

# **New Law of the Agricultural Property Georeferencing in Brazil: a Profile of the Professionals in Rio Grande do Sul State**

**Adriane B. THUM, Maurício R. VERONEZ, Genival C. de SOUZA and  
Alessandro O. REINHARDT, Brazil**

**Keywords:** Law 10,267, Georeferencing, Professional Profile.

## **ABSTRACT**

With Law 10,267 published in 28 August, 2001 that deals with the georeferencing of rural landed properties, some paradigms begin to change, that is, there is a new position allied to doubts and questions from professionals that work in the measurement area. This new structure brings a series of advantages, imperfections and resistance from the ones involved in this process. One of the difficulties is the unfamiliarity by the population about the existence of the Law and the benefits it will bring, besides the lack of qualified professionals to supply the growing demand, to imply in an examination and not in just a simple measurement. With the objective to research the profile of professionals and what Surveyors from Rio Grande do Sul State think, this research was carried out. There is in the State, as well as in other parts of the National Territory, lack of qualified professionals to services of georeferencing of rural landed properties. Some have already seeked for improvement in the area, others are still getting professional improvement in order to be accredited. Most professionals are from the Agronomic Engineering, followed by Agricultural, Road, Geodesy technicians, Civil Engineers, among others. Some important aspects of the research illustrate that for 92% of the interviewed say this change will bring many positive aspects such as a greater professional value, compelling them to a constant recycling. They believe that in the future there will be a natural selection, remaining in the market just the serious and technically qualified Surveyors. Another positive aspect is that, with the new law, it will be possible the reorganise the property cadastre, it will create a norm for the agrarian issue in the country, besides creating great service demand. Among the negative aspects, it was evidenced the problem with the identification and the agreement of neighbours when localising the borders, the elaboration of more consistent reports and a lot of doubts in relation to INCRA's technical norm. Thus, results suggest a serious discussion about the thematic in question, as well as professional education in this area.

# **New Law of the Agricultural Property Georeferencing in Brazil: a Profile of the Professionals in Rio Grande do Sul State**

**Adriane B. THUM, Maurício R. VERONEZ, Genival C. de SOUZA and  
Alessandro O. REINHARDT, Brazil**

## **1. INTRODUCTION**

The equipments that have been used for surveying areas have passed through such a great technological improvement allowing the integration of traditional topography with modern methods of surveying such as the use of the GPS system; making the practice of topographic surveys more efficient and precise. Together with these changes, there is the Federal Law 10,267, 2001 which refers to the CNIR – *Cadastro Nacional de Imóveis Rurais* (National Cadastre of Rural Landed Properties), to be managed together with INCRA – *Instituto Nacional de Colonização e Reforma Agrária* (National Institute of Colonization and Agrarian Reform) and the Federal Revenue Secretary, changing the paradigms and the context of work that demands a differentiated posture of the professionals that work in the Mensuration area.

Law 10267/01 modifies law numbers 4,947, 6 April, 1966, 5,868, 12 December, 1972, 6,015, 31 December, 1973, 6,739, 5 December, 1979, 9,393, 19 December, 1996, and gives preventive measures.

Law 10,267 was regulated by Decree 4,449 and is effectively valid since its publication on 30 October, 2002. In November 2002, a new systematics to collect data related to the Declaration for the Cadastre of Rural Landed Properties was published by INCRA, such action happened at the same time with the georeferencing of properties and now is also part of the rules of the environmental legislation that are into effect. In November 2003, INCRA has published a Technical Norm for the Georeferencing of Rural Landed Properties and the Governmental Regulations with the precision needed for the coordinates (50 cm) and the stpes for the certification of works. Moreover, in August 2004, Clause 59 of Law 10,931 changed Clauses 212 and 214 of Law 6,015 of the Public Registry, increasing the use of the administrative emendation also for cases where there are land differences due to georeferencing. The information related to laws and norms can be found on INCRA's website.

Decree 4,449/02 defined a yealy fitting schedule in relation to the area of the property being 90 days from the publication of the Decree for properties of over 5,000 ha (29 January, 2003); a year for properties between 5,000 and 1,000 ha (1 November, 2003); two years for properties of 500 to less than a 1,000 ha (1 November, 2004), and three years for propeties of less than 500 ha (1 November, 2005). However, part of this Decree has been changed by Decree 5,570 on 31 October, 2005, being 5 years for areas of 500 or less than 1,000 ha, that is, from 21 November, 2008, and 8 years for areas of less than 500 ha, or from 21 November

2011, in accordance with §3 clause 10, a new writing of Decree 5,570/05. From the fitting, the necessity of a previous georeferencing will be asked by the Officer of the Landed Property Registry when the owner asks for the registry of dismemberment, division, rememberment or any other case of change in the property (Clause.3 of Law 10,267), when registering it.

