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*Archimedean Witness: The Application of Remote
Sensing as an Aid to Human Rights Prosecutions*

A thesis submitted in partial satisfaction
of the requirements for the degree Master of Arts
in Geography

by

James Robin Walker

2014

ABSTRACT OF THE THESIS

Archimedean Witness: The Application of Remote Sensing as an Aid to Human Rights Prosecutions

by

James Robin Walker

Master of Arts in Geography

University of California, Los Angeles, 2014

Professor Adam Moore, Chair

The 21st century has seen a significant increase in the use of remote sensing technology in the international human rights arena for the purposes of documenting crimes against humanity. The nexus between remote sensing, human rights activism, and international criminal prosecutions sits at a significant crossroads within geographic thought, calling attention to the epistemological and geopolitical implications that stem from the “view from nowhere” afforded by satellite imagery. Therefore, this thesis is divided into three sections. The first looks at the geographical questions raised by the expansion of remote sensing use in the context of international activism. The second explores the complications inherent in the presentation of remote sensing data as evidence of war crimes. Building upon the first two, the third section is a case study in alternate forms of analysis, aimed at expanding the utility of remote sensing data in international criminal prosecutions.

The thesis of James Robin Walker is approved.

John Agnew

Thomas Gillespie

Adam Moore, Committee Chair

University of California, Los Angeles

2014

Archimedean Witness: The Application of Remote
Sensing as an Aid to Human Rights Prosecutions

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In February of 2014 Human Rights Watch (HRW), a Geneva based International Non-Governmental Organization (INGO), released a 36 page report on the Syrian crisis entitled Razed to the Ground: Syria's Unlawful Neighborhood Demolitions in 2012 - 2013. The report was released in the midst of the ongoing "Geneva II" peace negotiations between the warring parties to the Syrian conflict, and was intended to show in shocking visual detail the extent of civilian property destruction and population displacement within the Syrian capital of Damascus, and the town of Hama. The introduction states that:

*"Human Rights Watch [has] concluded that seven cases of large-scale demolitions documented in this report violated the laws of war either because they served no necessary military purpose and appeared intended to punish the civilian population, or because they caused disproportionate harm to civilians. Those responsible for the wanton destruction of civilian property or for imposing collective punishment have committed war crimes and should be investigated and held to account."*¹

The evidence presented within the report is multifaceted, relying upon witness testimony, news-media footage, social media reportage, and on site documentation from HRW staffers, all of which is intended to corroborate the veracity of evidence gathered by satellite remote sensing (RS). The aim of this thesis is to explore the burgeoning use of RS technology in the international human rights arena, and in particular to understand the utility and admissibility of RS data for the purposes of criminal prosecution of war crimes, and crimes against humanity.

Within the non-governmental sphere there has been a steady increase in the use of RS technology over the past decade. Environmental groups have been at the forefront of this movement, often in conjunction with university researchers, as the utility of freely

¹ Solvang, Ole. "Razed to the Ground: Syria's Unlawful Neighborhood Demolitions in 2012 - 2013." *Human Rights Watch*, 30 January 2014.

available satellite data (some of which dates back over 40 years) has clear applications in regards to charting environmental change over time. In addition, the development and easy access to virtual globes, such as Google Earth, has offered NGOs and other civil society actors access to relatively up to date, high resolution imagery that can be easily adapted for use with a minimum of technical knowhow or training. This has served to “democratize” RS technology, moving it out of the exclusive realm of state, military, and commercial entities, and into the public arena.²

Within the Human Rights (HR) community, a number of major events have served to bring RS data to the forefront. Beginning with satellite images of mass graves in Srebrenica, Bosnia released by the US Government in the mid 1990’s, the HR world began to take a clear interest in the potential for RS data as a means of documenting crimes against humanity.³ The use of satellite imagery meant that organizations such as Amnesty International (AI) and Human Rights Watch (HRW) could attempt to monitor situations even in cases where it was impossible to send in representatives, or where conditions on the ground were too dangerous to allow for fieldwork.⁴ The most high profile example of this kind of application of RS monitoring is the continuing work done in Darfur, by groups such as Eyes on Darfur and the Satellite Sentinel Project.

Significantly, the issue of sovereign territorial control as a means to exclude international observation has become somewhat redundant. Authoritarian regimes can no longer simply hide their atrocities behind national borders, as the “eyes in the sky” are

² Van Wyk, Jo-Ansie. "Space for Peace? The Use of Space Technology to Monitor Conflict Trends and Human Security in Africa." *Conflict Trends* 1, 2008.

³ Parks, Lisa. "Satellite Views of Srebrenica: Tele-visibility and the Politics of Witnessing." *Social Identities* 7, no. 4, 2001.

⁴ Lavers, C, C Bishop, O Hawkins, E Grealey, C Cox, D Thomas, and S Trimmel. "Application of Satellite Imagery to Monitoring Human Rights Abuse of Vulnerable Communities, with Minimal Risk to Relief Staff." *Journal of Physics: Conference Series* 178, no. 1, 2009.

always watching. This raises important geopolitical questions concerning the role of non-state trans-national actors and their effects upon the internal political actions of sovereign states. Commercial satellite companies such as Digital Globe can provide high-resolution imagery to human rights campaigns in near real-time, allowing greater agency for INGOs as data obtained from orbit bypasses terrestrial political constraints.⁵

Therefore, in the modern era both state and non-state actors, such as INGOs, are able to use remotely acquired data against the interests of particular regimes. This highlights potential infringements of national sovereignty, and places the issue of RS technology within the continuing debate over the evolving nature of sovereign authority in the 21st century.

At the same time, the development and institutionalization of humanitarian international criminal law has moved swiftly over the past two decades. In response to a number of highly publicized humanitarian catastrophes, the international community (under the auspices of the United Nations) moved to set up first ad hoc, and then permanent legal institutions to prosecute individuals responsible for crimes against humanity. The creation and ratification of the "Responsibility to Protect" doctrine (R2P) within the UN stands as a significant shift in the international understanding of the rights and responsibilities of state parties, and of the international community's duty towards populations across the globe, regardless of national or political boundaries. While institutions such as the International Criminal Court (ICC) or the implementation of R2P

⁵ The major exception to this is the State of Israel. Through the use of extensive pressure exerted by both the USA and the Israeli state, since 1997 no commercially available satellite imagery is allowed with a resolution higher than 2m by 2m over Israel, the West Bank, the Golan Heights, the Gaza Strip, and a five mile buffer zone around the entire region. See Lyons, Joshua. "Documenting Violations of International Humanitarian Law From Space: A Critical Review of Geospatial Analysis of Satellite Imagery During Armed Conflicts in Gaza (2009), Georgia (2008) and Sri Lanka (2009)." *International Review of the Red Cross* 94, no. 866, 2012.

remain controversial, they do encapsulate an important aspect of the dynamic geopolitical shift taking place. In this regard, the utility and admissibility of RS imagery in tribunal settings is a question of some importance.

Within Geography as a discipline there is also a longstanding debate over the epistemological divide between a resurgent positivist ideal, as represented by the RS and Geographic Information Systems (GIS) end of the spectrum, and the critical, post modern position taken by many human geographers. The issue of RS imagery and humanitarian activism therefore sits at a significant crossroads within geographic thought, and leads to important considerations of the ethical and geopolitical implications that stem from the “view from nowhere” afforded by satellite imagery.⁶

Consequently, by reviewing the ways in which satellite data has been presented in the past, as well as looking at the judicial responses garnered by such evidence, the aim of this paper is to explore further potential uses of RS technology in the prosecution of war crimes, while also attempting to clarify the epistemological complications that arise from the application of RS technology in a human rights framework. Therefore, the paper is divided into three sections. The first looks at the geographical questions raised by the expansion of RS use in the context of international activism. The second explores the complications inherent in the presentation of RS data as evidence of war crimes. Building upon the first two, the third section is a case study in alternate forms of RS analysis, aimed at expanding the utility of RS data presentation beyond the “before and after”, visual ideas exemplified by the HRW Syrian report.

⁶ Dodge, Martin, and Chris Perkins. "The 'View From Nowhere'? Spatial Politics and Cultural Significance of High-resolution Satellite Imagery." *Geoforum* 40, no. 4, 2009.

Section I: Geographic Issues

Within the field of geography, the sub-discipline of political geography has experienced something of a renaissance over the past two decades. The rapidly changing international system has forced geography as a whole to attempt to come to terms with radical shifts in the nature of economic, political, and cultural interactions on a global scale. Technological innovations like the Internet, Friedman's "electronic herd" of global capitalism,⁷ and the exponential increase in satellite imagery all serve to question our understanding of the international order. As such, any exploration of the ever increasing use of RS data on the global stage must confront perhaps the most significant political geographic question of our time; namely, the hotly contested nature of sovereignty in a globalized era.

Sovereignty:

A full exploration of this complex issue is outside the scope of this paper, however certain aspects of the debate are directly relevant. In particular, the rise of trans-national forces in global governance, the institutionalization of normative values in international law, and the increasing influence of non-state actors in such value creation. The argument here is that satellite imagery has the potential to impact the global order at quite fundamental levels. For better or worse, this influence will only increase in significance as the costs of RS data acquisition falls, and the imagery resolution rises.

Exactly how state sovereignty is changing is a matter of some conjecture, but the idea that the global order is now subject to increasingly influential trans-national flows is

⁷ Friedman, Thomas L. *The Lexus and the Olive Tree: Understanding Globalization*. Macmillan, 2000.

apparent. Moving from a distinctly Westphalian, static understanding of the division between the domestic and the international plane, geopolitics envisages a far more complex and dynamic international system. In particular, one that is not territorially bounded in the way that has traditionally been the case. Drawing upon Agnew's rejection of the "territorial trap" in the mid 1990s,⁸ political geography and geopolitics has sought to become "more spatially imaginative in conceptualizing sovereignty" with less of a focus on the territorial state as a seat of sovereign authority, and more of an emphasis on the "spatial dimensions (such as locational intensity, transnational reach, and territorial limits) of sovereignty."⁹

The role of transnational actors in the international system is one of the most significant areas of interest. The Razed to the Ground report published by HRW is a prime example of the potential impact that INGOs and other non-state actors attempt to project into the geopolitical realm. It is not coincidental that the HRW Geneva office chose to release their findings during the contentious and politically charged Syrian "Geneva II" peace negotiations. The global media attention focused upon the conference served to greatly expand the reach and impact of the report, thereby positing HRW (in the guise of international civil society) as more than just an advocacy group, but in effect an international actor with a distinct voice to contribute to the discussions. In particular, the satellite "before and after" images worked as compelling visual communication aids that were re-posted by news agencies across the globe, and helped to set the tone for the international reporting of the negotiations.

⁸ Agnew, John. "The Territorial Trap: The Geographical Assumptions of International Relations Theory." *Review of international political economy* 1, no. 1, 1994.

⁹ Mountz, Alison. "Political Geography I: Reconfiguring Geographies of Sovereignty." *Progress in Human Geography* 37, no. 6, 2013.

This kind of INGO activism can be seen as a distinct challenge to traditional notions of state oriented sovereignty, in that it posits international civil society as having a participatory role that transcends national boundaries. Groups such as HRW and AI are, in effect, suggesting that they have both the right and the duty to speak on behalf of a constituency that resides within the domestic authority of the state (in this case, the people of Syria). It is therefore unsurprising that a number of autocratic regimes have sought to curtail both the creation and development of a domestic NGO realm, while at the same time making it increasingly difficult for INGOs to operate within their territories.¹⁰

International Civil Society:

However, the role of international civil society is not one that has been entirely imposed upon the international arena. To a great extent, much of the impact afforded to normative value creation and agenda setting by NGO actors has resulted from the active participation and promotion of state entities. Raustiala, in his review of the development of international environmental treaties, suggests that the role of non-state actors in fact works to the benefit of state authorities, and allows for greater state participation in global regulation and normative legal development:

“States have incorporated NGOs because their participation enhances the ability, both in technocratic and political terms, of states to regulate through the treaty process. The terms of that incorporation reflect the resources, skills, and domestic influence of NGOs: NGO participation provides policy advice, helps monitor commitments and delegations, minimizes ratification risk, and facilitates signaling between governments and constituents.”¹¹

¹⁰ Dobson, William J. *The dictator's learning curve: Inside the global battle for democracy*. Random House, 2012.

