The Use of Satellite Data in Court Proceedings

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Introduction

Questions surrounding the authentication of satellite data submitted to court are today of paramount importance. It is indeed difficult to assert the validity of this data once it has gone through a long chain of interpretations from the moment it is collected as primary data, when it cannot be modified, to the time the end product is submitted to court. There are no international standards agreed so far on this topic. Therefore, in this current stage of confusion, disputes are likely to occur.

However, at this point in time, some recommendations and perceptions on the matter shall be outlined in the following pages.

This presentation analyses the ways and means of overcoming these situations and possible disputes arising in the field. It also adds a word on the advisability of resorting to the *new Optional Rules for Arbitration of Disputes Relating to Outer Space Activities*, specifically drafted and designed by the Permanent Court of Arbitration, which became effective on 6 December 2011.

Finally, having in mind that the United Nations/Argentina Workshop on Space Law[1] is dedicating one of its sessions (Session 4) to the *Use of Space Technology and Space-derived Geospatial Data for Sustainable Development,* this presentation also includes an initial exploration of one of the latest achievements in the field, namely the legal issues underlying space technologies and 'remote presence', also referred to as 'beaming technologies'.

State-of-the-art

The current situation is not too different from the days a study on *Earth Observation data in the legal sector*, produced by the British Institute of International and Comparative Law (BIICL) in 2001, was referring to a certain amount of trouble arising from the use of satellite data in court and, therefore, questioning its validity as evidence. This announcement was based on experience in a few cases decided at the time by the International Court of Justice (ICJ) and other international arbitrations concerning boundary

[1] UN/Argentina Workshop held in Buenos Aires on 5-8 November 2012. See www.unoosa.org

disputes. These doubts were beginning to conspire against the use of the many advantages provided by space technologies -particularly the precision of the information collected- which could be downgraded by suspicion or lack of transparency.

At the root of the problem was -and still is- the wide margin of interpretation of the technical expert called upon to interpret a digital map in court. The problem is aggravated in cases of international disputes over land and water involving highly sensitive issues of sovereignty.

This situation, as it now stands, is a matter of concern to practitioners and to the academic world as well and there are many issues in need of discussion.

Satellite data in international litigation

The International Law Association (ILA) began focusing on these issues from an early stage. The first step was to examine the major problems involved at its 70th Conference[2] (New Delhi 2002) in response to the deep study concluded on 22 June 2001 by the British Institute of International and Comparative Law (BIICL)[3], as pointed out earlier. This study was prompted by a number of cases -decided by the ICJ and the and the Permanent Court of Arbitration (PCA) during the nineties and the beginning of the new millennium- where maps based on satellite data were produced as evidence, their validity raising a string of divergent opinions. Inter alia, Botswana/Namibia (judgment of 13 December 1999), Qatar/Bahrain (23 March 2001) and Cameroon/Nigeria (10 October 2002) were leading cases decided by the ICJ on the matter. The PCA, for its part, confronted similar problems in the Yemen/Eritrea award (17 December 1999). The outcome was that the interpretation of satellite data was conflictive and, instead of having a clarifying effect for the courts, it created confusion[4].

In more recent times the Caribbean area -where a number of longstanding boundary disputes involving neighbouring states have been taken to the ICJ to decide- clearly shows that certain issues remain outstanding. An illustrative example is provided by the views of experts working in the region for the production of digital maps to be submitted to the ICJ[5].

The problem was brought to the attention of regional institutions as well. To mention only a few the Ibero American Institute of Air and Space Law examined these question in October 2003 at a meeting in Montevideo, Uruguay, where the advantages and

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[2] *Report of the Seventieth Conference* (New Delhi 2002), 212.

[3] The BIICL study concerned *Applications of Earth Observation to the Legal Sector* and may be found on its website: www.biicl.org. The Group consisted of lawyers and experts who shared their experience in the interpretation of satellite data and its submission as evidence to courts and tribunals.

[4] See the BIICL study on applications of *Earth Observation to the Legal Sector, supra.*

[5] See, inter alia, the proceedings of a Workshop on *Evidence from Space* held in London on 5 October 2010, organised by the London Institute of Space Policy and Law and the European Space Agency which reflects the current situation.

shortcomings of satellite data in court and its value as evidence were initially analysed in that context [6] and again reviewed in 2011[7].

