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Beyond Reasonable Doubt

The Quest to Optimize the Suitability of Satellite Data for
Monitoring Human Rights and International Criminal Prosecution



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Beyond reasonable doubt

The quest to optimize the suitability of satellite data for monitoring Human Rights and international criminal prosecution.

First draft

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Aim and Contents

The aim of this paper is to contribute to the filling of the gap between the maturing use of satellite data for Human Rights (HR) purposes and providers of infrastructure and processing activities for raw satellite data. It is meant to serve as a practical basis for further discussion.

The growing role of satellite data in HR in the last two decades has led to analytic contributions on the conditions needed to be met while using satellite data as part of Digital Derived Evidence (DDE). Detailed analyses of the judicial practice have provided for a (quality) framework for actors in (legal) proceedings. The data which is used in these cases is generated by satellite instruments that are not specifically designed for the purpose.

Both the judicial practice and the problems in acquiring (dedicated) data and data-products would benefit from a more in-depth discussion on improvement by the stakeholders involved.

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Introduction

In our information society there is an increasing role for data and products provided by satellite-based instruments. Where positioning and timing is delivered by four major global systems, Earth observation depends on international cooperation with an important contribution by the growing European Copernicus constellation. Besides these publicly financed and operated systems (open source), private parties are active both in infrastructure and data and product provision (closed source). The combination of these active partners and technological developments leading to lower cost infrastructure and data provides for a (potential) very powerful tool for the international society.

Satellite based evidence is seen as part of the growing body of Digital Derived Evidence (DDE) as used in international and domestic courts. DDE reflects evidence that originates from electronic or

digital technology, as well as evidence that would normally fall under another category of evidence but has been copied or preserved by being converted into a digital form.¹

Satellite data and Human Rights

Products based on satellite data provide a service to almost all aspects of human activity. At the same time, they play an important role in tackling global challenges such as climate change, population and natural disasters.²

In this context the use of data and products in the field of human rights has grown steadily. In the – broad – field of human rights it seems useful to distinguish two categories:

1. The role of satellite products and data applications to support the achievement of rights such as the security of person (natural disasters) and the right of people to feed themselves. It can address a broad range of applications - e.g. agricultural monitoring, early warning of droughts, flood damage assessment, conflict and population dynamics monitoring and urban food security assessments. Because – the threat of – disasters often concern large communities of people these applications can provide enormous support. These Applications are based on open sources from public constellations such as the European Copernicus constellation, and are often combined with (commercial) data from private operators.
2. Information gathered by satellites plays an increasingly important role in mobilizing attention on a national and international level for possible violations of Human Rights, (mass) atrocities and International Humanitarian Law violations. Reporting based on such data is a useful instrument to press the (international) political level into action as well as providing a basis for the inquiry phase and proceedings under international (criminal) law. This concerns the International Court of Justice (ICJ), the International Criminal Court (ICC) as well as ad hoc and mixed tribunals. Current examples are the start of the Investigation Procedure by the ICC Prosecutor Karim Kahn³ as well as the start of a Joint Investigation Team (JIT) on possible war crimes with the support of Eurojust⁴.

This paper focusses on the second aspect. This is necessary as the product list of the European and global systems for Earth Observation like Copernicus and Positioning like GPS and Galileo pays no particular attention to the role they could play in this domain of human rights.

¹ Leiden Guidelines on the Use of Digital Derived Evidence, see also their reference to the definition of the International Bar Association and the Human Rights Centre of the Berkely School of Law; <https://leiden-guidelines.netlify.app/guidelines/#a-definition-of-dde>

² See i.a. MOU Cooperation between the Space Agency of the European Union (EUSPA) and the United Nations Office for Outer Space Affairs (UNOOSA), 2022.

³ <https://www.icc-cpi.int/Pages/item.aspx?name=2022-prosecutor-statement-referrals-ukraine>

⁴ <https://www.eurojust.europa.eu/news/eurojust-supports-joint-investigation-team-alleged-core-international-crimes-ukraine>

Availability of data and products

The products used are based on data generated by public and private satellite systems often combined with images from Google Earth and citizen participation (telephone). High resolution data often comes from private operators. Military intelligence could strengthen the quality of data considerably. As can be seen in the current Russian aggression in Ukraine, the availability is subject to the military and political interest of the owner in making them public.⁵

Turning data into usable products and combining those products with other information is the domain of data processing and research journalism like Bellingcat⁶, Amnesty International, Human Rights Watch⁷ and UNOSAT.⁸

Programmes of the European Space Agency (ESA) and the European Union Space Agency (EUSPA) cover space solutions for the important challenges of modern times such as climate change, the environment, efficient farming, communication, state-of-the-art positioning and timing, sea level rising and weather forecast.⁹ The programmes and projects are financed by public means from EU and ESA member states and their partner countries. The content of the activities is decided upon by member states on a proposal of the organizations.

