information engineering in the 21<sup>st</sup> century". In: Gerhard Navratil (ed.) *Research Trends in Geographic Information Science*, pp.203-214. Berlin, Springer Verlag, 2009 (ISBN: 978-3-540-88243-5).
9. Frederico Fonseca and Gilberto Câmara, "Geo-Ontologies". In: Marguerite Madden (ed.), *Manual of Geographic Information Systems*, pp. 157-164. Bethesda, MD, ASPRS Press, 2009.
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### EDITED BOOKS IN PORTUGUESE

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2. Gilberto Câmara, Antonio Miguel Monteiro, Julio D' Alge, *Introdução à Ciência da Geoinformação (Introduction to Geoinformatics)*. INPE, São José dos Campos, 2001. On-line: <http://www.dpi.inpe.br/gilberto/livro/introd>.
3. Suzana Druck, Marília Carvalho, Gilberto Câmara, Antonio Miguel Monteiro, *Análise Espacial de Dados Geográficos (Spatial Data Analysis)*. Brasília, EMBRAPA, 2004 (ISBN 85-7383-260-6). On-line: <http://www.dpi.inpe.br/gilberto/livro/analise>.
4. Marco Casanova, Gilberto Câmara, Clodoveu Davis, Lúbia Vinhas, Gilberto Ribeiro de Queiroz (eds) *Bancos de Dados Geográficos (Geographical Databases)*. Curitiba, Editora Mundo Geo, 2005, 506 pp. On-line: <http://www.dpi.inpe.br/livros/bdados>
5. Margareth Meirelles, Cláudia Almeida, Gilberto Câmara (eds), *Geomática: Fundamentos e Aplicações (Geoinformatics: Fundamentals and Applications)*. Brasília, EMBRAPA, 2007, 593 p (ISBN: 978-85-7383-386-7).
6. Cláudia Almeida, Gilberto Câmara, Antonio Miguel Monteiro (eds.) *Geoinformação em Urbanismo: Cidade Real x Cidade Virtual (Geoinformatics in Urban Studies: The Real City and the Virtual City)*. São Paulo: Oficina de Textos, 2007. 366 p (ISBN: 978-85-86238-55-0).

### BOOK CHAPTERS IN PORTUGUESE

1. Gilberto Câmara, José Simeão Medeiros, "Princípios básicos do Geoprocessamento" (Basic principles of Geoinformatics). In: Eduardo Assad, Edson Sano (eds.), *Sistema de Informações Geográficas. Aplicações na Agricultura (GIS in Agriculture)*. Brasília, EMBRAPA, 1998, pg. 3-11 (2<sup>nd</sup>-ed).
2. Gilberto Câmara, José Simeão Medeiros, "Mapas e suas representações computacionais" (Maps and their computational representations). In: Eduardo Assad, Edson Sano (eds.), *Sistema de Informações Geográficas. Aplicações na Agricultura (GIS in Agriculture)*. Brasília, EMBRAPA, 1998, pg. 13-29 (2<sup>nd</sup>. ed).