The main objective of Law 10267/01, in accordance with the Technical Norm for Georeferencing of Rural Landed Properties, is to guarantee its owner the reliance on the descriptive geometry of the property, so that to solve problems due to overpositioning of borders of neighbouring properties. The new legislation is a mark in the Brazilian land organisation for establishing, through an adequate identification of the property, the accordance between the legal and physical realities.

With this law, there is the necessity of qualified professionals to do the mentioned job.

In reality only Cartographic Engineers and Surveyors should carry out georeferencing surveys of rural landed properties. In some Brazilian states, there are only a reduced number of these professionals, like in Rio Grande do Sul (RS). Therefore, CONFEA – *Conselho Federal de Engenharia, Arquitetura e Agronomia* (Federal Council of Engineering, Architecture and Agronomy) stated some Plenaries such as PL024/03, PL0633/03, and PL2087/04 mentioning the demands and the professionals that are really capable of working in the area.

The professionals who are capable of take technical responsibility for georeferencing services in accordance with PL2087/04 are those who have taken 360 hours of the following subjects: Topography applied to georeferencing; Cartography; Reference Systems; Cartographic Plans; Adjustment of observations; Methods and Measurements of geodesic positioning.

The georeferencing of rural landed properties is relatively new and is a great market niche, there are a few professionals capable of working in the area though. For this reason, some higher education institutions decided to offer refresher courses, besides rethinking the subjects offered, trying to fulfill this demand.

At Unisinos, in 2004, the Georeferencing of Rural Landed Properties course was offered four times as a further studies course, aiming to fulfill the necessity of improvement of the professionals mentioned in PL0633/03 which was into effect at the time. In 2005, the first Specialisation course occurred, being the first one in Rio Grande do Sul State, and this year, 2006, the Specialisation in Georeferencing of Rural Landed Properties is occurring for the second time. It is in accordance with the demands of PL2087/04.

With these courses we serve professionals throughout the national territory, enabling that in the future INCRA and land registries, together with land owners do not have to face the same problems that there are today in relation to property title and its localisation.

The mentioned research has the objective to search for the professional profile and what the surveyors of the State think about georeferencing of landed properties. It also brings information related to professionals and properties in Brazil.

## 2. MATERIALS AND METHODS

The surveyors in Rio Grande do Sul were asked to answer a questionnaire. The questions were the following: What is your degree? How long have you been graduated and where from? In what region do you work and what are your main activities? Do you do topographic surveys? In urban, rural or both areas? What kind of equipment do you use (model and brand)? Have you purchased any type of modern topographic equipment (total station and/or GPS)? How long is it necessary to get the money invested back? Would you purchase a single or dual-frequency GPS receptor today for georeferencing services? Why? Do you invest in professional updating? Name the type of investment. What do you think about INCRA's georeferencing law in professional terms? Is the norm in accordance with Law? Why? Give suggestions. INCRA's webpage has been consulted during the research in order to follow the evolution of the number of professionals registered and the georeferenced properties.

## 3. RESULTS

On 15 May, 2005, there were 264 accredited professionals of Rio Grande do Sul on INCRA's webpage (source: INCRA's website), being 134 of them, Agronomists. Similar results were found in the reaseach carried out, where 46% of the professionals that work are from the Agronomical Engineering, followed by Agricultural, Road, and Geodesy Technicians, Civil Engineers among others (as per Figure 1).