Be that as it may the situation now seems clearer and possibly less dramatic than in earlier times. Suffice it to recall, as Hedman was observing at the ILA Berlin Conference in 2004 that, when the ICJ was called upon to decide in the Burkina Faso/Mali boundary dispute in 1986, it held that digital maps were not binding documents or a territorial title by themselves, whatever their precision and technical value, unless the parties had previously agreed on the value of this means of evidence[8] This judgment entailed a rather gloomy outlook for the future of satellite imagery as evidence in court.

The use of satellite imagery at the stage of evidence is nowadays frequent. Yet, on some occasions, international judges may request other supporting evidence, such as aerial photographs and the like. In fact, as **Kopal** observed in his comments to the ILA Reports for Rio de Janeiro and The Hague[9], the international community was not yet aware of the multiple applications of remote sensing and their legal implications.

Indeed, raw data, in its initial stage, cannot be modified. The issue lies in the manipulation of digital data as the outcome of a string of interpretations once the raw data has been collected by the satellite. This, as observed previously, is particularly sensitive where boundary disputes are concerned, involving sovereignty questions over land, islands and water.

One of the outstanding questions is the handling of digital images -which amount to a collection of data- without a possibility of detecting changes at a later stage. The difference between satellite data and other conventional means of evidence is not merely the higher precision of the former, which leaves no space for human error, but the very wide margin for interpretation left to the expert. This is not a procedural question but, rather, a substantial one. The main pitfall is that obscuring, moving or introducing elements to digital images may be largely invisible to the human eye. This implies an inevitable dependence on the experts called upon to interpret the data which, in turn, makes judges, arbitrators and lawyers particularly uneasy.

What follows is a summary of the views of the doctrine over the last decade.

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[6] *XXXII Jornadas Iberoamericanas de Derecho Aeronáutico y del Espacio y de la Aviación Comercial*, Ed. Fundación AENA, Madrid 2008, Williams, M. *Actividades comerciales en el Espacio: la observación de la Tierra, 195-207,*

[7] *XXXIX Jornadas Iberoamericanas de Derecho Aeronáutico y del Espacio*, Asunción del Paraguay, 2008, Williams, M. *Las tecnologías espaciales al servicio de las telecomunicaciones, la observación de la Tierra y otras aplicaciones en el mundo de hoy, 121-141.*

[8] ICJ Reports 186, paragraphs 54-55-56 quoted by Niklas Hedman in his Introductory Report to the Report of the Space Law Committee to the Seventy-First Conference of the ILA (Berlin 2004), 740-743.

[9] See the *Annexes to the Reports of the ILA Space Law Committee* (Rio de Janeiro and The Hague) containing Professor **Kopal's** observations in *Report of the Seventy-Third Conference* (2008), 650-652, and *Report of the Seventy-Fourth Conference* (2010), 279-280

The doctrine

A first and thorough analysis of the issues at stake was carried out by the ILA at its Seventy-First Conference in Berlin (2004). The conclusions and recommendations, at this early stage, proved helpful for practitioners and academics alike.

Among the views expressed on that occasion it was stated that the satellite image submitted to court was the result of a long chain of interpretations[10], a situation which called for caution in court proceedings. Part of the doctrine was in favour of drafting a model statute to preserve the integrity of the data collected, with penalties for wilful or negligent misrepresentation (Carl Q. Christol). Others disagreed with the view that higher precision was the only difference between evidence obtained by earth observation satellites and evidence supplied by more traditional means, aerial or terrestrial (Armel Kerrest and the present writer). In fact, should a conventional photograph be altered, an expert could, at a later stage, prove manipulation.

Conversely, in the case of a collection of satellite data -e.g. numbered images- changes may happen without the possibility of an *ex post facto* detection. Thus, it is indispensable that the process be supervised from the moment the raw (primary) data is collected until it is used in court. This idea, stemming from the ILA Berlin Conference, was further developed in later years and served as basis for drafting recommendations, referred to later in this presentation. The possibility of drafting basic rules on the matter -such as guidelines for interpretation purposes- was beginning to gain ground during this Conference[11].

The problem was revisited by the present author in a discussion paper submitted to a UN/Brazil Workshop in 2004[12] and commented upon by José Monserrat and Joanne Gabrynowicz**.** Both these authors made pointed remarks on the suspicion surrounding digital imagery as evidence in court. One of the main reasons was the deficiencies in authentication methods[13]. On 6 April 2005 the European Centre of Space Law organised a Conference at Surrey University (UK point of contact) entitled *"Current Issues in Earth Observation"* where the issue of satellite imagery in court was especially addressed. The subject was followed up at the 48th Colloquium of the International Institute of Space Law (IISL) in Fukuoka (October 2005)[14].