3. Gilberto Câmara, José Simeão Medeiros, “Modelagem de dados em Geoprocessamento” (Data modelling in Geoinformatics). In: Eduardo Assad, Edson Sano (eds.), *Sistema de Informações Geográficas. Aplicações na Agricultura (GIS in Agriculture)*. Brasília, EMBRAPA, 1998, pg. 47-65 (2<sup>nd</sup>. ed.)
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5. Gilberto Câmara, Simeão Medeiros, “Tendências na evolução do Geoprocessamento” (Trends in Geographical Information Systems). In: Eduardo Assad, Edson Sano (eds.), *Sistema de Informações Geográficas. Aplicações na Agricultura (GIS in Agriculture)*. Brasília, EMBRAPA, 1998, pg. 411-424 (2<sup>nd</sup>. ed)..
6. Gilberto Câmara, Marília Sá Carvalho, “Análise espacial na eefinição de políticas públicas em grandes aglomerados urbanos” (Spatial analysis to support public policy in large urban areas). In: Elias Rassi, Cláudia Bógus (eds), *Saúde nos Grandes Aglomerados Urbanos: Uma Visão Integrada (Health in Large Urban Areas)*. Brasília, DF, OPAS, 2003, pg. 137-154.
7. Gilberto Câmara, Antônio Miguel Monteiro, Marília Carvalho, Suzana Druck, “Análise espacial e Geoprocessamento” (Spatial analysis and GIS). In: Suzana Druck, Marília Carvalho, Gilberto Câmara, Antônio Miguel Monteiro (eds), *Análise Espacial de Dados Geográficos (Spatial Data Analysis)*. Brasília, EMBRAPA, 2004.
8. Gilberto Câmara e Marília Carvalho, “Análise espacial de eventos” (Point pattern analysis). In: Suzana Druck, Marília Carvalho, Gilberto Câmara, Antônio Miguel Monteiro (eds), *Análise Espacial de Dados Geográficos (Spatial Data Analysis)*. Brasília, EMBRAPA, 2004.
9. Eduardo Camargo, Suzana Druck, Gilberto Câmara, “Análise espacial de superfícies” (Spatial analysis of continuous distributions). In: Suzana Druck, Marília Carvalho, Gilberto Câmara, Antônio Miguel Monteiro (eds), *Análise Espacial de Dados Geográficos (Spatial Data Analysis)*. Brasília, EMBRAPA, 2004.
10. Gilberto Câmara, Marília Carvalho, Oswaldo Cruz, Marcos Neves, Virginia Correa, “Análise espacial de áreas” (Spatial analysis of 23ole23). In: Suzana Druck, Marília Carvalho, Gilberto Câmara, Antônio Miguel Monteiro (eds), *Análise Espacial de Dados Geográficos (Spatial Data Analysis)*. Brasília, EMBRAPA, 2004.
11. Gilberto Câmara, “Representação computacional de dados geográficos” (*Computational representations of geographical data*). In: Marco Casanova, Gilberto Câmara, Clodoveu Davis, Lúbia Vinhas, Gilberto Queiroz (eds), *Bancos de Dados Geográficos*. Curitiba, Editora Mundo Geo, 2005, pp. 11-52.
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13. Marco Casanova, Daniela Brauner, Gilberto Câmara, Paulo Lima, “Integração e interoperabilidade entre fontes de dados geográficos” (*Integration and interoperability between geographical data sources*). In: Marco Casanova, Gilberto Câmara, Clodoveu Davis, Lúbia Vinhas, Gilberto Queiroz (eds), *Bancos de Dados Geográficos (Spatial Databases)*. Curitiba, Editora Mundo Geo, 2005, pp. 317-352.