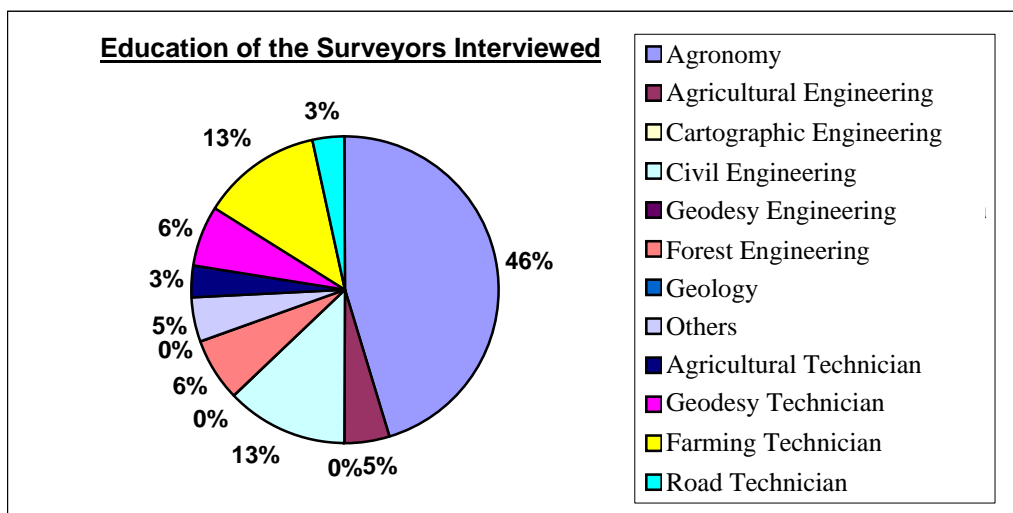
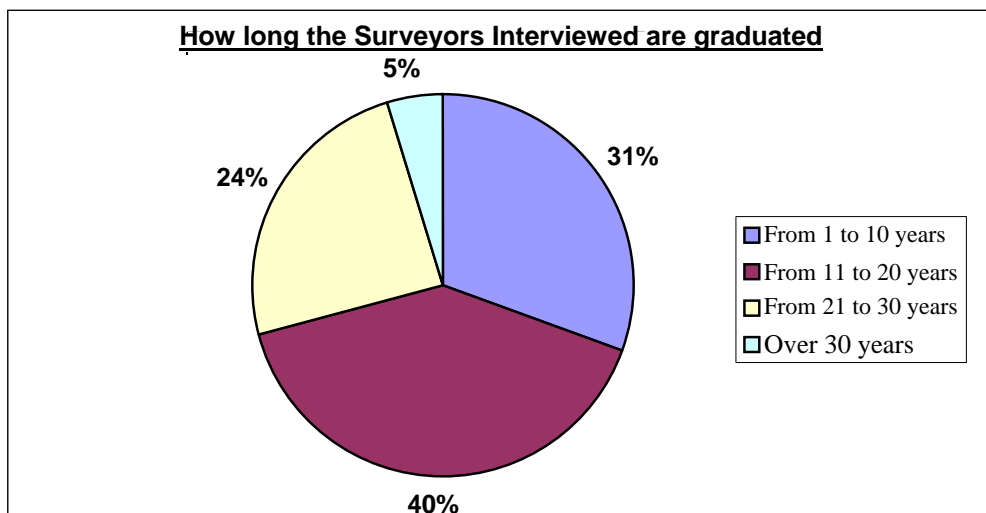


Figure 1 – Education of the surveyors in Rio Grande do Sul

It is believed that this is so due to the courses offered in the State. There are several Higher Education institutions with undergraduate courses in Agronomy and Civil Engineering, and a good number of Technical Schools enabling technical education in different areas. There are not any institutions in Geodesy in RS that offer neither a technical nor a undergraduate course. In Cartography there is only the Federal University of Rio Grande do Sul – UFRGS which is a relatively new course and therefore has not graduated many professionals yet.

A year later, in May 2006, from the 3654 accredited in Brazil, 307 were from RS. Most of the accredited professionals in Brazil are Geodesy Engineers (1064), Cartographers (245), and Geodesy Technicians (883), totalising 59.98%.

Results show that most professionals are graduated less than 20 years, and that only 5% over 30 years (as per Figure 2).



**Figure 2** – For how long the Surveyors are graduated

Figure 3 shows that the greatest concentration of professionals are in the Central Region of the State, followed by the metropolitan area of Porto Alegre and the West Boarder. Perhaps, this is due to the proximity of education institutions.

In relation to technicians, there are professionals that have different equipments. According to the chart below, one can observe that 77% of the professionals have electronic equipments and software, 52% of them have total stations, and single and dual-frequency GPS receptors. Navigation GPS receptors were not considered in this percentage because they are not used for topographic and of georeferencing purposes.

Only 10% of surveyors have optical-mechanic equipments.

There is great professional concern in improving their knowledge and updating equipments.

According to the research, the investment done is very quickly gotten back. In 65% of the cases, this happens in less than a year.