¹¹ Raustiala, Kal. "States, NGOs, and International Environmental Institutions." *International Studies Quarterly* 41, no. 4, 1997.

The role of non-state actors within the United Nations further supports this idea, with several thousand NGOs now afforded limited participatory roles as “consultants.” It is worth noting, however, that their accreditation is still subject to veto by the domestic authority of the home state.

A direct example of this concept in action concerns the development of the Rome Statute that governs the International Criminal Court (ICC). Glasius identifies a number of international civil society actors who were fundamental in the creation of the ICC, and who formed an “epistemic community” in which “community members’ professional training, prestige, and reputation for expertise in an area highly valued by society or elite decision makers accord them access to the political system and legitimize or authorize their activities.”¹² As such, the Coalition for the International Criminal Court (CICC), an umbrella organization of like minded civil society actors, was able to participate in setting the agenda for the development of the Rome Statute, as well as play an essential role in lobbying for both domestic and international ratification of the treaty.

Within this context, it is clear that the role of non-state transnational actors (such as INGOs) has an important part to play in our understanding of normative value creation at the international level. This, in turn, affects the domestic capacity of the state (admittedly, with varying degrees of success) providing just one of the many challenges to state sovereignty that are so indicative of the modern era. More pointedly, the institutionalization of such normative values, as exemplified by the creation of the ICC in 2002, demonstrates the challenges to absolute sovereign authority that are a hallmark of the 21st century.

¹² Glasius, Marlies. *Expertise in the Cause of Justice: Global Civil Society Influence on the Statute for An International Criminal Court*. Oxford University Press, 2010.

Positionality and the Politics of Scale:

However, the increasingly influential role played by international civil society groups does pose significant questions concerning the ways in which international normative ideals are represented in their advocacy work. From the point of view of critical geography, it is troubling that a series of predominantly Western oriented, well funded INGOs such as AI and HRW are in a position to help set a global agenda on human rights. This is especially the case when such organizations posit themselves as speaking on behalf of those who have no voice – a worthy aim, but one that can be accused of being prone to replacing the localized agenda of the oppressed with a specifically globalized narrative concerning the nature of justice.

For all the desire shown by interventionist groups, civil society actors, and other international personnel to be culturally sensitive, in many fundamental ways they still project the dominance and hierarchical superiority of global, universal normative ideals over local considerations. A review of the literature provided by HRW and AI will serve to demonstrate this process in action.

As one of the most important international human rights advocacy groups in the world today, HRW works in virtually every country of the globe, and has an outstanding reputation for producing clear, factual assessments of conditions on the ground, as well as having established a strong reputation for the veracity and impartiality of their work. In fact, much of their output is achieved through the extensive collection of data and interviews in country, meaning that they are actively engaged with local populations for extended periods of time. Their methodology requires that researchers “develop a thorough, well-rounded understanding of the incident or rights violation and gain a strong

sense of the local political, social, and cultural context of the violation.” The researcher must also “frame the violation as it relates to international human rights and humanitarian law.”¹³ This insistence on an international framing is consistent with the mission statement of the organization, as it demonstrates the focus of the group and its view of where effective change can be enacted:

*“Human Rights Watch is dedicated to protecting the human rights of people around the world. We stand with victims and activists to prevent discrimination, to uphold political freedom, to protect people from inhumane conduct in wartime, and to bring offenders to justice. We investigate and expose human rights violations and hold abusers accountable. **We challenge governments and those who hold power to end abusive practices and respect international human rights law. We enlist the public and the international community to support the cause of human rights for all.**”¹⁴*

The other major player in the human rights field is Amnesty International (AI). Unlike HRW, Amnesty is a distinctly membership based organization that looks to leverage grass-roots campaigns at the local, national and international levels in order to affect change. Their involvement “in country” is more extensive and focused, and yet the overall vision of the organization is still one that looks to universal ideals of justice, and to the international community as the guarantor of human rights. As such, their vision states that:

“Amnesty International is a global movement of more than 3 million supporters, members and activists in over 150 countries and territories who campaign to end grave abuses of human rights.

Our vision is for every person to enjoy all the rights enshrined in the Universal Declaration of Human Rights and other international human rights standards

We are introducing a new, global way of working...because we owe it to the people we work for to be the most effective force for freedom and justice that we can, globally.”¹⁵

¹³ “Our Research Methodology.” *Human Rights Watch*. www.hrw.org. 2013. Web.

¹⁴ “About Us.” *Human Rights Watch*. www.hrw.org. 2013. Web. (*Emphasis added*)

¹⁵ “Who We Are.” *Amnesty International*. www.Amnesty.org. 2014. Web.

Clearly, for AI as for HRW, ensuring that issues at the local and national levels comply with the international human rights agenda is of paramount importance. The fact that their practical efforts may be focused on ensuring documentation of domestic human rights infringements does not detract from the idea that they view such events through the lens of “universal” standards. Although both of these organizations (along with a plethora of others) remain committed to an ideal of cultural sensitivity, an understanding of the crimes in the context of the local environment, and the necessity for the people affected to gain some sense of justice from any resulting legal process, the narrative remains one that posits the superiority of international norms over any local considerations.

Taking this notion a step further, in exploring the nature of those international legal personnel that make up the front lines of the normative battlefield, Baylis refers to an emerging archetype of “post-conflict justice junkies” as “internationals who work on post-conflict justice issues and who maintain an itinerant lifestyle in pursuit of that work, moving from one post-conflict justice hot spot to the next as the previous spot cools down.”¹⁶ The disparity between the two central demographics – the victims of crime and the international responders – is a significant factor in how the quest for justice plays out. The relative power dominance available to the justice junkies (and the organizations they work for) has a pejorative effect on how the prosecution of individuals is understood and narrated, particularly in scalar terms.

One of the most salient issues in this regard is the nature of cultural boundaries. For the victims of war crimes any prosecution is inevitably viewed through a localized cultural lens. There have been numerous post-conflict situations in which the affected community

¹⁶ Baylis, Elena. “Tribunal-hopping with the post-conflict justice junkies.” In *Oregon Review of International Law, Symposium Issue*, vol. 10, 2008: p. 361.

has called for traditional methods of adjudication and punishment. Probably the most well known of these is the Gacaca court system in Rwanda, instigated in 2001 as a way to expedite the judicial process, clear the enormous backlog of genocide cases, and reintegrate offenders back into the community. Just how successful the process has been is open to some debate, but for the purposes of this paper what is most significant is the resistance posited by the international legal community towards such traditional systems of justice. Concerns over the efficacy and legitimacy of a judicial process that does not include many of the standard rights and protections afforded by Western justice mechanisms meant that advocacy groups such as HRW voiced grave concerns about the justice inherent in the system.¹⁷ This is not surprising, as the post-conflict advocacy specialists - even those who are situated in country - are culturally attuned to a distinctly internationalist viewpoint. In fact, Baylis suggests that there is a clear cultural agenda that is inherent in the lifestyle and working climate of such responders:

*“Post-conflict justice junkies are immersed in expat culture, human rights culture, and democracy-building culture, and should be adept in operating in these cultures. International institutions play an important role in post-conflict zones, and these institutions are typically staffed by expats who are at least to some extent committed to the aims of promoting human rights and democracy. Accordingly, this cultural knowledge is also crucial to interacting successfully with those institutions in post-conflict contexts.”*¹⁸

As such it is unsurprising that the scalar narrative associated with the local is often regarded as traditional, anachronistic, and pre-modern. Within the social sciences, this coincides with a view of *place* as outdated and insignificant. As Agnew puts it, “in social terms at least, place equates to a collectivist traditional community and that as modern

¹⁷ Vasagar, Jeevan. “Grassroots justice.” *The Guardian*. March 17, 2005.

¹⁸ Baylis. *Ibid.*, p. 384.

national (and global) society has inevitably eclipsed community so has place lost its significance.”¹⁹ Hence, for the ex-patriot staff who parachute into a conflict situation, the actual location may be insignificant in regards to the application of justice as it is understood at the international scale. Thus the process of establishing the bureaucratic and institutional mechanisms of intervention ensure that those with the ability to push for justice are people who think on a global scale, rather than a local one.

The View from Nowhere:

Within this context, questions over the use of remotely acquired and analyzed satellite imagery become very significant, as the process of RS data acquisition is as distantly removed from the object of observation as is physically possible. In addition, the epistemological debate over the nature of knowledge, and questions of positivist universality that are associated with the science of remote sensing, mean that critical geographers have begun to question the objectivity of RS imagery. The first objection often raised is the fact that most RS technology is derived from (and utilized for) military applications. The strategic, positivist underpinnings of RS science therefore reflects this genealogy, tying into what Graham describes as “Vertical Geopolitics” in which a “God’s eye view” of the Earth’s surface presents a cartographic vision of reality.²⁰ The idea that much traditional geopolitical thought can also be traced back to a vertical view of the earth is also significant, and can be seen in examples such as Mackinder’s Geographical Pivot of History, and Huntingdon’s Clash of Civilizations – or as Williams puts it:

¹⁹ Agnew, John. "Space and place." *The Sage Handbook of Geographical Knowledge*. Sage Publishing. London, 2011: p. 321.

²⁰ Graham, Stephen. "Vertical Geopolitics: Baghdad and After." *Antipode* 36, no. 1, 2004.

*"The epistemological underpinnings of much political geography and geopolitics scholarship centre upon an explicit acknowledgment of, and interest in, the aerial view, conceptualised as a looking down from the sky to create geographical imagery of the earth from above. This has its origins in classical geopolitical scholars' adoption of what Ó Tuathail has termed a Cartesian perspectivalism."*²¹

This notion suggests that the entire process of satellite data capture and analysis is fraught with inherent geopolitical and positivist overtones. What stands out as most troubling in this regard is the fact that satellite images give an impression of uncontestable truth. Dodge and Perkins explore this apparently unmediated view when they state that:

*"[T]he position of the camera seems to be invisible. This apparent transparency distinguishes satellite imagery from the severe abstraction and uniformity of aesthetics associated with topographic reference maps. Satellite images appear to see more of the world, or at least the viewers perceive they are seeing much more."*²²

To be clear, in many ways the idea that RS imagery is able to capture reliable scientific data about the world is founded upon solid, positivist ideals. When environmentalists and climate scientists use RS data to build weather models, track rainforest destruction, chart algae growth in the oceans, or map changes in hydrological systems in the Siberian tundra, they are utilizing just one of many tools available for scientific observation. However, the necessity of localized ground measurements for the purposes of calibration and verification are considered an essential aspect of such RS work. In his overview of the development and utility of RS capabilities as an aid to geographic science, Sheng emphasizes the need for in-situ measurements that work alongside RS imagery when he states, "remote sensing is not a panacea that will provide all the required

²¹ Williams, Alison J. "Re-Orientating Vertical Geopolitics." *Geopolitics* 18, no. 1, 2013.

²² Dodge, Martin, and Chris Perkins. "The 'view From Nowhere'? Spatial Politics and Cultural Significance of High-resolution Satellite Imagery." *Geoforum* 40, no. 4, 2009.

information to conduct physical, biological, or social science applications.”²³ Clearly, from a scientific viewpoint, RS data is a useful tool rather than a stand-alone source of undeniable truth.