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15. Margareth Meirelles, Fábio Moreira, Gilberto Câmara, Ana Coelho, Thales Carneiro, “Métodos de inferência geográfica: aplicação no planejamento regional, na avaliação ambiental e na pesquisa mineral” (Applications of geographical inference in regional planning, environmental evaluation and geological research). In: Margareth Meirelles, Gilberto Câmara, Claudia Almeida (eds), *Geomática: Fundamentos e Aplicações (Geoinformatics: Fundamentals and Applications)*. Brasília, EMBRAPA, 2007, pp.283-386.
16. Bianca Pedrosa e Gilberto Câmara, “Modelagem dinâmica e sistemas de informação geográfica” (Dynamic Modelling and GIS). In: Margareth Meirelles, Gilberto Câmara, Claudia Almeida (eds), *Geomática: Fundamentos e Aplicações (Geoinformatics: Fundamentals and Applications)*. Brasília, EMBRAPA, 2007, pp. 237-280
17. Cláudia Almeida, Gilberto Câmara, Antônio Miguel Monteiro, Britaldo Soares-Filho, Gustavo Cerqueira, “Modelos celulares de dinâmicas espaço-temporais: aplicações em estudos urbanísticos” (Cellular automata modelling of urban evolution). In: Margareth Meirelles, Gilberto Câmara, Claudia Almeida (eds), *Geomática: Fundamentos e Aplicações (Geoinformatics: Fundamentals and Applications)*. Brasília, EMBRAPA, 2007, v. 1, p. 445-496.
18. Frederico Ramos, Gilberto Câmara, Antonio Miguel Monteiro, “Territórios digitais urbanos” (Digital urban spaces). In: Cláudia Almeida, Gilberto Câmara, Miguel Monteiro (eds.), *Geoinformação em Urbanismo: Cidade Real x Cidade Virtual (Geoinformatics in Urban Studies: The Real City and the Virtual City)*. São Paulo, Oficina de Textos, 2007, pp. 34-53.
19. Carolina Pinho, Elizabeth Goltz, Gilberto Câmara, “Ontologia de objetos geográficos: o lote urbano” (Ontology of geographical objects: the urban land parcel). In: Cláudia Almeida, Gilberto Câmara, Miguel Monteiro (eds.), *Geoinformação em Urbanismo: Cidade Real x Cidade Virtual (Geoinformatics in Urban Studies: The Real City and the Virtual City)*. São Paulo: Oficina de Textos, 2007, pp.54-62.
20. Patrícia Genovez, Antonio Miguel Monteiro, Gilberto Câmara, Corina Freitas, “Indicadores territoriais de exclusão/inclusão social: geoinformação como suporte ao planejamento de políticas sociais” (Spatial indexes of social exclusion and inclusion to support public policy). In: Cláudia Almeida, Gilberto Câmara, Miguel Monteiro (eds.), *Geoinformação em Urbanismo: Cidade Real x Cidade Virtual (Geoinformatics in Urban Studies: The Real City and the Virtual City)*. São Paulo, Oficina de Textos, 2007, pp.64-85.
21. Flávia Feitosa, Gilberto Câmara, Miguel Monteiro, Thomas Koschitzki, Marcelino Silva, “De conceitos a medidas territoriais: a construção de índices espaciais de segregação urbana” (*From concepts to spatial measurement: developing spatial indexes of urban segregation*). In: Cláudia Almeida, Gilberto Câmara, Miguel Monteiro (eds.), *Geoinformação em Urbanismo: Cidade Real x Cidade Virtual (Geoinformatics in Urban Studies: The Real City and the Virtual City)*. São Paulo: Oficina de Textos, 2007, pp. 86-105



22. Patrícia Genovez, Miguel Monteiro, Gilberto Câmara, Corina Freitas, “Armadilhas de desigualdade: detecção e dinâmica espacial, trajetória das desigualdades sociais” (*Poverty traps: detection and spatial dynamics of social inequality*). In: Cláudia Almeida, Gilberto Câmara, Antônio Miguel Monteiro (eds.), *Geoinformação em Urbanismo: Cidade Real x Cidade Virtual (Geoinformatics in Urban Studies: The Real City and the Virtual City)*. São Paulo: Oficina de Textos, 2007, pp.106-130 (ISBN: 9788586238550).
23. Flávia Feitosa, Antonio Miguel Monteiro, Gilberto Câmara, “Compatibilização de bases de dados censitários para análises multitemporais com o auxílio de imagens Landsat” (*Matching multitemporal 250m data using remote sensing images*). In: Cláudia Almeida, Gilberto Câmara, Antônio Miguel Monteiro (eds.), *Geoinformação em Urbanismo: Cidade Real x Cidade Virtual (Geoinformatics in Urban Studies: The Real City and the Virtual City)*. São Paulo: Oficina de Textos, 2007, pp.162-170 (ISBN: 9788586238550).
24. Cláudia Almeida, Antonio Miguel Monteiro, Gilberto Câmara, “Perspectiva histórica de modelos de dinâmicas urbanas e regionais” (*Historical perspective of spatiotemporal modelling for urban and regional studies*). In: Cláudia Almeida, Gilberto Câmara, Antônio Miguel Monteiro (eds.), *Geoinformação em Urbanismo: Cidade Real x Cidade Virtual (Geoinformatics in Urban Studies: The Real City and the Virtual City)*. São Paulo: Oficina de Textos, 2007, p. 249-281 (ISBN: 978-85-86238-55-0).