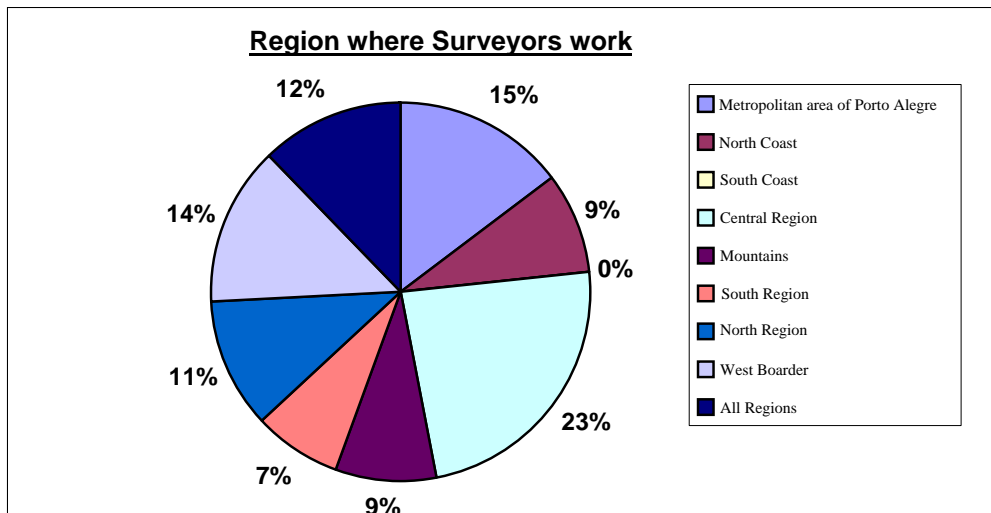


Figure 3 – Region where surveyors work in Rio Grande do Sul State

The georeferencing survey is not just a topographic survey as once we were used to doing. It can be said that it involves five steps: *planning*, with the analysis of the documentation and legislation, consulting the involved organs, and the definition of what and how to georeference; *demarcation*, with the knowledge of the borders, the mark monumentation and codification of the vertexes in the patterns of the Technical Norm and the formalisation of the term of limit agreement for each comparison; *measurement*, with the effective transportation of the coordinates of the homologated marks by IBGE; *report*, with the description of the works, reached results, and the generation of final products (plant, descriptive memorial, and control archives) and the request of certification and; *certification*, with its follow up at INCRA and the compliance with any judicial execution that may be, until the plant is delivered and the descriptive memorial certified to be sent to the Landed Property Registry.

In Brazil, there are many problems related to reliable data and cartographic bases, besides the lack of precise information at property registries and the real area.

There are approximately 4,200,000 rural landed properties registered at INCRA in the country, however, only 3499 were georeferenced. Mato Grosso and Mato Grosso do Sul States have the greatest number of georeferenced properties. In Rio Grande do Sul there were just six, and now 54, as per Table 1 (source: INCRA's website).

**TABLE 1 – Total of Georeferenced Properties in Brazil**

(Source: INCRA's website – May 2005, December 2005, and May 2006).

State	Description	Georeferenced Properties		
		May 2005	December 2005	May 2006
AC	ACRE	002	011	012
BA	BAHIA	016	043	059
CE	CEARA	009	015	015
DC	DISTRICT CAPITAL	001	003	006
ES	ESPIRITO SANTO	000	015	020
GO	GOIAS	106	336	458
MA	MARANHAO	000	000	019
MG	MINAS GERAIS	029	131	174
MS	MATO GROSSO DO SUL	266	579	740
MT	MATO GROSSO	296	861	1255
PA	PARA	000	000	001
PI	PIAUI	000	000	003
PR	PARANA	000	000	002
RN	RIO GRANDE DO NORTE	003	011	012
RO	RONDONIA	000	004	010
RS	RIO GRANDE DO SUL	006	033	058
SC	SANTA CATARINA	000	002	004
SP	SAO PAULO	139	400	520
TO	TOCANTINS	018	086	131
-	T O T A L	891	2530	3499

As many may already know, georeferencing of Properties should be increased to urban areas, although the dates and norms for its realisation have not been defined yet. This way, the demand for qualified professionals will also increase.

In order to do georeferencing the professional may be qualified by CREAs and accredited by INCRA, hired by whoever is interested, who will take full responsibilities by the services, through the *Anotação de Responsabilidade Técnica - ART* (Entry of Technical Responsibility).