Expectations and limitations of RS technology:

The paradox of RS usage in the context of a humanitarian crisis is very important. Access to reliable information on the ground may be extremely limited, placing more of an emphasis on the use of RS data as the only available source of documentary evidence. In addition, the apparently transparent and uncontested nature of RS imagery (particularly when presented in the RGB visual bands, or “true-color approximation” wavelengths) means that much of the subjective nature of what is being presented can be either misunderstood, or simply ignored.

The lack of understanding concerning the limitations of satellite imagery serves to create a false impression of both the scope and utility of available data sources. While there are multiple metrics associated with satellite sensor systems, the two most significant are the temporal and spatial resolutions. While the latest commercial orbital systems can provide spatial resolutions of a half-meter square, which is small enough to pick out individual people from space, such imagery is highly expensive to collect and requires a very specific temporal window, as the satellite in question has to be directed to take a picture at a designated time and place. GeoEye’s Ikonos-1 satellite can be tasked to take a shot of anywhere on earth with a repeat time of less than three days. On the other hand, platforms such as the US Landsat 8 satellite can provide continuous global coverage, with a

²³ Sheng, Yongwei. "Remote Sensing." *The SAGE Handbook of Geographical Knowledge*. Sage Publishing, London 2011: p. 171.

repeat temporal resolution of 16 days, but at a much lower spatial resolution of 30 meters square (or 15 meters in the panchromatic band). Unlike Ikonos, Landsat images are provided free by the US government to anyone with an internet connection. In other words, you can choose to pay private providers for high resolution images that capture a specified moment in time and space, or you can download images with lower spatial and temporal resolution, but greater accessibility, and a back-catalog that can stretch back almost forty years in some cases.

These limitations are very apparent to anyone involved in using satellite data, but they run counter to the general public understanding of what satellites are capable of providing. The visual impact of satellite images has led to a perception that the “eyes in the sky” are watching everything on earth, all the time, in minute detail. As such, activists and even some governments have a distorted view of the capacity of RS data to pinpoint highly temporal events on the ground. Even at a resolution of a half meter square, if the sensor passes over the spot an hour before or an hour after an event, then what is recorded may not show exactly what was expected.

Perhaps the most significant external factor that needs to be considered is the issue of cloud cover. Much laudable work has been done in using RS data for monitoring the appalling situation in Darfur over the past decade. In some ways, this has led to a false sense of what can be achieved by such continuous efforts, as one of the most distinct aspects of the region is the relatively clear sky afforded by the arid landscape. In other words, when looking at Darfur from space, you have a relative plethora of clear, non-cloudy

imagery to work with.²⁴ On the other hand, if you were attempting to do the same thing over Myanmar then the number of clear, cloud free images available for analysis drops precipitously, making the temporal and spatial issues that much harder to work with.²⁵ A cloudy picture every three days is no use to you, no matter how high the resolution might be.

The combination of a lack of understanding over such limitations, along with the passions induced by horrific abuses, can lead to a somewhat unrealistic vision of the utility of RS data as a source of unquestionable HR documentation and evidence. Lyons specifies a number of incidents in which not only activists, but also government expectations far outstripped the reality of what could be seen from space. In a number of recent incidents, Lyons explores the requests posted to the UN for satellite data to confirm the narratives surrounding various conflicts. Emphasizing the gap between what could be shown, and what was expected to be shown, Lyons demonstrates the distorting effect of popular conceptions of satellites, and the apparent omnipresence of the “God’s eye view” that they afford:

“There are multiple cases where [RS imagery] provided inconclusive, ambiguous, and sometimes misleading or erroneous results which have generally gone underreported, creating a distorted perception of the overall efficacy of space technology, and consequently raising unrealistic expectations within the international humanitarian community.”²⁶

Ultimately, a more balanced and educated view of exactly what RS data is capable of

²⁴ Sulik, John J, and Scott Edwards. "Feature Extraction for Darfur: Geospatial Applications in the Documentation of Human Rights Abuses." *International Journal of Remote Sensing* 31, no. 10, 2010.

²⁵ Wang, Ben Yunmo, Nathaniel Raymond, Gabrielle Gould, and Isaac Baker. "Problems From Hell, Solution in the Heavens?: Identifying Obstacles and Opportunities for Employing Geospatial Technologies to Document and Mitigate Mass Atrocities." *Stability: International Journal of Security and Development* 2, no. 3, 2013: p. 57.

²⁶ Lyons, Joshua. "Documenting Violations of International Humanitarian Law From Space: A Critical Review of Geospatial Analysis of Satellite Imagery During Armed Conflicts in Gaza (2009), Georgia (2008) and Sri Lanka (2009)." *International Review of the Red Cross* 94, no. 866, 2012.

is necessary if the HR world really wants to expand the use of such technology. Satellite imagery has a powerful role to play in the documentation and prosecution of crimes against humanity; the following section will look to explore some of the issues inherent in enhancing that role at the level of international criminal institutions.

Section II: Legal Issues

In order to set the context for a discussion of RS usage in the international arena, the preceding analysis attempted to explore some of the concerns inherent in a critical geographic understanding of the organization and development of the trans-national actors at play; namely international civil society, institutionalized legal forums, and normative value production in the modern, globalized world, along with the perception of satellite data as a tool. Section II shifts focus to the issue of RS data itself, and the complications involved in the presentation of digital evidence.

Admissibility of RS data in tribunal settings:

There are a number of important factors identified by the international legal and human rights communities to consider in regards to the admissibility and use of RS data in criminal prosecutions. Perhaps the most comprehensive reviews available of the legal implications of remote sensing data (or “Earth Observation” – EO data) were compiled by the British National Space Center (BNSC), in conjunction with the British Institute for International and Comparative Law (BIICL) in 2001 and the London Institute of Space

Policy and Law (LISPL) in 2012.²⁷²⁸ The most noteworthy problems identified revolve around the acquisition and digital manipulation of the imagery, coupled with concerns over the “chain of custody” of the data and the need for specialized analysis and expert testimony to be presented to the court in order for RS evidence to be admitted and considered effective. While these factors combine to pose a significant challenge, there is still a history of satellite imagery use in tribunal settings that sets a precedent for RS data as corroborative evidence in international prosecutions.

Digital Manipulation and Analysis:

In a purely evidentiary sense, the status of RS imagery as “hearsay” evidence is one that must be addressed according to the specific rules of evidence outlined for each individual court system. This issue arises from the notion that:

“[Satellite] data will have to be converted into a comprehensible document by some process. It is the processed information that will be offered as evidence, not the original data. As a consequence, [RS] information may be regarded as hearsay. To be admissible, it will have to meet the specific hearsay requirements of the court. To be probative of the facts at issue, it may be necessary to introduce expert witness testimony or ground truth evidence.”²⁹

As such, the issue of whether RS data constitutes admissible hearsay evidence, or not, is directly tied into the need for expert testimony and analysis. In fact, the idea that the processing of data might constitute an obstacle to its application strikes at the heart of another important consideration: namely the difference between what is considered

²⁷ BNSC SECTOR STUDIES PROGRAMME: *Applications of Earth Observation to the Legal Sector, Final Report. Prepared by the NPA Group.* August 2001.

²⁸ LISPL. "Evidence From Space: Study for the European Space Agency on Use of Space Derived Earth Observation Information As Evidence in Judicial and Administrative Proceedings. Final Report." *London Institute of Space Policy and Law*, 2012.

²⁹ LISPL. *Ibid.*, p. 17.

scientific proof, and what is considered legal proof. While the aim of positivist, scientific objectivity is to demonstrate the use of a repeatable algorithm that would allow anyone with access to the same raw data to come to the same quantifiable outcome, legal conceptions of proof are not oriented in the same manner. The emphasis in law may aim towards a more subjective form of legal proof, which is “concerned with reconstructing and interpreting situations that are rarely repeatable, and often rely on subjective assessment of the probability that such a fact is true, or that an event took place.”³⁰ While this difference in outlook is not necessarily irreconcilable, it does pose issues for how RS data is presented, and in turn how the court interprets such evidence.

When you add the notion of HR advocacy into the mix, it is clear that perceptions of proof become very significant. Evidence gathered by HR groups must not only be relevant in the context of direct advocacy, but also both scientifically rigorous and legally applicable. In my opinion, much of the scope to improve the utility of RS imagery stems from facilitating a better understanding between these different visions of proof, and the underlying agendas that inform each of them. In essence, both the courts and the HR community need to work on establishing a clearer conceptualization of RS data, and its potential application in law.

This issue is identified as another prompt for the use of expert testimony, along with the necessity of improving the relationship between the scientific community that provides the data, and the legal and humanitarian communities that wish to understand and apply it. In this vein, Nuñez identifies the innovative application of RS data in legal settings as another significant obstacle to be overcome, where “continuing judicial mistrust over the

³⁰ LISPL. *Ibid.*, p. 13.

use of such data persists, namely because of its relative novelty and the fact that the data is digital in nature and therefore more easily manipulated.”³¹ Prevalent in most of the literature is the notion that courts instinctively distrust the manipulation of data as an inherent aspect of working with RS imagery. The BNSC report states:

*“With the advancement of technology it is becoming increasingly easy for inexperienced users to apply image processing techniques to [RS] data and to manipulate the data in an inaccurate manner. This is well known throughout the legal and other sectors and is a barrier that has to be overcome before the uptake and potential use of [RS] data is realised.”*³²

However, it is also increasingly recognized that electronic or digital evidence has a significant role to play in modern criminal prosecutions. Many domestic court systems now accept digital images as direct evidence, as is the case with traffic cameras for example. As such, it is clear that the legal community as a whole is becoming much more comfortable with the notion of digital evidence, and this will inevitably spill over into international tribunal settings. This expansion of usage at the individual state level suggests ways in which electronic data might be applied internationally. The LISPL report recommends that the implementation of well-defined processes would have a major impact upon the use of RS data:

*“It is necessary to validate the models and their operation and suitability for the relevant application. This can be done through expert testimony that the system used is appropriate for recording the required information, that there is a traceable and secure chain of custody, a secured electronic record of the process to which the [RS] data is subjected, the systems and individuals involved, verified with a qualified electronic certificate, and that the data is the uncorrupted data generated by the sensor, that it was processed in a known way by acceptable methods, and that it produced the result being offered in evidence.”*³³

³¹ Núñez, Ana Cristina. Innovations in Human Rights Monitoring Working Paper, Amnesty International, August, 2012: p. 2.

³² BNSC. *Ibid.*, p. 39.

³³ LISPL. *Ibid.*, p. 39.

The legal literature makes a strong case that while the imagery itself has the potential to be very significant, it is the testimony of the expert witness that holds the key to the expansion of RS data. In the words of one of the participants of the BNSC report, "It is not the Earth Observation data that is used in court, it is the opinion of the expert."³⁴

Expert Testimony and Accreditation:

As with the issue of hearsay evidence, the rules concerning the admissibility of expert testimony are contextually specific to each individual court system. While a review of the differences between legal systems (such as the ICC and the ICJ) is beyond the scope of this paper, there are certain factors that are relevant across the board. Primarily, the concept of expert testimony at the international level is very well grounded and has been an established aspect of war crimes prosecutions since the inception of the Nuremburg trials at the end of the Second World War. Both domestic and international courts have long been accustomed to relying upon specialized testimony from acknowledged experts in a variety of fields, as an aid to the court in understanding complex evidence. As such, the need to have expert satellite imagery analysis should be no more controversial than the need for a pathologist to describe a cause of death, or a statistician to deconstruct demographic data.