A general opinion was already being perceived whereby the advantages - particularly the precision - of this new technology should be preserved and be given a more

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[10] N. Hedman, ibid. 749.

[11] For further details see *Report of the Seventy-First Conference.... (2004),* 749-751.

[12] See, by the present writer *Remote Sensing and International Law, UN/Brazil Workshop on Space Law*, Rio de Janeiro (November 2004), published by UN Vienna in 2005, 132-135.

[13] See J. Gabrynowicz, op.cit. in note 28 *supra, 158.*

[14] *Proceedings of the Forty-Eighth Colloquium on the Law of Outer Space,* Fukuoka 2005, published by the American Institute of Aeronautics and Astronautics.

positive spin to confront suspicions of manipulation which, by then, was reaching other areas as well, particularly in the field of biology. *The Journal of Cell Biology* (US), for example, was using a test whereby the manuscripts were being run through Photoshop[15], a procedure which revealed extensive photo-manipulation and misrepresentation of data in breach of the Journal's guidelines.

To sum up, at the end of the nineties the doctrine was divided. Lawyers and judges continued to have conflicting views on the subject, many of them showing mistrust where satellite imagery as a means of evidence was concerned. Others welcomed the high precision of the new technology, particularly in its application in court proceedings.

Towards the end of the first decade of the new millennium **a** certain consensus was noted on the use, as working tool, of a description of the various stages involved in the elaboration of digital maps as listed by Harald Guinzky[16] in 2005 as follows.

1 The raw -or primary- data is collected by the satellite. In this initial stage is unprocessed and has no real value.

2 The first step, generally called 'pre-processing', is meant for radiometric and geometric corrections and atmospheric changes relating to spacecraft attitude, among others.

3 The next step is when the raw data is available in digital form and certain parts of the image may be enhanced, at the user's request, by computers.

4 In a following stage the user may ask for a classification of the collected information, bringing together, for example, similarities and differences.

5 Some additional information, like maps, GPS data and so forth, may be added to complete the interpretation of the satellite image.

The scientists, for their part, were observing that one of the reasons for pre-processing raw data was the continual non-ideal position of the orbit and spacecraft attitude (yaw, pitch and roll) and that some corrections were needed to ensure the image was not distorted. In an effort to provide solutions, it was suggested that remote sensing satellite operators be required to keep archives with a record of the raw data so that it would be possible to return to it when manipulation was suspected[17].

In the Report of the International Law Association to the Río de Janeiro Conference (2008) one of the members of the Space Law Committee, Ray Purdy (UK) stressed the importance of training the legal sector in the development of these technologies given the

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[15] See *The Buenos Aires Herald,* Vol. 6, N° 258, *'On Sunday with the New York Times',* 20.

[16] Ginzky, H., *Satellite Images as evidence in Legal Proceedings relating to the Environment –A US Perspective*, Air and Space Law, Vol. XXV, Kluwer 2000, 115.

[17] Rajan, Y.S., Report of the Seventy-Third Conference of the International Law Association, Río de Janeiro 2008, Space Law Committee, when referring to the pre-processing stage of satellite imagery,632.

unawareness of what this technology could offer. There might be greater public awareness of satellite technologies through internet programmes such as Google Earth -downloaded by millions- but many in the legal sector had probably never seen a satellite image in a legal context[18].

Overall, towards the end of the first decade of the new millennium the key words underlying the problems of satellite data in court were, undoubtedly, capacity building and the creation of awareness in the legal sector plus a strict control of the process of data collection until it became an end product. Furthermore, the idea of keeping raw data in archives for later consultation, as advocated by the scientists, was seen with favour[19] by a majority of the doctrine.

At this stage the views of publicists began to draw attention to what were then considered the most practical aspects of remote sensing. In this quest studies focused on three main areas, namely the use of remote sensing for supervising compliance with international obligations (i.e. treaty behaviour), particularly in the field of environmental law, the use of satellite data for the management of water resources and satellite data as evidence in international litigation[20].

Purdy's latest experience in Australia[21] resulting from a project on this specific question conducted from University College London, and this findings -summarised in the ILA Report to its 74th Conference (The Hague 2010)- are of special interest on these matters[22]. This Report has also registered the experience of the present writer in an international conference in Buenos Aires in 2008, organised by the national space agency of Argentina (CONAE) and the European Space Agency (ESA), with the auspices of CONICET/University of Buenos Aires and the University of Belgrano (Buenos Aires), to discuss the value of satellite data in national and international courts from a strictly interdisciplinary approach. The general opinion emerging from the conference was that modifying raw data, in its initial stage, was not possible and that strict control over data collection should exist from the very beginning up to the moment it was produced as evidence in court. Moreover, the opinion was confirmed in the sense that the most

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[18] For further detail on these positions see R. Purdy, *Report of the Seventy-Third Conference* (Río de Janeiro 2008), 631-637.