With the introduction of cheaper (cube) satellite(s) systems and lower launching costs, daily images of every corner of the earth are available.¹⁰ These (constellations of) satellites are often commercially oriented and financed by private capital.

To be able to serve their purpose, the instruments of the satellites often contain cutting edge technology dedicated to specific (scientific) developments and societal challenges.

Where the use of satellite data in economic sectors is promoted by owners of the constellations¹¹ or technical organizations for the development of instrumentation¹², the use in the field of human rights monitoring and providing evidence in its violation is poorly developed. Despite the good work done by dedicated NGO's, the field of work is shattered.

Specifications for (new) generations of satellite instruments are increasingly user-driven and are fed by extensive consultation of the user communities¹³ to accommodate their needs. So far, the use of the data for monitoring Human Rights developments or providing evidence of their violation or possible atrocities has not been (explicitly) included in the user-driven approach.

Several existing aspects have resulted in limitations on the use of satellite data and data products. These are: coverage and resolution, government restrictions, ethical considerations and cost.¹⁴

⁵ <https://theconversation.com/sharing-top-secret-intelligence-with-the-public-is-unusual-but-helped-the-us-rally-the-world-against-russian-aggression-178084>

⁶ <https://www.bellingcat.com/news/uk-and-europe/2016/06/22/new-google-earth-satellite-update-confirms-presence-of-buk-in-eastern-ukraine/>

⁷ <https://www.hrw.org/news/2017/11/30/new-satellite-imagery-partnership>

⁸ https://unosat-maps.web.cern.ch/UA/CE20220223UKR/UNOSAT_Mariupol_LivoberezhnyiDistrict_DamageAssessment_14March2022.pdf

⁹ See: https://www.esa.int/Applications/Observing_the_Earth and <https://www.euspa.europa.eu/european-space/eu-space-programme>

¹⁰ <https://www.planet.com/products/planet-imagery/>

¹¹ <https://www.euspa.europa.eu/newsroom/news/euspa-eo-and-gnss-market-report-out-did-you-get-your-copy>

¹² <https://www.esa.int/Applications>

¹³ <https://www.euspa.europa.eu/newsroom/news/registrations-3rd-user-consultation-platform-are-now-open>

¹⁴ Harris e.a., AAAS, p. 7

Emerging new technologies to increase accountability for human rights violations create challenges for actors who should seek to uphold the highest methodological and procedural standards to ensure that, if information might ever become relevant to criminal proceedings, its probative value will not be lost or compromised.¹⁵

The UN Office of the High Commissioner for Human Rights (OHCHR) has recognized the crucial role that UN mandates can play in supporting accountability purposes by gathering reliable data and has already begun to build an investigations support unit.¹⁶

Moral and ethical considerations

Information based on satellite data can affect behaviour, privacy and security of people and organisations. Therefore it is crucial to ensure that the protection of (basic) Human Rights is ensured when applying information based on satellite data.¹⁷ Important rights in this context are the right to information, the right to protection (when harm could result from measures based on the data), the right to privacy and security, the right to data agency (access to personally identifiable information) and the right to redress and rectification. Currently, Digital Globe provides 30 cm pixels able to identify types of cars and numbers on planes.¹⁸

Current and future technological developments in high resolution in particular need to go hand in hand with this right to privacy and security. This means that conditions have to be met concerning processing, accuracy, being adequate and storage.¹⁹

If important conditions such as the right of privacy are not met, it could lead to the exclusion of the evidence concerned.

The comprehensive Berkeley Protocol on Open Source Investigations contains important guidelines for people active in research using digital evidence and directed to Human Rights issues and international criminal proceedings. The Protocol also contains ethical principles, the right to privacy and data protection and security of all actors involved in the investigations.²⁰ Although open or closed sources of satellite data and products should be treated differently concerning some aspects such as intellectual property rights and copyright, the guidelines should be applicable to both sources of information.

Practice in Human Rights monitoring and litigation

The use of satellite data in the field of Human Rights dates back to the nineties, for example in the former Yugoslavian conflict.²¹ Because civilian high-resolution remote sensing satellites have only

¹⁵ D'Alessandra/Sutherland, The Promise and Challenges of New Actors and New Technologies in International Justice, *Journal of International Criminal Justice*, Volume 19, Issue 1, March 2021, P.