#### **INVITED LECTURES IN INTERNATIONAL EVENTS AND COLLOQUIA**

1. “Frameworks for Sustainability of GIS and Earth Observation Technologies in Developing Countries”. 18<sup>th</sup> International CODATA Conference, Montreal, 2002.
2. “Making International Collaboration Work in Earth Observation: A View from Brazil”. Earth Observation Business Network (EOBN), Vancouver, Canada, May 2002.
3. “CBERS: The Brazilian Experience”. Workshop CBERS-1, Beijing, 2002.
4. “Open Source GIS Development in Brasil”. International Symposium on Open Source and Open Access for Science, CODATA/UNESCO, Paris, 2003.
5. “The Importance of Improving Access to Environmental Data in the Americas”. Keynote lecture at CODATA Inter-American Workshop on Environmental Data Access. Campinas, 2004.
6. “Challenges for Spatio-Temporal Database Research”. Keynote lecture at IX Symposium on Spatial and Temporal Databases (SSTD 2005), Angra dos Reis, 2005.
7. “Earth observation data for everyone: the CBERS experience”. Earth Observation Business Network (EOBN 2006) meeting, Vancouver, 2006.
8. “How can GIScience contribute to land change modeling?” Keynote lecture at 4<sup>th</sup> International Conference on Geographic Information Science – GIScience 2006, Munster, Germany, September 2006
9. “Understanding Land Change in Amazonia: A Multidisciplinary Research Challenge”. IGERT Colloquim Series, Department of Geography, SUNY Buffalo, February 2007.
10. “Modelling Land Change: The Scientific Challenges”. 1<sup>st</sup> Brazilian Symposium on Global Environmental Change, Rio, March 2007.
11. “International cooperation in promoting the use of space-derived geospatial data for sustainable development”. United Nations Committee on Peaceful Uses of Outer Space (COPOUS) 50<sup>th</sup> session, Vienna, June 2007.

12. "Free Earth Observation Data on a Global Scale: A View from Brazil". Keynote lecture at Royal Society, London, October 2007.
13. "Working at a global scale: challenges for a worldwide tropical forest monitoring system". GLP Workshop on Globalization and Land Use, Copenhagen, October 2007.
14. "Why should emerging nations fly into space?". Panel on "Emerging Space Nations", International Space University, Barcelona, July 2008.
15. "Monitoring and Modelling Deforestation in Amazonia". Schermerhorn Innagural Lecture, Opening Academic Year, ITC. Enschede, Netherlands September 2008.
16. "INPE's contribution to REDD Capacity Building: data, applications, and software". Workshop on Capacity Building for REDD, São Jose dos Campos, February 2009.
17. "INPE's vision for monitoring and modelling tropical deforestation". Brazil-Norway Workshop on Forest and Marine Monitoring, March 2009.
18. "Low Carbon Growth in Brazil". World Forum on Enterprise and Environment, Oxford, July 2009.
19. "Beyond OGC Standards: The New Challenges for Open Source GIS". Keynote lecture at International Open Source Geospatial Research Symposium, Nantes, July 2009.
20. "CEOS space agencies: support for climate observations". UNFCCC COP-15 side event on "Global Monitoring of Essential Climate Variables (ECV)", Copenhagen, December 2009.
21. "Impacts of Climate Change in Land Use, Food Security and Agricultural Production in Brazil". UNFCCC COP-15 side event on "Climate change and food security: unifying commitment and action in land-based sectors", Copenhagen, December 2009.
22. "Earth Observation Information and Decision Making: An ongoing story". GEO-IGOS Symposium, Washington, November 2009.
23. "Are we ready for REDD? Multidimensional policies for reducing Amazon deforestation: 2001-2010". Global Land Project – Open Science Meeting, Tempe, Arizona, October 2010.
24. "The challenge of global environmental monitoring". China-Brazil High Level Dialogue in Science and Technology, Beijing 2011.
25. "Extracting Land Change Information from Large Remote Sensing Image Databases". Keynote lecture at Spatial Statistics 2011 Conference, Enschede, Netherlands.
26. "Are we ready for REDD? Multidimensional policies for reducing Amazon deforestation: 2001-2010". Brazil-MIT Forum, April 2011.
27. "Building public good institutions in developing nations". University of Muenster, Doctor honoris causa acceptance speech, 2011.
28. "Land Use Change in Amazonia: Institutional analysis and modeling at multiple temporal and spatial scales". FAPESP Climate Change Program Workshop, May 2011.
29. "New trends for geoinformatics in a changing world". Keynote lecture at Brazilian Symposium on Remote Sensing, May 2011.
30. "Space derived geospatial data for sustainable development". United Nations Committee on Peaceful Uses of Outer Space (COPOUS), Panel on Benefits from Space at United Nations. New York, October 2011.
31. "Land use and human-environment interactions in Amazonia". 50 Years of Science in Brazil and Challenges Ahead, FAPESP Week, Washington, October 2011.