A major factor in the use of expert testimony is the legal definition of what such evidence entails. In the case of an ordinary witness to an event, the individual is charged with testifying to their own, personal knowledge. However, an expert witness is charged

³⁴ BNSC. *Ibid.*, p. 41.

with assisting the court in understanding complex evidence within a particular field, whereby:

*"An expert witness testifies to his/her honest opinion and belief as to matters within his/her field of expertise. Thus s/he may rely on published and unpublished material in reaching conclusions, draw on his or her own experience and that of colleagues, and may refer to research papers, learned articles and letters during the course of giving testimony, such documents being themselves admitted in evidence and supporting any inferences which can fairly be drawn from them."*³⁵

In essence, the role of an expert is not to testify on behalf of either the prosecution or defense, but instead to become an aid to the court, or as the BNSC report puts it, "the expert has an overriding duty to help the court and is no longer his or her client's advocate."³⁶ In reality, expert testimony is often couched in a pedagogical sense by one side or the other, in order to compensate for a lack of field specific experience on the part of the judge(s).³⁷ In fact, it is possible that more than one expert might be called upon, either by the parties to the case, or the court itself if it feels it necessary, in order to clarify the nature of the evidence presented. In addition (depending on the rules of evidence in play) expert testimony can be subject to cross-examination and dispute, as with other forms of testimony in criminal proceedings.

Given the significance placed upon expert testimony, one of the most pressing issues revealed in both the advocacy and the legal literature is the need to establish a system of recognized expert accreditation. Domestic court systems generally have such a system in place, and may rely upon various elements, from academic standing, to recognition within the field in question, to citation in previous case law and prior experience in testifying

³⁵ BNSC. *Ibid.*, p. 44.

³⁶ BNSC. *Ibid.*, p. 44.

³⁷ Aranburu, Xabier Agirre. "Sexual Violence Beyond Reasonable Doubt: Using Pattern Evidence and Analysis for International Cases." *Law & Social Inquiry* 35, no. 4, 2010: p. 865.

before the court. This idea also holds true in regards to the methodology used by experts, such as the acquisition and analysis of data from specified sources, and in the case of satellite imagery the use of program tools and scientific standards within the RS community at large.

Unfortunately, there are no agreed upon criteria in the international legal realm for the accreditation of RS experts, or the analysis of RS data sets. As with the other issues identified, each international tribunal has its own rules and standards. Hence the fact that commentators and international organizations alike have been advocating for the need to establish international rules regarding the methods to present satellite imagery before international tribunals as evidence.³⁸

The BNSC report makes a series of recommendations for moving forward in this regard, including the formation of accepted scientific norms in the analysis of RS data for legal usage to be published in accredited journals, along with the establishment of standards via recognized professional bodies such as the International Organization for Standardization (ISO).³⁹ The LISPL report suggests that this process is already underway, and cites two examples of relevant ISO standards that have been applied in this context (ISO 21962:2003, and ISO 19123:2005) which have gone “some way to creating benchmarks of reliability.”⁴⁰ The report also calls for the establishment of an organizing body for expert witnesses, stating that “Improved standardisation regarding the quality of both the information and the experts that interpret it, perhaps through an organisation

³⁸ Núñez. *Ibid.*, p. 4.

³⁹ BNSC. *Ibid.*, p. 84.

⁴⁰ LISPL. *Ibid.*, p. 216.

such as the ISO, should increase the credibility and acceptance of satellite-derived EO evidence.”⁴¹

For their part, the HR world has also been calling for a system of accreditation for experts, as the expanding accessibility of RS data as a source of war crimes documentation has meant that the field as a whole has begun to look at using satellite imagery more extensively in their advocacy work. Lyons highlights the need for such standards within the HR world when he states:

“One important objective of this emerging field of applied humanitarian research should be a more self-critical understanding of the inherent limits to imagery analysis, as well as the potential political and legal consequences of conducting incomplete, erroneous, or otherwise misleading analytical work over conflict zones. Considering the increasing interest in and potential adoption of such technical capacity within humanitarian agencies and non-governmental organisations (NGOs) there is a corresponding need for more rigorous debate and the open exchange of lessons learned and best practices.”⁴²

Wang (et al) identifies a number of advocacy oriented approaches towards standardization that are making some headway in countering the issues raised above. In particular, the work being done by the American Association for the Advancement of Science (AAAS), along with the Satellite Sentinel Project (SSP) based within the Harvard Humanitarian Institute (HHI), which both aim to provide university trained RS analysts to work on reports for the HR community. As such, their recommendation is that:

“To avoid deliberate errors, non-governmental actors should operate under a strict code of ethics and acquire imagery from reputable commercial satellite providers with expert analytic support and training... To mitigate inadvertent errors, analysts employed by non-governmental actors should closely engage with experienced remote sensing experts. Ideally, they should work together to revise findings before they are released to the media.”⁴³

⁴¹ LISPL. *Ibid.*, p. 218.

⁴² Lyons. *Ibid.*, p. 4.

⁴³ Wang et al. *Ibid.*, p. 8.

Within this context, Wang calls for the establishment of an independent, third party organization that would be a credible source of both RS analysis and expert testimony. This would not only facilitate the standardization and use of RS data in a humanitarian context, but would also avoid issues of potential bias present in advocacy oriented satellite analysis. A non-partisan, professional body would have the advantage of both credibility and objectivity, thereby making the use of RS data in an international legal setting that much easier.⁴⁴

While there is an obvious appeal to the notion of a formal professional organization of RS analysts, the establishment of such a body does raise a few questions. It would go some way to answering the legal community's desire for a form of recognized accreditation, and would also allow for the development of potential best practices in HR oriented analysis. However, who would participate, and in what way would they be chosen? What form of recognition would such an organization receive from state parties, international institutions, and international civil society? Importantly, how would it establish its legitimacy in the eyes of the accused?

Perhaps most significant from a geopolitical view, in what ways would the establishment of such an international body affect the development and implementation of RS usage? Bütte and Mattli define this form of transnational organization as engaging in "non-market private standard setting," and ascribe a significant amount of geopolitical power to such organizations.⁴⁵ In particular, they caution against the perceived notion of scientific objectivity as an apolitical stabilizing factor in agenda setting. Stating that "those

⁴⁴ Wang et al. *Ibid.*, p. 16.

⁴⁵ Bütte, Tim, and Walter Mattli. "The New Global Rulers." *The Privatization of Regulation in the World Economy*, Princeton, 2011.

who set standards wield influence...standard-setting is thus an inherently political activity,” they refute the notion that best practices are created in a political vacuum afforded by scientific rationale. Stakeholders, whether activist, legal, or scientifically oriented, all have their agendas. I find this argument to be very persuasive, and while it does not dampen my enthusiasm for some form of organized structure, it does suggest that close attention be paid to the processes involved in the establishment of such a body.

Having explored some of the legal obstacles to RS usage, we now turn to the case law that exists in the international arena, in order to view the ways in which RS data has been accepted and used in various tribunal settings to date.

The International Court of Justice (ICJ):

The ICJ was designed to be the “principal judicial organ of the United Nations”⁴⁶ and has functioned in that role for the past seven decades. It is based in The Hague, and handles cases of international disputes between member states. The jurisdiction of the court is subject to the voluntary participation of the litigant state parties, although technically under Article 94 of the UN Charter, all UN member states are obliged to abide by the decision of the court.⁴⁷ The recognition of the ICJ as one of the pre-eminent international legal arenas has meant that rulings from the court carry significant weight in the creation of legal precedent. Judicial decisions from the “most highly qualified and recognized authorities” are considered one of the fundamental ways in which international law is

⁴⁶ "International Court of Justice Statute." Article 1. In *The Wiley-Blackwell Encyclopedia of Globalization*. Blackwell Publishing Ltd. Oxford, 2012.

⁴⁷"Charter of the United Nations and Statute of the International Court of Justice." *United Nations New York Department of Public Information*. United Nations, 1993: p 17.

established.⁴⁸ In this context, the ICJ itself stands as an important source of case law for the application and utility of RS data.

The majority of cases before the court do not fall under the rubric of crimes against humanity that we are primarily concerned with. Much of the precedent in RS use at the ICJ derives from border disputes between states. Of particular note are the cases between Nigeria/Cameroon, Botswana/Namibia, and Qatar/Bahrain.⁴⁹ In each of these instances, satellite imagery was presented to the court as evidence, but accorded varying degrees of weight.

In particular, the dispute between Nigeria and Cameroon has direct relevance to the call for a greater sense of expertise in the presentation of RS data. Nigeria submitted satellite images in order to lay claim to a disputed boundary on Lake Chad. However, Cameroon offered a conflicting interpretation of the same exact dataset, resulting in the court being “more confused, rather than less”⁵⁰ and causing the court to place limited value on the evidence presented. As Nuñez states, “Accordingly, what Nigeria had considered a very straightforward way to prove its assertion before the ICJ ended up having an opposite effect.”⁵¹

In much of the legal and HR oriented literature the Nigerian example is often cited as a clear statement of the need to establish a more stringent set of criteria for RS use in international legal settings. The BNSC report goes so far as to suggest that the increasing

⁴⁸ Article 38(1), “International Court of Justice Statute.” In *The Wiley-Blackwell Encyclopedia of Globalization*. Blackwell Publishing Ltd. Oxford, 2012.

⁴⁹ Case documents are available from the ICJ at the following URLs:

Nigeria/Cameroon: <http://www.icj-cij.org/docket/index.php?p1=3&p2=3&code=nc&case=101&k=52&p3=0>

Botswana/Namibia: <http://www.icj-cij.org/docket/index.php?p1=3&p2=3&code=bona&case=98&k=b7&p3=0>

Qatar/Bahrain: <http://www.icj-cij.org/docket/index.php?p1=3&p2=3&code=qb&case=87&k=61&p3=0>

⁵⁰ BNSC. *Ibid.*, p. 76.

⁵¹ Nuñez. *Ibid.*, p. 4.

reliance on the presentation of RS data in international litigation may necessitate “a possible role of permanently based scientific and technical experts in international adjudication bodies such as the International Court of Justice.”⁵² In other words, the rise in the use of RS data reflects a greater need for the court to come to terms with the changing nature of the technology involved, to the extent that the ICJ might need to retain its own technical experts in order to provide a clear understanding of the value of evidence presented in this manner.

The need for an institutional understanding of RS technology will only increase in the future, as the use of satellite images continues to develop with the ever-increasing number of sources (both government and private) that provide images for litigants. In particular, the growing number of private providers has a distinct effect on such cases, as countries that do not have their own satellite systems can simply task a private group to provide them with relevant images. The LISPL report notes that “Geoserve, an authorized distributor of satellite and EO images from commercial satellites such as WorldView-2, GeoEye, RapidEye, Spot-5 and Radarsat-2,⁵⁷ indicated that they regularly sell EO data to parties before the ICJ.”⁵³

Of more direct relevance to this paper are two ICJ cases that relied upon the presentation of RS images in regards to human rights abuses. In the dispute between Georgia and the Russian Federation in 2008, the Georgian case contained a number of satellite images of South Ossetia that they claimed provided evidence of Russian aggression against ethnic Georgians, to the extent that Russian efforts constituted ethnic cleansing of

⁵² BNSC. *Ibid.*, p. 44.

⁵³ LISPL. *Ibid.*, p. 362.

the region.⁵⁴ This assertion was backed up with satellite images from the UN (UNOSAT) office, and corroborated by a number of INGO reports from the region.⁵⁵ Lyons states that the UNOSAT analysis provided “a prima facie case that the Russians...had systematically failed to restrain the militias from attacks against civilians and residential property, and were therefore responsible for serious violations of multiple Articles in the Fourth Geneva Convention.”⁵⁶ This evidence was later disputed by a Russian NGO, which claimed that the satellite imagery was inadequate to the task of assessing the full range of damage due to a lack of resolution, and the inability to document artillery and rocket fire into the sides of buildings. This line of thought was further argued by the Russian Federation in their response to the case before the court, in which they claimed that the imagery presented was biased in its representation of the effects of conflict on the ground, as it did not account for the extent of damages wrought by Georgian forces and militias.⁵⁷

The second significant ICJ case concerned the application of the Convention on the Prevention and Punishment of the Crime of Genocide, in reference to the Bosnian conflict. In this instance, the court relied in part on comprehensive reports submitted by the UN Secretary General to the General Assembly, which included a number of references to satellite evidence of war crimes. In particular, the court referred to the fall of Srebrenica in 1995, as demonstrating:

“[A] coherent narrative [of] how thousands of men and boys were summarily executed and buried in mass graves within a matter of days while the international community attempted to negotiate access to them... In 1995, the details of the tragedy were told in

⁵⁴ “Application of the International Convention on the Elimination of All Forms of Racial Discrimination (Georgia v. Russian Federation)”. *International Court of Justice*.