12, <https://doi.org/10.1093/jicj/mqab034>

¹⁶ The Investigation Unit of the UN Office of the High Commissioner for Human Rights, supported by the Dutch Government, defined GEOIntelligence as one of the new technologies

¹⁷ See: Harvard Humanitarian Initiative, The Signal Code: A Human Rights Approach to Information During Crisis, https://hhi.harvard.edu/files/humanitarianinitiative/files/signalcode_final.pdf?m=1607469621

¹⁸ See: <https://www.euspaceimaging.com/true-30-cm-imagery/> ; <https://microsites.digitalglobe.com/30cm/>

¹⁹ Harvard Humanitarian Initiative, The Signal Code, pag. 16

²⁰ Berkeley Protocol on Digital Open Source Investigations, A practical guide on the Effective Use of Digital Open Source Information in Investigating Violations of International Criminal, Human Rights and Humanitarian Law; United Nations 2022; https://www.ohchr.org/sites/default/files/2022-04/OHCHR_BerkeleyProtocol.pdf

²¹ Dina Fine Maron, How Satellite Images Can Confirm Human Rights Abuses; 16-4-2017

existed since 1999, the studies that took place earlier had to rely on declassified government imagery.²²

Since then, the availability of the data has increased dramatically. Geospatial technologies have enormous potential and have been found to have a significant application in Human Rights documentation.²³

Examples of the use of satellite data in fact-finding missions on Human Rights can be found in the work of the Office of the High Commissioner of Human Rights (OHCHR), the Human Rights Council and the non-UN International Humanitarian Fact-finding Commission (Geneva Conventions). Countries and conflicts involved concern Sri Lanka, Myanmar, Syria, Sudan and Occupied Palestinian Territory.²⁴ As mentioned above a JIT from the ICC and Eurojust is currently investigating the (possible) war crimes conducted by the Russian-led invasion army in Ukraine. As the role of satellite data is most striking in this conflict, it is clear that they will play a role as (corroborative) evidence in (pre)trial cases in international criminal proceedings.²⁵

Between 1990-2010, the geopolitical situation made possible the establishment of international and mixed (international/regional/national) tribunals to punish atrocities committed in former Yugoslavia, Rwanda, Sierra Leone and Lebanon. The Rome statute, which came into force on 1 July 2002, established the permanent International Criminal Court (ICC).

The International Court of Justice (ICJ), the judicial organ of the UN, started its work in 1946. Contrary to the focus on individual responsibility and guilt in the tribunals and the ICC, the ICJ is competent for disputes between states. In some of the cases brought before the ICJ, satellite imagery played an important role in disputes on the proper implementation of international agreements as well as cases on pollution (Nigeria), boundary disputes and the application of the Law of the Sea Convention.

Beside the dispute-oriented use of the data, imagery and measurements play a significant, not to say decisive, role in assisting parties in the compliance with international obligations.^{26 27} To play a more effective role in the national context, technology will have to be developed and validated.²⁸

Using satellite data to prove individual responsibility in international crimes pushes it to the extreme.

Courts and Tribunals which adjudicate international crimes, including the ICC, generally have broader discretion to admit evidence than national courts. This is due to the fact that the crimes involved are extremely challenging to document as they may concern vast areas and multiple locations.²⁹

The International Criminal Court has had 26 cases since its start in 2003 and has issued a verdict in six cases. The Court has the most developed procedures for evidence based on geospatial

²² Harris, T.L., J. Drake, J.M. Wyndham, S.R. Wolfenbarger, S.D. Lott, M. Lerner 2018. Geospatial Evidence in International Human Rights Litigation. (AAAS report), p 5,21.

²³ Freeman, L. 2018, Digital Evidence and War Crimes Prosecutions: The Impact of Digital Technologies on International Criminal Investigations and Trials. Fordham International Law Journal, Vol 41, pp. 286-287.