INCRA publishes on its website the list with all the accredited professionals by State.

On figure 4 it can be seen that professionals work either in the rural area as in the urban one, that is, 61% work in both of them.

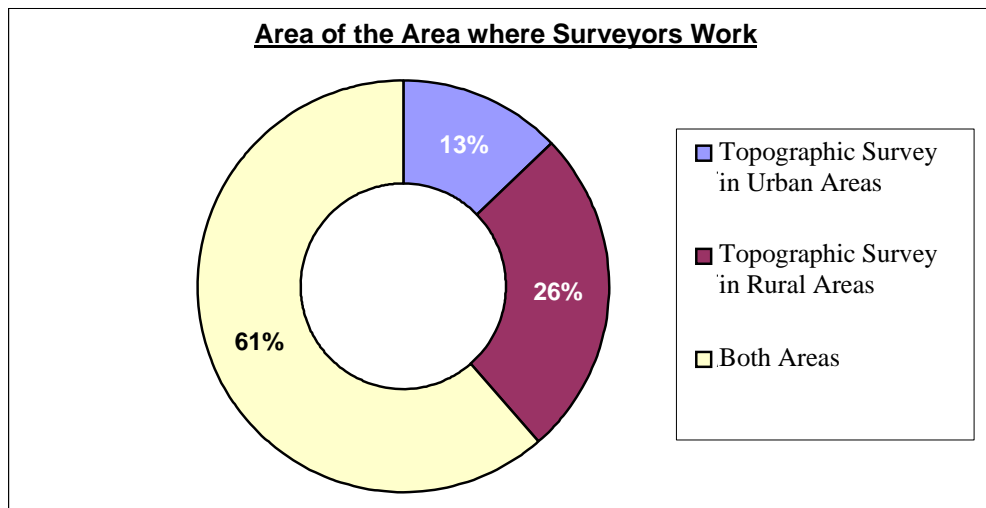


Figure 4 – Area where surveyors work

#### 4. CONCLUSIONS

According to the results of the research one can conclude that:

Most of the Surveyors that work in the Rio Grande do Sul State – Brazil are Agronomists, followed by Agricultural, Road and Geodesy technicians, Civil Engineers, among others. In Brazil, most of them are Geodesy Engineers, Cartographers, and Geodesy Technicians.

From the ones interviewed, 92% say that this change has brought more positive than negative aspects. This will value the professional who will feel obliged to recycle and he/she believes that in the future there will be a natural selection, staying on the market the surveyors who are serious and technically qualified.

Nowadays, 61.29% of the professionals intend to invest in a dual-frequency GPS receptor.

Over 50% of the surveyors have total stations and a GPS receptor.



The return of the investment is gotten back in less than a year in 65% of the cases.

There is certain insecurity and doubts from surveyors in relation to INCRA's technical norm.

All professionals reported the will to learn more and update themselves constantly, showing a preoccupation with the works that can be done by other unqualified professionals.

Following this research, a Database will be done with the information provided by the surveyors and it will be available on the internet, enabling its constant updating.

## 5. REFERENCES

- ERBA, D. A., THUM, A. B., SILVA, C. A. U. da et al. Topografia para Estudantes de Arquitetura, Engenharia e Geologia, Editora UNISINOS, São Leopoldo – RS, 202p.
- GEMAEL, C. 1994. Introdução ao Ajustamento de Observações - Aplicações Geodésicas, Editora UFPR, Curitiba, 319p.
- GEMAEL, C. 1999. Introdução a Geodésia física, Editora UFPR, Curitiba, 304p.
- LOCH, C; CODINI, J. 2000. Topografia Contemporânea – planimetria, Editora da UFSC, Florianópolis, 321p.
- MÔNICO, J. F. G. 1999. Posicionamento pelo NAVSTAR – GPS - Descrição, Fundamentos e Aplicações, Editora da UNESP, Presidente Prudente -SP, 287p.
- OLIVEIRA, C. de. 1993. Curso de Cartografia Moderna, IBGE, Rio de Janeiro - RJ, 152p.
- SILVA, I. da; ERWES, H.; SEGANTINE, P. C. L. 2000. Introdução à Geomática, USP, 100p.
- SILVEIRA, L. C. da. 1996. Fundamentos de Astronomia de Posição e Trigonometria Esférica Aplicados na Determinação do Azimute Verdadeiro. Editora Luana Ltda, Criciúma-SC. 126p.
- <http://www.incra.gov.br/>
- <http://www.confex.org.br/>

## 6. ACKNOWLEDGEMENTS

We would kindly like to thank all the Surveyors from Rio Grande do Sul State that cooperated with our research answering all questions.