⁵⁵ Núñez. *Ibid.*, p. 10.

⁵⁶ Lyons. *Ibid.*, p. 13.

⁵⁷ “Public Sitting in the Case Concerning Application of the International Convention on the Elimination of All Forms of Racial Discrimination (Georgia V. Russian Federation).” *Verbatim Record*. International Court of Justice, 8 September 2008: p. 55.

piecemeal fashion, as survivors of the mass executions began to provide accounts of the horrors they had witnessed; satellite photos later gave credence to their accounts.”⁵⁸

However, as Nuñez notes, the ICJ rarely makes explicit reference to RS data in explaining the court’s decisions. As such, it is unclear exactly how much weight, if any, is attached to the presentation of such evidence. Nonetheless, it is clear that litigants before the court are increasingly turning to satellite imagery as a form of corroborative proof of their respective positions.

The International Tribunal for the Former Yugoslavia (ICTY):

The UN established the ICTY in 1993, in order to prosecute all persons “responsible for serious violations of international humanitarian law committed in the territory of the former Yugoslavia since 1991.”⁵⁹ As was the case with the ICJ, the ICTY has also relied on UN produced reports that utilized satellite imagery as documentation of crimes against humanity. Explicitly, the court paid special attention to the events in Srebrenica, where:

“[T]he satellite aerial image photography [sic] furnished by the U.S. military intelligence pinpointed to the minute movements on the ground of men and transports in remote Eastern Bosnian locations. These photographs not only assisted the prosecution in locating the mass grave sites over hundreds of miles of terrain, they were also introduced to validate its witnesses’ accounts of where thousands of civilians were detained and eventually killed.”⁶⁰

The images of mass graves identified by US/NATO Military sources were one of the major prompts in the creation of a fully-fledged UN investigation of the Srebrenica

⁵⁸ “Case Concerning Application of the Convention on the Prevention and Punishment of the Crime of Genocide (Bosnia and Herzegovina V. Serbia and Montenegro).” *Reports of Judgments, Advisory Opinions and Orders*. International Court of Justice, 26 February 2007: p. 190.

⁵⁹ “Updated Statute of the International Criminal Tribunal for the Former Yugoslavia.” United Nations, September 2009: p 7.

⁶⁰ Wald, Patricia M. “International Criminal Tribunal for the Former Yugoslavia Comes of Age: Some Observations on Day-to-Day Dilemmas of An International Court, the.” *Wash. UJL & Pol’y* 5, 2001: p. 102.

massacres, due in no small part to the public outcry that the images help to create.⁶¹ Of particular note, the evidence provided to both the UN and the ICTY, was fundamental to the prosecution of Radislav Krstic,⁶² a senior figure in the Bosnian Serb army who was convicted of genocide in 2001 over his role in the Srebrenica massacres, and ultimately sentenced to 46 years imprisonment by the court (later reduced to 35 years upon appeal). Krstic was the first person to be convicted of genocide in Europe since the UN Convention of the Prevention and Punishment of the Crime of Genocide was established in 1948.⁶³

Additionally, the ICTY has used RS imagery in order to establish the geographic details and topography of specific areas of interest, if not directly as evidence of a specific crime. The LISPL report details two prosecutions in which satellite data was used in this manner.⁶⁴

While it is clear that satellite images have been utilized by the ICTY, and in some cases may have proved to be essential elements in the prosecution of war crimes, the status of RS evidence is still far from clear. The public record does not define exactly how data was acquired (whether by orbital or sub-orbital means), or make clear the extent to which it was relied upon in the decision making process, as there are no public rulings that deal specifically with the issue of RS evidence published by the court.⁶⁵ As such, there may be limited value to be gained in regards to setting legal precedent on RS usage from cases before the ICTY.

⁶¹ Parks, Lisa. "Satellite Views of Srebrenica: Tele-visibility and the Politics of Witnessing." *Social Identities* 7, no. 4, 2001: p 587.

⁶² LISPL. *Ibid.*, p. 197.

⁶³ "Serb general convicted of genocide." *The Guardian*. www.theguardian.com. 2 Aug 2001.

⁶⁴ LISPL. *Ibid.*, p 195: Note: *In the Prosecutor v. Karadzic (IT-95-5/18-I)*, satellite images were used during the questioning of a witness on 10 October 2010 (page 7954); *In The Prosecutor versus Ramush Haradinaj (IT-04-84-T)*, a satellite image was used during the examination of a witness on 15 October 2007 (page 9366).

⁶⁵ LISPL. *Ibid.*, p. 197.

The International Criminal Court (ICC):

The ICC was established in 2002 as a permanent international legal institution, charged with jurisdiction over what were termed “the most serious crimes of international concern.”⁶⁶ Specifically, the court is intended to act as a venue of last resort for the prosecution of acts of Genocide, Crimes against Humanity, War crimes, and (somewhat contentiously) the Crime of Aggression. In this capacity, the court stands as perhaps the most significant legal venue for the purposes of this analysis.

There are a number of noteworthy cases in which RS data was provided as evidence before the court. In particular, the Office of the Prosecutor worked closely with HR oriented INGOs (especially Darfur Now and the Satellite Sentinel Project) in putting together a case against a number of high-ranking Sudanese individuals, including the sitting President of Sudan, Omar al Bashir. In a clear reference to its utility in the documentation of HR prosecutions, the 2008 application for an international arrest warrant against Bashir states, “The Prosecution has also compiled open source information, victim accounts, video footage, photographs and satellite imagery about the attacks and destruction of villages.”⁶⁷ Since that time the SSP has submitted additional RS imagery to both the UN Security Council and the ICC in regards to the ongoing humanitarian crisis in the Kordofan region of the country.⁶⁸ Given that the President of Sudan has shown no inclination to attend the court to answer these charges, it is impossible to say exactly how significant the RS evidence might prove to be in this instance.

⁶⁶ "Rome Statute of the International Criminal Court." International Criminal Court, 1 July 2002. Article 1, p. 8.

⁶⁷ "Public Redacted Version of the Prosecutor's Application Under Article 58 - Annex A." International Criminal Court: Office of the Prosecutor, 14 July 2008: p. 32.

⁶⁸ LISPL. *Ibid.*, p. 198.

Another situation that has referenced RS imagery involved cases against guerilla leaders in the Democratic Republic of the Congo (DRC) during the Second Congo War of the late 1990s and early 2000s. The LISPL report notes that in the cases against Germain Katanga and Mathieu Ngudjolo Chui, RS data was used to identify crime scenes in the DRC, where “Satellite imagery provided by the Prosecutor was the subject of testimony by an expert witness, along with photographs taken by the expert to produce a 360-degree image, and photographs taken by a drone.”⁶⁹ Although the court acquitted Chui, Katanga was convicted in 2012. Unfortunately, the court did not make a public statement concerning the weight they attached to the RS evidence presented.

Perhaps the most interesting reference to the potential expansion of the use of RS data within the ICC comes from the ongoing prosecution against the President of Kenya, Uhuru Kenyatta. In April of 2013, the chief prosecutor, Ms. Fatou Bensouda, filed an application with the Trial Chamber to have an expert witness appointed by the court, in order to analyze satellite data of the Kenyan election violence of 2007.⁷⁰ A review of the application shows that the court had hoped to appoint a mutually agreed upon expert witness, but that complications over the manner in which the expert (Mr. Lars Bromley) was instructed to begin his analysis resulted from a breakdown in cooperation between the prosecution and defense team. Ms. Bensouda asked for the court to appoint Mr. Bromley, despite the Chamber’s “preference to have joint experts instructed where possible, in order to avoid disagreement as to the qualifications and impartiality of an expert and to afford

⁶⁹ LISPL. *Ibid.*, p. 195.

⁷⁰ “Bensouda plans to use satellite image evidence.” *The Daily Nation*. www.nation.co.ke. 14 April 2013.

the Chamber the best opportunity to receive useful evidence on issues in dispute.”⁷¹ As this example demonstrates, the issue of expert testimony is key to the examination of RS data, and therefore is a matter of some dispute between parties. Perceptions of impartiality are essential, and are recognized by the institution as necessary for the performance of justice. As such, the need for accredited experts to be available to the court is of paramount importance, leading credence to the call from the legal and humanitarian communities to establish a system of reliable and accepted accreditation at the international level.

In this regard, Mr. Bromely is a good example of the issues at hand: a recognized expert in the field of satellite analysis, Mr. Bromely held the title of Principal Analyst and Senior Advisor for Human Rights and Security at the United Nations Operational Satellite Applications Program (UNOSAT), and had previously worked with both UNITAR and the American Association for the Advancement of Science (AAAS). Given his academic and work related background, it is hard to see what objections could be raised against his possible testimony as an expert in RS analysis. Non-the-less, the defense was reluctant to issue joint instructions, thereby forcing the court to have to appoint Mr. Bromely as a prosecution expert.

As of March of 2014 the prosecution has not yet called RS imagery and expert testimony as evidence against President Kenyatta. Currently, the case has slowed to a standstill due to complications with the withdrawal and disappearance of several key prosecution witnesses. However, media reports surrounding the trial suggests that the prosecution hopes to use satellite images to confirm the location of conspiratorial

⁷¹ “Prosecution’s Third Report on Joint Instruction of Experts: Trial Chamber V.” *Situation in the Republic of Kenya: In the Case of the Prosecutor V. Francis Kirmi Muthaura and Uhuru Muigai Kenyatta*. International Criminal Court: Office of the Prosecutor, 15 February 2013.

meetings, scenes of violence and mass murder, and the burning of specific buildings (including an infamous incident in which a mob of 3000 youths surrounded and burned to the ground a church containing thirty five people).⁷² However, the utility of images in this case still hinges upon the corroboration of events witnessed from the ground. In this regard, the prosecution's hope to use RS data has been severely curtailed by what Ms. Bensouda claims is a campaign of intimidation, witness tampering, and bribery.⁷³

Although the prosecutor denies that the case against President Kenyatta is being withdrawn, there is skepticism amongst commentators about the chances of the trial proceeding much further, meaning that it is unlikely this case will result in much additional precedent. Notwithstanding that caveat, the fact that the prosecution chose to place such a public emphasis on the use of RS imagery is significant, and speaks to the increasing acceptance of RS data in the mindset of the legal community. It is clear from the submissions to the court, and from the public coverage of the case, that the novelty previously associated with satellite data has worn off. In both public and legal perceptions, the idea of images from space as corroborative evidence of crime has been firmly established. Even if satellite images and expert testimony are not presented in the trial of Mr. Kenyatta, it is clear that RS data has been accepted as a part of the prosecutorial arsenal of the legal and humanitarian communities. This is consistent with the trend of increasing acceptance of digital data discussed previously, and bodes well for the future.

⁷² "10 witnesses lined up against DP and Sang." *The Daily Nation*. 16 September 2013.

⁷³ Pflanze, Mike. "With landmark Kenyatta case in disarray, ICC prosecutor has one last shot." *Christian Science Monitor*. 11 March 2014.