32. "Two decades of monitoring land change in Amazonia: what have we learned?". Keynote lecture at Global Land Project Workshop on Land Changes in South America, November 2011.
33. "Reducing deforestation in Amazonia: how transparency builds governance". Eye on Earth Summit Plenary, Abu Dhabi, December 2011.
34. "I've found the data; it's free and open access. Now what?". Keynote lecture at EuroGeoss Conference 2012, Madrid, January 2012.
35. "Prebisch's paradox and the Capricorn triangle: S&T for Brazil in 21<sup>st</sup> Century". Brazil-US: Partnership for 21<sup>st</sup> Century, Washington, April 2012.
36. "Describing change in the real world: from observations to events". Keynote lecture at 15<sup>th</sup> AGILE conference on Geographic Information Science. Avignon (France), April 2012.
37. "Describing change using geographical objects". Keynote lecture at Fourth International Conference on Geographic Object-Based Image Analysis (GEOBIA 2012). Rio de Janeiro, May 2012.
38. "Sharing Geospatial Data and Tools: A Global Perspective." Keynote lecture and Global Citizen Award acceptance speech. Global Spatial Data Infrastructure GSDI Conference 2012, Quebec (Canada), May 2012.
39. "Data-intensive Geoinformatics: using big geospatial data to address global change questions". Workshop on GIScience in the Big Data Age. GIScience Conference 2012, Columbus, OH (USA), September 2012.
40. "Biofuel production in Brazil: challenges for land use policy". Brazil-Germany Dialog on Science and Innovation, São Paulo, November 2012.
41. "On Mental Clocks and Mental Maps: Contributions of Behavioural Geography to a Theory of Geospatial Change". Reginald Golledge Lecture at the Department of Geography. University of California at Santa Barbara, March 2013.
42. "Land system modelling for a sustainable world". Plenary Session on Earth System Modelling, Brazilian Symposium on Remote Sensing, Foz do Iguaçu, April 2013.
43. "Spatial data and public policy: observing the Earth". World Social Science Forum. Montreal, September 2013.
44. "Understanding and Representing Change in Geospatial Data". ETH Geomatik Seminar, ETH, Zurich, October 2013.
45. Land change in Brazilian Amazonia: A case study in nature-society interaction". ILÖK Colloquium, Institute of Landscape Ecology, University of Münster, November 2013.
46. "Open Source and open data: what changes in academia?" Keynote lecture at Erasmus Mundus GeoMundus Symposium; Universitat Jaume I, Castelló, November 2013.
47. Science and Technology in Brazil: from Prebisch's paradox to the Capricorn triangle Innagural Lecture for Brazil Chair at the University of Münster 2013-2015. Münster, December 2013.
48. "How did Brazil reduce deforestation in Amazonia?". Tedx Münster, May 2014
49. "E-sensing: Big Earth Observation Data Handling And Analysis On Array Databases". IFGI 20<sup>th</sup> Anniversary Symposium. Münster, June 2014
50. "Monitoring Tropical Forests and Agriculture: the Roadmap for a Global Land Observatory". Copernicus Big Data Workshop. European Commission, Brussels, March 2014.