[19] CONICET (National Council for Scientific Research of Argentina) had at that time a Project underway, conducted by the present writer, which specifically emphasised s on satellite data in national and international litigation. (Proyecto PIurianual 5718).

[20] *Report of the Seventy-Third Conference...2008,* 636. Also *Report of the Seventy-Fourth Conference* (The Hague 2010), 267.

[21] http://www.ucl.ac.uk/laws/environment/satellites.

[22] See, for further details, http://www.space-institute.org, London Institute of Space Policy and Law, ISPL/ESA Project, workshop *Evidence from Space,* London 5 October 2010.

controversial issues were to be found in international boundary disputes involving thorny issues of sovereignty[23].

During the 2010 working session of the ILA Space Law Committee at The Hague a stimulating exchange of views was registered. It was observed that, even if guidelines were adopted regarding the production of satellite imagery in court, the court would always remain the final authority to decide on the credibility of such evidence.

It was further noted that the crucial point was to ensure the authenticity of the data which implied that data archives ought to be standardised and, once data was stored, it should not be manipulated. If in doubt, there would be a possibility of returning to the archives to access the data in its original form. Furthermore, the general opinion considered that references to the use of satellite data and space technologies in international treaties would be a useful way of creating awareness[24].

All in all, international lawyers and judges still have polemical stands on the value of satellite data as evidence in court and, sometimes, doubts on its credibility. At the Hague working session mentioned above, the general view was confirmed that satellite evidence was less controversial in national courts where the information submitted had already been certified by the local authority.

The new Rules for Arbitration of Disputes Relating to Outer Space Activities of the Permanent Court of Arbitration (PCA)

As noted at the outset of this presentation, in the current stage of confusion regarding satellite data in court disputes are more likely to occur. However so, only a few words will be said on the matter under this heading as it has already been extensively discussed by the present author in previous presentation to the UN/Argentina Workshop entitled '*Dispute settlement in space law'* (Session 2 on '*International Legal Framework Governing Space Activities'*).

Suffice it to say that this recent development in the framework of the PCA is of major importance. To say the least, the New Rules on Outer Space –as currently referred to by the doctrine) appear as a useful tool for a prompt and amicable settlement of disputes arising from the use of space technologies, which is growing by leaps and bounds and involving both industrialised and developing countries. Furthermore, having in mind that space technologies are essentially of a commercial nature in today's world, disputes are

[23]See Report of the ILA *Seventy-Third Conference, Río de Janeiro* 2008, 635. The question of 'boundary disputes and sovereignty' was taken up as a point of contention at The Hague, *Report of the Seventy-Fourth Conference*... 2010, 267.
[24] *Report of the Seventy-Fourth Conference...2010,* 260-290.

more likely to happen giving way to a myriad of questions, and sub-questions and uncertainties, mostly linked to technological development.

It is fair to say the dispute settlement mechanisms envisaged by the UN Treaties on Outer Space Treaties, and by UN Principles, have not been able to show their effectiveness so far. It is submitted that, *per contra,* the PCA Optional Rules for *Arbitration of Disputes Relating to Outer Space Activities* will go a long way in meeting its objective of easing procedures in these fields and, most importantly, in issues relating to satellite data in international litigation and its validity as evidence in court and have a ripple effect over other forthcoming uses of space technologies to be described later.

In brief, the PCA Rules, effective since 6 December 2011, provide a sound example of progressive development of the law and have a master role to play in covering the gaps left by the UN Treaties on Outer Space. It is submitted that insofar as dispute settlement relating to the use of space technologies is concerned, arbitration appears as the best solution particularly, as noted earlier, in disputes surrounding the use of satellite data in court to which we may add, at this point in time and as part of a non-exhaustive list, space debris issues, telecommunications and remote sensing in general and the very recent possibilities relating to remote presence issues and beaming technologies.

Recommendations and perceptions on the use of satellite data in court

1 The point of substance is that, unlike traditional photography where changes or manipulations are easy to establish, data collected by remote sensing technologies may be manipulated with no possibility of detecting *ex post facto* changes.