Section III: Practical Case Study

The preceding analysis demonstrates the ways in which RS data has been utilized in various international legal settings, and while there is still very little in the way of concrete legal precedent, it is clear that satellite imagery has a role to play, and will continue to grow in significance. As such, the remainder of this paper will explore future potential usage of RS analysis in the context of human rights documentation, with a view to the gathering and presentation of such data as an aid to the prosecution of grave crimes against humanity. In particular, it will explore the potential use of non-visual imagery, with a focus on the use of thermal detection as an alternate form of satellite imagery in legal proceedings.

The following case study derives in part from a project undertaken in the Winter of 2014 under the guidance of Prof. Tom Gillespie at UCLA, and Mr. Joshua Lyons of the Emergency Response Office of Human Right Watch in Geneva.⁷⁴ The initial project was then included into an emerging working group on Remote Sensing and the Central African Republic, organized between HRW and the Harvard Humanitarian Initiative, in conjunction with Dr. Andrew Marx of the U.S. State Department. Although the extended program is in the developmental stage, my participation offers a personal case study for many of the issues identified in section one of this paper.

⁷⁴ Walker, James and Raphael Di Febo. "Remote Sensing and the Humanitarian Crisis in the C.A.R.: The Utility of VIIRS Fire Detection as an aid in the Documentation and Verification of Crimes Against Humanity." (University of California Los Angeles, 2014).

Background to the conflict in the Central African Republic:

In March of 2013 the city of Bangui, the capital of the Central African Republic (CAR), fell to an insurgent rebel force commanded by Michel Djotodia. This was the culmination of a yearlong battle by Muslim forces to establish control over the country, effectively destroying the already fragile nature of the CARs government infrastructure, and control over its sovereign territory. Widespread sectarian violence ensued, with the result that by January of 2014, France had deployed 1600 troops in an effort to disarm the various militias at work within the state, and interim President Djotodia had been forced to resign after failing to secure any real movement towards re-establish peace on the ground. He was replaced by Catherine Samba-Panza, former Mayor of the capital city of Bangui, who stepped into office amidst one of the gravest humanitarian crises in recent memory.

Christian “anti-balaka” militias have since replaced the initial sectarian violence of the Muslim rebel groups, and have taken to hunting down and executing entire Muslim neighborhoods. While visiting the CAR in February of 2014, US Permanent Representative to the United Nations, Ambassador Samantha Power stated “There is a tyranny of the mob that has taken hold here that is horrific in its own right, but also something that can be hard to stop once it’s been unleashed.”⁷⁵ As a result of the widespread nature of these atrocities, the international community has begun to take a concerted look at the reports from the ground, gathered by civil society actors such as AI and HRW. Significantly, the Chief Prosecutor for the ICC, Fatou Bensouda, has stated her intention to open an investigation

⁷⁵ Sengputa, S. “U.N. Ambassador, in Central Africa, Vows Aid and Hears of a Unity Shattered.” *New York Times*, 20 Dec 2013.

into potential war crimes and crimes against humanity resulting from the current turmoil.⁷⁶

The Central African Republic constitutes 622,941 km² of the central African plateau. The terrain is formed of a vast, flat to rolling, monotonous plateau with scattered hills in the northeast and southwest. As of July 2013 the population was estimated at 5,166,510 with the religious distribution consisting of 35% indigenous, 25% Protestant, 25% Roman Catholic, and 15% Muslim.

The state gained independence from France in 1960, but has seen very little peace or stability over the following 50 years. It shares borders with some of the most volatile states in Africa (Sudan, South Sudan, Chad, the Democratic Republic of the Congo, and the Republic of the Congo). As a result, it is often subject to spillover effects from regional conflicts. The current political situation is extremely chaotic, with the almost complete break-down of civil authority. An escalating sectarian division between the Christian and Muslim populations has forced many people to flee their homes and seek refuge in internally displaced (IDP) camps or cross the border in neighboring states, thereby adding to the issue of regional instability.

⁷⁶ AP. "ICC opens Central African Republic investigation." *The Guardian*, 7 Feb 2014.

Primary Investigation:

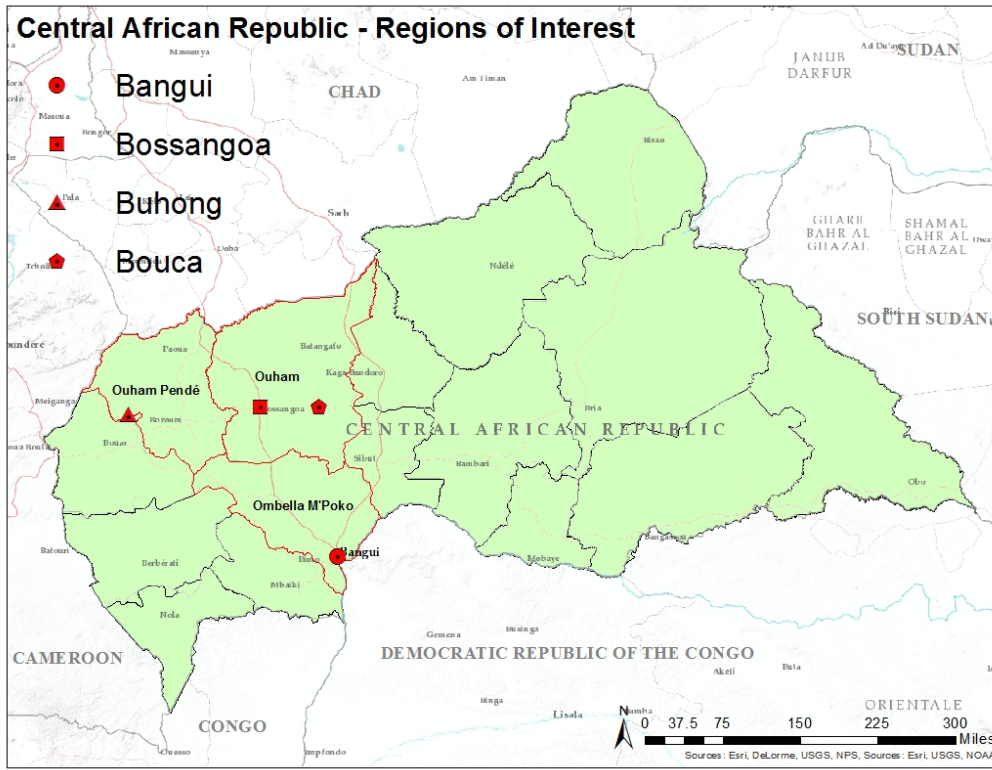


Figure 1: Map of the Central African Republic

In late 2013 eyewitness reports from the region indicated an alarming escalation in sectarian violence, in particular in the Ouham and Ouham-Pendé regions of the country. International human rights organizations had already documented a series of attacks in a number of special reports, including Ethnic Cleansing and Sectarian Killings in the Central African Republic, from Amnesty International,⁷⁷ and They Came to Kill: Escalating Atrocities in the Central African Republic, from Human Rights Watch.⁷⁸

⁷⁷ "Ethnic Cleansing and Sectarian Killings in the Central African Republic." Amnesty International. www.Amnesty.Org. 12 Feb 2014.

⁷⁸ "They Came to Kill: Escalating Atrocities in the Central African Republic." Human Rights Watch. www.hrw.org. 19 Dec 2013.

Working in conjunction with the RS Emergency Office of HRW, I undertook a short project that focused on the situation in the CAR. The work was intended to see if advances in RS technology might support efforts at the documentation of arson attacks against civilian populations. Specifically, HRW furnished details of eyewitness accounts from within the CAR, along with an approximate time, date, and location of arson incidents. HRW estimates they have over forty such events that require verification. A representative sample of attacks from four distinct regions of interest (ROIs) were used in a “proof of concept” approach, with the intention that further work could be done if the process proved to be effective.

HRW had already obtained a series of impressive Very High Resolution (VHR) images of the aftermath of a significant number of attacks, provided by the Astrium Pléiades-1A/B satellite array. As such, the focus of this project was intended to determine if non-visual band data could be used for verification purposes, in order to help determine the date that attacks took place. In particular, the analysis focused on the use of Night Light/Fire Imagery acquired from the National Oceanic and Atmospheric Administration (NOAA) Suomi National Polar-orbiting Partnership (NPP) Visible Infrared Imaging Radiometer Suite (VIIRS) sensor.

Datasets from VIIRS are available from the NOAA webpage, already geo-referenced to a ground station Mercator projection (EDR), and in scientific HDF (H5) file format. Significantly, a number of VIIRS data sets are available in pre-processed KMZ (Google Earth) formats. This project focused on using the KMZ *Nighttime Detection and Characterization of Combustion Sources* pre-processed VIIRS product. The NOAA describe the composition of this dataset as follows:

“Nightfire data makes use of six spectral bands to detect and characterizes subpixel infrared emitters. Provides locations and times of hot pixel detections along with estimates of temperatures and source sizes. For cloud-free gas flares a calculation is performed to estimate the flared gas volume in methane equivalents. Nighttime data are available in 24 hour increments.”⁷⁹

In essence, this NOAA product provides a formatted multi-spectral representation of satellite data, extrapolated from the raw files and converted into a series of identified night fire events that are then geolocatable in Google Earth.

Date ranges provided by HRW delineated 40 to 45 day windows for four distinct ROIs (the capital city of Bangui, the major city of Bossangoa, and two smaller settlements, Buhong and Bouca). Based upon a review of the available data sets downloaded from the NOAA, it became clear that the evidence did not support the initial hypothesis. Analysis could not identify any incidents from two of the locations (Buhong and Bouca), and only sparse data for a third (Bangui). The meager results available for the town of Bossangoa constituted the most significant results obtained. However, it should be noted that for each of the four locations, only limited temporal coverage was available. In the cases of Buhong and Bouca, at least 30% of the necessary date range was unavailable, meaning that a third of the window requested remained unknown. This constituted a major flaw, and served to caution against a clear rejection of the utility of VIIRS data in this context.

However, the KMZ datasets did provide a probable hit for Bossangoa. Although not sufficient to really prove the initial thesis, the correlation between analysis provided by HRW and the VIIRS datasets was clearly visible. The following visualization of Bossangoa

⁷⁹ Visible Infrared Imaging Radiometer Suite – Products and Services. NOAA National Geophysical Data Center. Available at <http://ngdc.noaa.gov/eog/viirs.html>

was taken from an HRW report and represents over 1,500 destroyed buildings identified from VHR Astrium Pléiades-1A/B imagery.⁸⁰

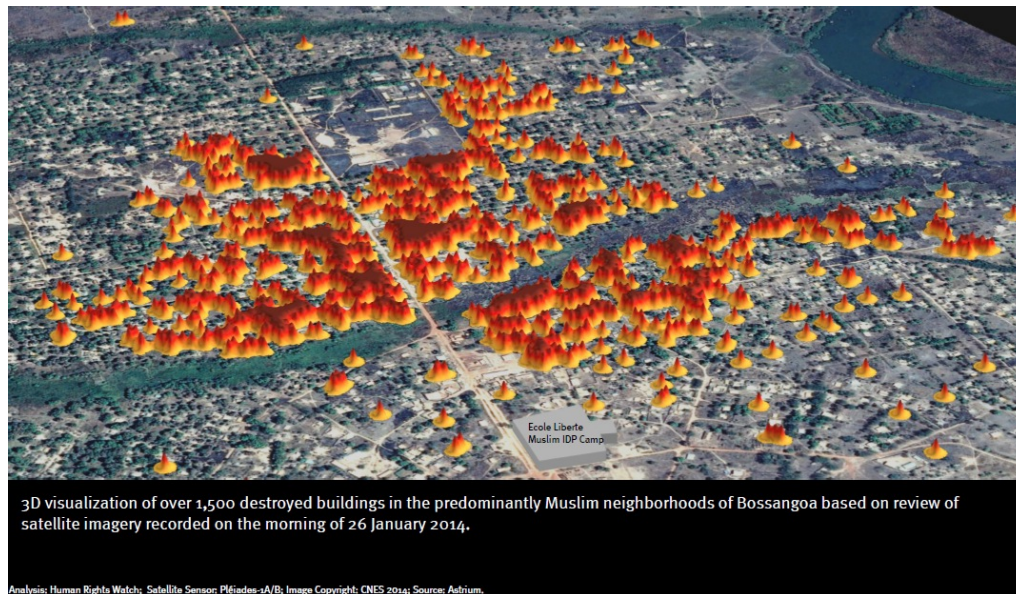


Figure 2: HRW Visualization of destruction in Bossangoa

By using Google Earth to represent the VIIRS findings for the night of December 18th 2013 in a similar oblique orientation, it is interesting to note the similarity between the locations of destroyed buildings identified by HRW and the night fire incidents documented by the VIIRS datasets. The green flags indicate geolocated night fire events. While this apparent correlation was somewhat tentative, it did suggest that VIIRS events documented as having taken place on that date were potentially connected to the destruction of houses within this particular Muslim neighborhood of Bossangoa.