²⁴ Heinsch, R. (coord.) e.a., Report on digitally Derived Evidence used in UN Human Rights Fact-finding Missions, Leiden University, December 2020

²⁵ For a short overview see: ICC investigations in Ukraine: How Digitally Derived Evidence can make a difference, Leidenlawblog, 19 May 2022; <https://leidenlawblog.nl/articles/icc-investigations-in-ukraine-how-digitally-derived-evidence-can-make-a-difference>

²⁶ Satellite data to Monitor International Agreements, European Space Policy Institute, ESPI Briefs no. 14, June 2017

²⁷ See also: www.tropomi.eu

²⁸ See ESPI Briefs no. 14, June 2017

²⁹ Harris e.a., p. 12

information. The different stages in the – preparation of – the cases are very time consuming because gathering evidence, often after a long period of time, is especially complicated. Data from remote sensing instruments offers solutions to the most difficult Human Rights documentation challenges.³⁰

While the courts discretion to consider evidence is broad and flexible, it can be challenged by the parties in the case. To determine the probative evidence before it, the Court must evaluate both authenticity and reliability.³¹ Optimizing both aspects could diminish limitations on the use of satellite data. These include (see above): coverage and resolution, cost, government restrictions and ethical considerations.³²

In order to improve the authenticity and reliability, more standardized procedures for obtaining, transfer, storage and editing data and products are necessary.

As the vast investments done in the sphere of supporting scientific evidence, effective compliance and monitoring of international agreements e.g. on climate can be noted, comparable dedicated investments in ensuring Human Rights are non-existent.

This raises the question how to optimize the suitability of satellite data for monitoring Human Rights and international criminal prosecution.

Development of criteria for evidence based on satellite data

The practice of the increasing role of satellite data related evidence contributed to the formulation of criteria and standards to come to a higher level of authenticity and reliability of the derived evidence.

National rules for the admissibility of digital or new evidence could contribute to setting standards for the use in Human Rights cases and international (criminal) prosecutions.

An example of these national criteria is the American Daubert Standard. This set of more general criteria, which includes the requirement that the technique has been tested in practice, has been subject to peer review and publication. The potential rate of error is known as is the existence of a standard for the operation of the new technique.³³

Criteria on the admissibility of the evidence can be derived from the jurisprudence of international courts and tribunals. An important source of information in this respect can be found in the products of the 'Leiden Guidelines on the use of Digitally Derived Evidence in international criminal courts and tribunals'. They are based on thorough summaries and the extrapolation of case law.³⁴ These guidelines are derived from cases of international courts and tribunals in the different stages of proceedings (arrest warrant, pre-trial, trial, appeals) and arguments from parties and the chamber. The guidelines contain conclusions such as the reduction of the complexity, the combination with witness testimony and the necessity of contemporaneous products.

³⁰ Harris e.a., p 1

³¹ Harris e.a., p. 14;

³² Harris e.a., p. 7

³³ Purdy and Leung, Evidence from Earth Observation Satellites, 2012

³⁴ Leiden Guidelines on the use of Digitally Derived Evidence, Project of the Kalshoven-Gieskes Forum on Humanitarian Law (Grotius Centre for International Legal Studies); <https://leiden-guidelines.netlify.app/resources/downloads/>

The research within the Leiden project was combined with the outcome of a comparison of national legislation on the admissibility of digital evidence, including aerial and satellite images.³⁵

Now the description of the practice in the use of the data is more complete and accessible, it is time to judge them in the light of possible improvements in aspects such as presentation, infrastructure and data processing.

Steps to consider to support effective use of satellite data in Human Rights

For the effective use of satellite data, the different constraints should be addressed. The thorough research on the practice of use of satellite-based products provides a basis for interaction between provider (infrastructure and processing) and user.

Cost

The purchase of satellite data and raw products is often facilitated by national governmental agencies.³⁶ This is done to support the application developers. By explicitly addressing the needs of NGO's and courts and tribunals, supply and demand experiences a lower threshold to working together. This would also need the purchase of data for the purpose of Human Rights from areas other than the national territory. This should preferably be organized in a European or International context such as the EU or the UN. In this context, increased cooperation in processing facilities for dedicated satellite data could also lower the costs.

Coverage and resolution

This covers the question whether the current public and private space instruments can deliver timely products with the right quality. Whereas data from public constellations are freely available though often less dedicated, private operators have a limited capacity and might not be interested in areas where Human Rights incidents occur.³⁷ Up to now, very limited interaction between demand and supply in the field of Human Rights can be traced. As stated above, this interaction is organized for other sectors on a regular basis.³⁸ By addressing the demand of these stakeholders in similar ways to other sectors, the availability of adequate data and products could be stimulated. Furthermore, an interaction between demand and (technical) supply could be useful to explore – future – possibilities and limits. A rough scan thus far on the awareness of the technical and market related sides showed interest but no practice.