2 For that reason strict control of the whole process of data collection and interpretation is essential, from the moment the data is obtained (as raw data) until it becomes an end product for submission to court.

3 An international body should be in charge of, and made responsible for, the accreditation and certification of satellite data. Authentication, in this context, is a key word together with capacity building.

4 Following a traditional practice in other legal areas it is recommended to have a list of experts of international prestige from which the parties to a dispute and judges/arbitrators may be able to choose.

5 A helpful step would be the sealing of archives containing the raw data once collected, and to which it would always be possible to return in controversial situations.

6 The training of the legal sector (capacity building) in the development of these technologies is first priority given the current unawareness as to what this technology can offer and its limitations.

7 The issues surrounding satellite data in international litigation, and their development, should be kept under permanent review with particular emphasis on the production of satellite data in international boundary disputes where sensitive situations arising from claims of sovereignty are more likely to occur.

NOTE: The latest findings of the ILA on the value of satellite data as evidence in court and dispute settlement have been submitted to its Seventy-Fifth Conference in Sofia (26-30 August 2012) and to some extent embodied in this presentation. Further details may be found in the Report of the Space Law Committee to the ILA Sofia Conference, on the ILA website[25], in the Proceedings of tthe IISL 55th Colloquium on the Law of Outer Space (Naples, October 2012) and in the publications of the Annual Meetings of the Ibero American Institute of Aeronautic and Space Law, particularly in Asunción del Paraguay in October 2011 and, updated but more summarised, in Cádiz, Spain, October 2012.

'Remote presence' and beaming technologies – A brief introductory comment

A further step forward in the use of space technologies concerns the 'remote presence' possibilities. This topic has been recently addressed by Ray Purdy, a specialist from University College London (UCL) and developed further in the framework of an international project known as 'Beaming' -*Being in Augmented Multi-Modal Naturally-Networked Gatherings.* This project was funded by the European Commission (under an FP7 ICT Work Programme) to investigate how a person can visit a remote location via the internet and feel fully immersed in the new environment. To this end a study group was set up, which started work in January 2011 and was composed of leading experts and companies in eight European countries.

'Beaming', in simple terms, means a process of instantaneously transporting people (visitors) from one physical place in the world to another (the destination) so that they can interact with the local people there. The visitor may be embodied as an avatar or a robot, interacting with real people.

This outstanding achievement uses a variety of advanced technologies -including sophisticated space technologies- to influence human senses and emotional states so that users become fully immersed in a new environment and think they are 'really there´, in another place, even though, physically, they are not.

Most radically -as noted by Purdy[26]- beaming goes well beyond comparable communication technologies, such as Skype, as it allows for physical interactions to take place via the internet. Beaming differs from online games such as Second Life, a free 3D

[25] For further details on the Report submitted to this Conference by the ILA Space Law Committee see www.ila-hq.org (click on 'committees' and then on 'space law').

[26] Letter to this writer dated 24 October 2012, on file. For further details '*BEAMING.ETHICAL AND LEGAL ASPECTS',* Internal Workshop, University College London (UCL), 10 October 2012, where participants engaged in intensive discussion.

virtual world where users can socialize, connect and create using free voice and text chat. Moreover, beaming technologies enable users, embodied as avatars or robots, to be seen by other people virtually in human form and interact with real people in real places, rather than virtual people in virtual worlds.

These possibilities are a reality in the world of today. If we have in mind that technological developments in these areas are advancing at full speed it is not exaggerated to suggest that the use of ´remote presence' possibilities should become part of everyday life in a not too distant future.

Hence the risks of disputes over new situations involving space technologies -as described above- increasing at similar pace. It is anticipated that the development of appropriate laws, more consistent with the evolving scenarios, would become essential. As Purdy observes[27] the law may have to keep pace with the fact that certain crimes can be committed at a distance by means of beamed technologies and therefore awareness should be created in the sense that, in the near future, it should be quite easy to set up a beaming-enabled room in a typical home.

In addition to the legal questions involved in beaming technologies, ethical questions are likely to surface as well. In this context it is not unreasonable to believe that the PCA Rules of Arbitration for Dispute Settlement Relating to Outer Space Activities, specifically designed for the field, may have a constructive role in their application to these swiftly-evolving technologies for ironing out specific differences.

It is recommended to keep a general watching brief over further technological developments and their impact on space law and related ethical questions, such as beaming technologies and 'remote presence' possibilities.

[27] See BBC News, Special Reports, 11 May 2012.