## BIOGRAPHICAL NOTES

### **Adriane Brill Thum**

Forestry Engineering degree from the Federal University of Santa Maria (UFSM/RS) in 1993, Specialist degree in Interpretation of Orbital and Sub-Orbital Imagery from UFSM. Master's degree in Forestry Engineering from UFSM in 1996, Student at the Doctor's degree study programme of Water Resources from the Federal University of Rio Grande do Sul (UFRGS/RS). Assistant Professor at the Civil Engineering Undergraduate course from the Vale do Rio dos Sinos University (UNISINOS/RS) and Coordinator of the Specialist course on Georeferencing of Rural Real Estates at UNISINOS. Interest areas: Topography,

Environment, Global Positioning System - GPS, Cartography, Geoprocessing and Artificial Intelligence.

**Maurício Roberto Veronez**

Surveying Engineering degree, Universidade Federal de Viçosa (UFV/MG) in 1995. Master's degree in Civil Engineering at São Carlos Engineering School (EESC/USP) in 1998, Doctor's degree in Civil Engineering at São Carlos Engineering School (EESC/USP) in 2004 with an internship at the Faculty of Sciences of Porto University (FCUP/PT). Assistant Professor at the Graduate studies programme in Geology, Vale do Rio dos Sinos University (UNISINOS/RS) and academic member of Commission 2 of the International Federation of Surveyors (FIG). Interest areas: Global Positioning System - GPS, Automated Cartography, Adjusting of Observations and Artificial Neural Networks applied to Geosciences.

**Genival C. de Souza**

Surveying Engineering degree, Universidade Federal de Viçosa (UFV/MG) in 1982. Specialization in Geoprocessing by Federal University of Bahia (UFBA) in 1997, Master's degree in Civil Engineering at São Carlos Engineering School (EESC/USP) in 2001, Doctor's degree in Civil Engineering at São Carlos Engineering School (EESC/USP) in 2004. Professor at the Graduate Programme in Civil and Environmental Engineering, State University of Feira de Santana (UEFS). Interest areas: Global Positioning System - GPS, Referencing Systems, Urban and Rural Cadastre, Geoprocessing.

**Alessandro Ott Reinhardt**

Academic in Information Systems at Vale do Rio do Sinos University (UNISINOS). Employee of Remote Sensing and Digital Cartography Laboratory at this University. Interest areas: GIS, Geographic Databases and Cadastral Systems.

**CONTACTS:**

**Adriane Brill Thum**

Graduate Program in Civil Engineering - Vale do Rio dos Sinos University  
Avenida Unisinos, 950 - CEP: 93022-000  
São Leopoldo – Rio Grande do Sul State  
Brazil  
Tel.: + 55 (51) 3591-1100 – Ramal 1769  
Fax: + 55 (51) 3590-8177  
adrianebt@unisinos.br

**Maurício Roberto Veronez**

Graduate Program in Geology - Vale do Rio dos Sinos University  
Avenida Unisinos, 950 - CEP: 93022-000  
São Leopoldo – Rio Grande do Sul State  
Brazil  
Tel.: + 55 (51) 3591-1100 – Ramal 1769

Fax: + 55 (51) 3590-8177  
[veronez@unisinós.br](mailto:veronez@unisinós.br)

Genival C. de Souza  
State University of Feira de Santana – UEFS  
Graduate Programme in Civil and Environmental Engineering  
Br-116 - Km 03, Campus Universitário - CEP:44031-460  
Tel.: (75) 3224-8240  
Fax: +55(75)3224-8056  
[gcorrea@libra.uefs.br](mailto:gcorrea@libra.uefs.br)

Alessandro Ott Reinhardt  
Remote Sensing and Digital Cartography Laboratory (LASERCA)  
Vale do Rio dos Sinos University  
Avenida Unisinós, 950 - CEP: 93022-000  
São Leopoldo – Rio Grande do Sul State  
Brazil  
Tel.: + 55 (51) 3591-1100 – Ramal 1727  
Fax: + 55 (51) 3590-8177  
[ott@unisinós.br](mailto:ott@unisinós.br)