⁸⁰ "Housing Destruction in the Central African Republic (2013-2014) – Update 1" *Human Rights Watch*. www.hrw.org. 16 Feb 2014.



Figure 3: Google Earth representation of VIIRS identified heat sources 12/18/2013

While this did not prove the initial working hypothesis, it did suggest that a more comprehensive analysis of the VIIRS sensor data might have real potential. In particular, a focus on the primary data files rather than pre-processed data sets might yield interesting results. This is due to the fact that the KMZ data products provided by the NOAA, while undoubtedly subject to well-defined scientific rigor, must still be regarded as having come from within a “black box.” The data has been processed via a mostly unknown algorithm, and is not subject to analysis. While this does not distract from the value of the products made available from the NOAA, it does demonstrate some of the limitations inherent in using pre-processed datasets, as each KMZ file is a representation of the data, rather than the data itself.

It is quite possible that a more thorough analysis of the original data might provide very different results to the ones obtained. The most significant obstacle to such enhanced analysis consists of the difficulties involved in attempting to use the SDR and EDR files

available from the NOAA. Although the HDF (H5) file format is widely used in atmospheric analysis, it is apparently not well known outside of that particular sub-discipline.⁸¹

Ultimately, although the project was unable to use the available KMZ datasets to prove the efficacy of VIIRS as an aid to the documentation of arson attacks, the limitations inherent in the methodology were such that we could not conclusively disprove the utility of the VIIRS sensor system for such work. All that could confidently be stated was that the pre-processed datasets available for the CAR were not sufficient to the task.

CAR Remote Sensing Working Group:

At the completion of the project, the results were passed on to Joshua Lyons of HRW, who was in the process of putting together an RS working group to monitor the situation in the CAR. A collaboration between a variety of groups with specialized interests, the intent is to allow for a division of labor that facilitates a comprehensive pooling of RS oriented analysis. The HRW Emergency Office will provided the visual, VHR imagery analysis, while HHI will review thermal data collected from the Moderate Resolution Imaging Spectroradiometer (MODIS) sensor system provided by the Aqua and Terra EOS satellite platforms, and Dr. Marx will provided analysis derived from the Enhanced Thematic Mapper + (EMT+) and Operational Land Imager (OLI) sensors aboard the LANDSAT 7 & 8 platforms. The intention of the group is to see if a broad-spectrum analysis of multiple sensor systems allows for greater accuracy in the documentation of the date, time, and location of arson attacks.

⁸¹ To their credit, the NOAA acknowledges this issue, and much of the processed data products they provided are geared towards making their data more widely available.

From the perspective of HRW, this is a question of some importance. The organization has a number of personnel on the ground in the CAR, and has been able to effectively document multiple eye-witness accounts of attacks, as well as procure the VHR imagery necessary to confirm that such incidents took place. However, specifying exactly when an attack occurred can be problematic, even though such information is essential in attempting to document which groups or elements of the conflict are responsible for the resulting destruction. The fluid, dynamic nature of the situation in the CAR is such that temporal data of this kind may well prove to be essential to any future prosecution for war crimes.

In my understanding, the ultimate goal of the group is to provide a thorough analysis of the available data sources, with the intention of providing verified data for inclusion in HRW case files to be provided to the ICC Office of the Prosecutor. However, additional goals have also been expressed during conference calls between the participants that speak directly to many of the issues raised in this paper. In particular, the idea that such collaborations between the activist and academic communities are both necessary and desirable, and that the input of multiple perspectives should serve to make the resulting analysis much stronger from a legal perspective. The notion that the group would be in a position to explore issues of best practices for human rights oriented RS analysis was voiced, as was the prospect of authoring a number of academic papers so as to engage the larger academic community in the discussion. Explicitly, the notion of direct engagement between academia, international civil society, and the international legal community was an area identified as clearly requiring greater development.

Personal Reflections:

From a personal perspective, the initial project work that focused on the use of Google Earth as an analytical tool was quite revealing. The ease of use and relatively simple acquisition of KMZ datasets were clear examples of the democratization of geography, in that it required no specialized training or experience with RS imagery to perform the necessary analysis, and all of the data was immediately available free of charge. Anyone on earth with access to the internet and a moderately current computer could produce the exact same results. On the other hand, without a fairly clear understanding of the limitations inherent in the process, the conclusions returned from the analysis could be very different.

While the application of Google Earth and “NeoGeo” has been explored as an inherent aspect of our increasingly globalized world,⁸² it does raise concerns from an epistemological perspective, and speaks to one of the major objections raised in the legal and HR communities; that of enthusiastic yet unqualified analysis presented as documented proof. Lyons’ call for the HR and activist communities to take more care in their analysis, and the recommendations from Wang et al for the non-profit community to work more closely with academia before the publication of agenda driven reportage, all speak to this issue.⁸³

More directly, the use of Google Earth is inherently fraught with epistemological concerns. Dodge and Perkins explore many of these issues, and refer explicitly to the notion

⁸² Liu, Sophia B, and Leysia Palen. "The New Cartographers: Crisis Map Mashups and the Emergence of Neogeographic Practice." *Cartography and Geographic Information Science* 37, no. 1, 2010.

⁸³ See previous discussion, p. 22 -23.

that digital globes such as Google Earth serve to create a false realism that obfuscates the temporal and visual resolutions used to create a seamless vision of the world.

*"It conveys a heightened sense of pictorial realism, a heterogeneity of colourful patterns, and a sense of apparent naturalism...Myriad 'technical' processes 'correct' for distortions and make them 'look right'. Perhaps the biggest 'lie' of this seamless imagery is that it is constructed out of tiles from different times, which are mosaiced together to create a wholly artificial view devoid of cloud cover... So images appear to be transparent and offer unmediated viewing; the position of the camera seems to be invisible."*⁸⁴

In the process of working on the VIIRS KMZ files I had to constantly remind myself of this false realism, and the level of underlying abstraction that resulted from my ability to zoom down from above in order to overlay my data onto images taken months or even years before the incidents under investigation. In many ways it was easier to work on this project by approaching it from the vertical geopolitical "view from nowhere" facilitated by the digital platform, than it was to engage with the actual eyewitness reports that grounded the project. Stepping back from the digital globe and VIIRS data, and instead returning to the real world accounts of the crisis was quite jarring.

In looking to understand the role that the digital globe was playing in my work, I was reminded of the writings of Elisée Reclus. In 1898 Reclus spoke before the Royal Geographic Society on the subject of education, geography, and the necessity of representing the Earth in true scientific detail. Reclus insisted that there was "only one way to represent truly the surface of the Earth. Curves are to be translated in curves; a sphere or fragment of a sphere must be reproduced by another sphere or fragment of sphere."⁸⁵ In calling for the construction of truly massive globes, so large that the public would be able to

⁸⁴ Dodge, Martin, and Chris Perkins. "The 'View From Nowhere'? Spatial Politics and Cultural Significance of High-resolution Satellite Imagery." *Geoforum* 40, no. 4, 2009: p. 498.

⁸⁵ Reclus, Elisée. "A Great Globe." *The Geographical Journal* 12, no. 4, 1898: p. 403.

walk inside of them, Reclus aimed to make the common heritage of humanity apparent, by suggesting that:

*"[A] model of the Earth, under the shape of a globe, vast in dimensions, where every man will find himself at home... where he may also indicate all possible corrections and improvements; such a model, in fact, which will afford a standard of scientific perfection which human intellect and skill are able to attain. This is, I think, what the legitimate ambition of a geographical society ought to realize, and will certainly realize, in the proximate future... they will belong to all men, without any privilege for race or nationality, and will help to strengthen within us the feeling that we are one and the same family."*⁸⁶

A man of vision that stood out far ahead of his time, Reclus even goes so far as to suggest that the revolution of photography would be a significant aid in the work of accurately allowing geographers to "be most strict in one thing – always keep to the truth."⁸⁷ Digital globes such as Google Earth appear to me as a modern day expressions of Reclus' dream. However, the fact that they are viewed vertically from above rather than from within, coupled with the false realism afforded by the mosaiced composite images that constitute the platform, makes me wonder exactly how Reclus would view this technological realization of his ideal.

Reflecting more directly upon the application of RS evidence in international criminal prosecutions, I was pleased to find that the topic was considered one of the fundamental principals underlying the establishment of the CAR working group. While the conversations between the members focused more expressly on the subject of data capture and analysis, this is attributable to the fact that the initial emphasis of the group is in exploring the potential for pooling results from multiple sensor datasets. However, the need to establish a more cohesive and holistic approach to the presentation of RS imagery

⁸⁶ Reclus. *Ibid.*, p. 406.

⁸⁷ Reclus. *Ibid.*, p. 405.

as documentation of humanitarian abuses was stated as the ultimate goal of the collaboration. This speaks to many of the concerns raised in this paper, from the need for a greater interaction between the three major spheres involved in the process, to the notion that legal definitions of proof are to be considered as primary factors in the production of analysis.

Although this program is still in its formative stages, I believe that the stated desire to produce legally applicable RS analysis is a significant one. In this context, the CAR working group has the potential to help establish some of the best practices that many of the referenced authors have called for, and I feel this shows potential for further developments in the expansion of RS usage by international tribunals.

Conclusions:

I have attempted in this paper to provide an overview of the geographic and legal implications associated with the use of remote sensing technology in the criminal prosecution of crimes against humanity. While the legal literature does not provide much in the way of strong legal precedent for RS usage, it does demonstrate the increasing acceptance of digital evidence by the courts. The fact that satellite images are now considered to be a viable source of evidence by influential members of the legal community, such as the Chief Prosecutor for the ICC, strongly suggests that the impact of RS data is certain to increase over the next few years.

As the cost of acquisition falls, and the temporal and spatial resolution increases, satellite data has the potential to become a significant geopolitical force in the context of accountability towards the international community. Human rights groups are ahead of the

curve in this respect, and have begun to take a pro-active approach on this issue.

Academics have also started to look closely at the political implications inherent in the use of RS imagery, meaning that there is every possibility over the next few years that many of the teething troubles currently associated with the presentation of RS data in court may be ironed out by the development of a more collaborative connection between the legal, activist, and academic worlds. I believe this is a fertile area for further research, and one that has the potential to engage in what Pierre Bourdieu described as “a scholarship with commitment toward building collective structures capable of giving birth to new social movements and new sites for international action.”⁸⁸

As such, a clear theme within both the legal and human rights literature is the need to establish some form of accreditation for RS expertise. From the legal side, this would facilitate the acceptance of RS data in court proceedings and help to firmly establish the utility of satellite data as corroborative (if not *prima facie*) evidence of criminal responsibility for grave human rights abuses. From the activist perspective, the establishment of best practices in the analysis and presentation of RS data would serve to professionalize their work, allowing for greater acceptance of (and therefore greater influence on) policy makers, state parties, the media, and the general public. While this notion evokes comparison with Büthe and Walter’s idea of *non-market private standard setting* (and all the geopolitical implications inherent in that conception) it still stands as an opportune way forward, albeit it with the need to carefully view how such an organization is to be established.