51. "Uncertainties on land cover and land use data sets designed for global models". Global Land Project Open Science Meeting, Humboldt University, Berlin, March 2014.
52. "How did Brazil reduce deforestation in Amazonia?". Tedx Münster, May 2014.
53. "e-sensing: Big Earth Observation Data Handling And Analysis On Array Databases". IFGI 20<sup>th</sup> Anniversary Symposium, Münster, June 2014.
54. "e-sensing: using big Earth Observation data to monitor global land use and land cover change". FAPESP Week Munich, Deustches Museum, Munich, October 2014.
55. "We now have a Geo-Linux. What's next?". FOSSGIS Germany Conference, Münster, March 2015.
56. "The Road Map for a Global Land Observatory". Brazilian Symposium on Remote Sensing, Joao Pessoa, April 2015.
57. "Nature-Society Interactions and Public Policies". TU Dortmund, May 2015.
58. "Building a joint Brazil-Germany research agenda in the WWU". Final lecture as CAPES WWU Chair, Münster, May 2015.
59. "Modelling Land Use Change in Brazil:2000-2050". FAPESP Symposium on UNFCCC COP-21. Sao Paulo, October 2015.
60. "The road to Paris: Brazilian emissions and the 28ole of Geoinformatics". Institute of Geoinformatics, University of Münster. Münster, November 2015.
61. "Assessing future impacts of land use policies in Brazi". Global Landscapes Forum. Paris, December 2015.
62. "Data mining of remote sensing time series for land use change classification".. Department of Geoinformatics. Salzburg University, April 2016.
63. "VGI for Policy: what are the known unknowns?". Vespucci Initiative Meeting on VGI and Policy. Firenze, Italy, July 2016.
64. "Geographical ontologies for land use and land cover change: distinguishing continuants from occurents". Formal Ontologies and Information Systems Conference (FOIS) 2016. Annecy, France, July 2016.
65. "Using big Earth observation data for better semantic description of land use change". Simposio Argentino de Ontologias Aplicadas (SAOA) 2016. Buenos Aires, September 2016.
66. "REDD+ in the context of Brazil's NDC". Global Land Project Open Science Meeting, Beijing, China, October 2016.
67. "Time Series Analysis of Big Earth Observation Data for Land Use and Land Cover Change". Global Land Project Open Science Meeting, Beijing, China, October 2016.
68. "Big Earth Observation Data Analysis". Brazilian Symposium on Remote Sensing, May 2017.
69. "Machine learning techniques for for dense satellite image time series analysis". Humboldt University, Geography Department, Berlin, March 2017.
70. "Modelling land use change: the Brazilian experience". FABLE project meeting. IIASA, Laxenburg (Austria), December 2017.
71. "INPE's Data Cube: results and perspectives". GEO Data Providers Workshop, Frascati, Italy, May 2018.

72. "Challenges in machine learning for Earth observation data analysis". GEO Data Technology Workshop, Vienna, July 2018.
73. "How can GEO help Copernicus make a global impact?" EuroGEOSS Symposium, Geneva, September 2018.
74. "Empowering the Global South for co-design and co-production of SDGs". UN Environment Science-Policy-Business Forum, Nairobi, March 2019.
75. "Challenges in using Earth observation for sustainable development". Copernicus Summer School, Salzburg, Austria, June 2019.
76. "A strategy for a results-oriented GEOSS". ASPRS Pecora Symposium, Baltimore, US, September 2019.