Ethical considerations

Geospatial data does provide information on individuals as well as physical (moving) objects. The needs in the Human Rights sphere might go further than 'volunteered geographic information'. In these cases, ethical concerns, including privacy and informed consent, require careful scrutiny.³⁹ Special standards such as the Berkely Protocol could be developed for the use of the data in case of inquiries on Human Rights violations. These could be derived from national legislation⁴⁰ and experience, and be brought further in an international context.

³⁵ Leiden Guidelines of the use of Digitally Derived Evidence; Prosecution of International Crimes using Digitally Derived Evidence in National Courts;

³⁶ See for example: <https://www.satellietdataportaal.nl/hoef/>

³⁷ Harris e.a., p. 7

³⁸ See: note 9 and 11

³⁹ Harris e.a., p. 8 and note 13

⁴⁰ See for example: Karen Geer, The Constitutionality of Remote Sending Satellite Surveillance in Warrantless Environmental Inspections, Fordham Environmental Law Review, vol. 3 no. 1, 2011.

Government supply and restrictions

National Defence intelligence has made the difference in several cases of Human Rights violations. Often it depends on the (political) interest of the country concerned whether the information is shared. Although the information given cannot easily be checked because sources remain secure, it could be useful to explore if, and under what conditions, more information could be shared 'on call'. Governmental restrictions on information about predefined areas can restrict the availability of (high resolution) satellite data worldwide. The introduction of a mechanism for providing information based on the data concerned could reduce the impact of these national measures.

Authenticity and Reliability

The credibility of data and information available in defining Human Rights violations or in providing evidence in international criminal litigation depends on its authenticity and reliability. Both aspects are evaluated by the ICC to determine the probative value.

A very important prerequisite for this credibility is a well-defined chain of purchase, processing and analysis and archiving of data.⁴¹

In current practice the determination of whether satellite-based evidence is credible is done by multiple organizations and free press actors. This raises the question of how this process could be made more efficient to make it more effective and less costly. In other sectors the applications/procedures based on satellite data are certified. Certifying – part of – the information chain for evidence could contribute to its better use.

Technical adaptations in infrastructure and (secure) data handling could be defined if the demand side of NGO's and Court experts would share their experience with designers and market experts.

Conclusions

- 1) Satellite data and the products based on these data play a growing role in the monitoring and denouncing of violations of Human Rights, in trials under international (criminal) law and trials under mixed international criminal tribunals.
- 2) After initial basic analysis of several cases, the judicial practice of the role of DDE/satellite products was systematically and more thorough analysed in the project resulting in the Leiden Guidelines for DDE. This research is extremely helpful in accommodating the needs of the judiciary. The analysis and Guidelines are an important ingredient for a multi-stakeholder dialogue (supply and demand). The Berkely Protocol on Digital Open Source Investigations provides an excellent framework for qualitative and accountable research activities and products.
- 3) Despite the growing role of evidence based on satellite data, no – structured – dialogue could be traced so far to better accommodate the user side in its concern to attune to the supply side (infrastructure and processing). In other sectors this process takes place in a structured way. Organizations such as the European Union Space Organisation (EUSPA), the International Criminal Court, Universities, the European Space Agency (ESA) and the United Nations (UN) could play a role in this respect.
- 4) As stated in this paper, the user segment for space applications in the Human Rights activities has matured. Now it is time for multi-stakeholder and multi-disciplinary discussions. Conclusions could lay the basis for a more structured dialogue in future. Possible subjects to be discussed are:
 - a. Specific requirements concerning reliability and continuity;

⁴¹ For recommended practices see Harris e.a. AAAS pp. 9-11

- b. Technical and service related possibilities for authentication;
- c. Dedicated processing facilities that meet required standards;
- d. Regular interaction between the user community and instrument and processing developers;
- e. A liberal data policy is essential for using data for Human Rights; should certain restrictions be introduced, an exemption for this use should be made.

The author studied Public International Law, European law, Humanitarian Law and International Relations at Leiden University and worked for an NGO and the Netherlands Government. Besides bilateral relations he has specialized in the European and national Space Policy and implementation thereof i.a. as member of the Board of the EU Space Agency EUSPA, the Consultative Committee NL-ESA/ESTEC and the steering committee of the Netherlands Space Office.

Part-time retirement and COVID brought him to study International Criminal proceedings in which satellite data play a growing role. He noticed, that contrary to the interests of multiple sectors, no attention in programming and projects under the space programmes is paid to interests in Human Rights actions. In his view this is an omission that should be changed.

This paper is written in a personal capacity and does not reflect current policy.

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