⁸⁸ Quoted in Scheper-Hughes, Nancy. "Parts Unknown Undercover Ethnography of the Organs-trafficking Underworld." *Ethnography* 5, no. 1, 2004.

Concurrent with this theme is the need to educate relevant parties to the limitations inherent in RS data. Popular conceptions of satellites as omnipresent, invisible spies that record everything on Earth, all the time, in great detail, only serve to frustrate and undermine the utility of legitimate RS usage. Of course, the technological abilities of classified satellite platforms are impossible to know without appropriate access. In this context, academics, activist and lawyers alike are not really in a position to know exactly what level of coverage is currently available to the clandestine world. However, openly acknowledge satellite capacity has clearly defined parameters, and as such much more needs to be done to clarify exactly what can and cannot be observed and recorded from space.

Expanding upon this idea, the concept of using non-visual imagery (such as thermal, night fire, and night light detection) in both legal and activist settings stands out as an area for potential expansion of the reach of RS data. Environmentalists and academics have long understood the utility of such images. The human rights world stands to gain from the adoption of alternate systems of graphic representation other than the “true color approximation” that until recently has been the mainstay of their RS usage.

Ultimately, I have attempted to lay out some of the fundamental questions that stem from the intersection of technology, geography, and social activism at the international level. The nature of this research is such that, while I am excited by the prospect of using RS imagery in the ongoing battle against heinous human rights abuses, I am also troubled by some of the epistemological and social questions raised by its use. I feel that geopolitics as a sub-discipline is well suited to explore the ramifications of ever expanding satellite use in the context of a globalized world. In a more holistic sense, I also feel it is incumbent upon

the discipline of geography as a whole to explore these kinds of issues, particularly in the case of social science applications of RS data. The creation of new collaborations between the academic and activist arenas (such as the nascent working group on the CAR) provides an opportunity to explore the development of RS usage on the global stage. As such, there is scope for further academic research into the processes through which networks of individuals from contextually and methodologically different backgrounds come together in the production of RS imagery.

The digital era provides both potential benefits and pitfalls for global society. The democratization of geography through the application of platforms such as Google Earth has expanded the reach of “NeoGeo” to anyone with the resources to connect to the web. Satellite images serve to magnify both the applications associated with such access, and the epistemological implications that go hand in hand with them. In the modern era, the ways in which we conceive of the world as a whole are being shaped by the visualizations provided by orbiting platforms floating god-like across the heavens. Increasingly, those images are being utilized as a means to pursue a strong, universalist notion of accountability for crimes against humanity. In this context, geographers are ideally situated to help clarify the nature of RS technology, as well as help to dispel the notion of satellites providing data gathered from an “Archimedean point, [a] view from nowhere where everything is unambiguously revealed and known.”⁸⁹

⁸⁹ Hulme, Mike. "Geography and the Humanities." *Progress in Human Geography* 37, no. 2, 2013.

Works Cited:

- "10 witnesses lined up against DP and Sang." *The Daily Nation*. www.nation.co.ke. 16 September 2013. Web. Available at <http://mobile.nation.co.ke/news/Ruto-ICC-bensouda-hague-sang-/-/1950946/1995304/-/format/xhtml/-/c4fa0nz/-/index.html>
- "About Us." *Human Rights Watch*. www.hrw.org. 2013. Web. Available at <http://www.hrw.org/about>
- "Applications of Earth Observation to the Legal Sector, Final Report." *BNSC SECTOR STUDIES PROGRAMME*. Prepared by the NPA Group. August 2001.
- "Application of the International Convention on the Elimination of All Forms of Racial Discrimination (Georgia v. Russian Federation)". *International Court of Justice*. Available at <http://www.icj-cij.org/docket/index.php?p1=3&p2=3&k=4d&case=140&code=GR&p3=1>
- "Bensouda plans to use satellite image evidence." *The Daily Nation*. www.nation.co.ke. 14 April 2013. Web. Available at <http://www.nation.co.ke/News/Bensouda-plans-to-use-satellite-image-evidence/-/1056/1748624/-/9l4hq2z/-/index.html>
- "Case Concerning Application of the Convention on the Prevention and Punishment of the Crime of Genocide (Bosnia and Herzegovina V. Serbia and Montenegro)." *Reports of Judgments, Advisory Opinions and Orders*. International Court of Justice, 26 February 2007.
- "Charter of the United Nations and Statute of the International Court of Justice." *United Nations New York Department of Public Information*. United Nations, 1993.
- "Ethnic cleansing and sectarian killings in the Central African Republic." *Amnesty International*. www.Amnesty.Org. 12 February 2014. Web. Available at <http://www.amnesty.org/en/news/central-african-republic-ethnic-cleansing-sectarian-violence-2014-02-12#.Uw-qsBnU6LE.gmail>
- "Evidence From Space: Study for the European Space Agency on Use of Space Derived Earth Observation Information As Evidence in Judicial and Administrative Proceedings. Final Report." *London Institute of Space Policy and Law*, 2012.
- "Housing Destruction in the Central African Republic (2013-2014) – Update 1" *Human Rights Watch*. www.hrw.org. 16 February 2014.
- "International Court of Justice Statute." In *The Wiley-Blackwell Encyclopedia of Globalization*. Blackwell Publishing Ltd. Oxford, 2012.

- "Our Research Methodology." *Human Rights Watch*. www.hrw.org. 2013. Web. Available at <http://www.hrw.org/node/75141>
- "Prosecution's Third Report on Joint Instruction of Experts: Trial Chamber V." Situation in the Republic of Kenya: In the Case of the Prosecutor V. Francis Kirmi Muthaura and Uhuru Muigai Kenyatta. *International Criminal Court: Office of the Prosecutor*, 15 February 2013. Available at <http://www.icc-cpi.int/iccdocs/doc/doc1552991.pdf>.
- "Public Redacted Version of the Prosecutor's Application Under Article 58 - Annex A." *International Criminal Court: Office of the Prosecutor*, 14 July 2008.
- "Public Sitting in the Case Concerning Application of the International Convention on the Elimination of All Forms of Racial Discrimination (Georgia V. Russian Federation)." Verbatim Record. *International Court of Justice*, 8 September 2008.
- "Rome Statute of the International Criminal Court." *International Criminal Court*, 1 July 2002. Available at http://www.icc-cpi.int/nr/rdonlyres/ea9aeff7-5752-4f84-be94-0a655eb30e16/0/rome_statute_english.pdf
- "Serb general convicted of genocide." *The Guardian*. www.theguardian.com. 2 August 2001. Web. Available at <http://www.theguardian.com/world/2001/aug/02/warcrimes>
- "They Came to Kill: Escalating Atrocities in the Central African Republic." *Human Rights Watch*. www.hrw.org. 19 December 2013. Web. Available at <http://www.hrw.org/reports/2013/12/18/they-came-kill>
- "Updated Statute of the International Criminal Tribunal for the Former Yugoslavia." *United Nations*, September 2009.
- "Visible Infrared Imaging Radiometer Suite – Products and Services." *NOAA National Geophysical Data Center*. Web. Available at <http://ngdc.noaa.gov/eog/viirs.html>
- "Who We Are." *Amnesty International*. www.Amnesty.org. 2014. Web. Available at <https://www.amnesty.org/en/who-we-are>
- Agnew, John. "The Territorial Trap: The Geographical Assumptions of International Relations Theory." *Review of international political economy* 1, no. 1, 1994.
- Agnew, John. "Space and Place." In *The Sage Handbook of Geographical Knowledge*. Sage Publications, London, 2011.
- AP. "ICC opens Central African Republic investigation." *The Guardian*. www.theguardian.com. 7 February 2014. Available at <http://www.theguardian.com/world/2014/feb/07/international-criminal-court-central-african-republic-war-crimes>

- Aranburu, Xabier Agirre. "Sexual Violence Beyond Reasonable Doubt: Using Pattern Evidence and Analysis for International Cases." *Law & Social Inquiry* 35, no. 4, 2010.
- Baylis, Elena. "Tribunal-hopping with the post-conflict justice junkies." In *Oregon Review of International Law, Symposium Issue*, vol. 10, 2008.
- Büthe, Tim, and Walter Mattli. *The New Global Rulers: The Privatization of Regulation in the World Economy*. Princeton University Press, 2011.
- Dobson, William J. *The dictator's learning curve: Inside the global battle for democracy*. Random House, 2012.
- Dodge, Martin, and Chris Perkins. "The 'View From Nowhere'? Spatial Politics and Cultural Significance of High-resolution Satellite Imagery." *Geoforum* 40, no. 4, 2009.
- Friedman, Thomas L. *The Lexus and the Olive Tree: Understanding Globalization*. Macmillan, 2000.
- Glasius, Marlies. *Expertise in the Cause of Justice: Global Civil Society Influence on the Statute for An International Criminal Court*. Oxford University Press, 2010.
- Graham, Stephen. "Vertical Geopolitics: Baghdad and After." *Antipode* 36, no. 1, 2004.
- Hulme, Mike. "Geography and the Humanities." *Progress in Human Geography* 37, no. 2, 2013.
- Lavers, C, C Bishop, O Hawkins, E Grealey, C Cox, D Thomas, and S Trimel. "Application of Satellite Imagery to Monitoring Human Rights Abuse of Vulnerable Communities, with Minimal Risk to Relief Staff." *Journal of Physics: Conference Series* 178, no. 1, 2009.
- Liu, Sophia B, and Leysia Palen. "The New Cartographers: Crisis Map Mashups and the Emergence of Neogeographic Practice." *Cartography and Geographic Information Science* 37, no. 1, 2010.
- Lyons, Joshua. "Documenting Violations of International Humanitarian Law From Space: A Critical Review of Geospatial Analysis of Satellite Imagery During Armed Conflicts in Gaza (2009), Georgia (2008) and Sri Lanka (2009)." *International Review of the Red Cross* 94, no. 866, 2012.
- Mountz, Alison. "Political Geography I: Reconfiguring Geographies of Sovereignty." *Progress in Human Geography* 37, no. 6, 2013.
- Núñez, Ana Cristina. Innovations in Human Rights Monitoring Working Paper, *Amnesty International*, August, 2012.

- Parks, Lisa. "Satellite Views of Srebrenica: Tele-visibility and the Politics of Witnessing." *Social Identities* 7, no. 4, 2001.
- Pflanze, Mike. "With landmark Kenyatta case in disarray, ICC prosecutor has one last shot." *Christian Science Monitor*. <http://www.csmonitor.com>. 11 March 2014. Web. Available at <http://www.csmonitor.com/World/Africa/2014/0311/With-landmark-Kenyatta-case-in-disarray-ICC-prosecutor-has-one-last-shot-video>
- Raustiala, Kal. "States, NGOs, and International Environmental Institutions." *International Studies Quarterly* 41, no. 4, 1997.
- Reclus, Elisée. "A Great Globe." *The Geographical Journal* 12, no. 4, 1898.
- Scheper-Hughes, Nancy. "Parts Unknown Undercover Ethnography of the Organ-trafficking Underworld." *Ethnography* 5, no. 1, 2004.
- Sengputa, S. "U.N. Ambassador, in Central Africa, Vows Aid and Hears of a Unity Shattered." *New York Times*. www.nytimes.com. 20 December 2013. Available at <http://www.nytimes.com/2013/12/20/world/africa/us-ambassador-visits-central-african-republic-amid-bloodshed.html>
- Sheng, Yongwei. "Remote Sensing." *The SAGE Handbook of Geographical Knowledge*. Sage Publications. London, 2011.
- Solvang, Ole. "Razed to the Ground: Syria's Unlawful Neighborhood Demolitions in 2012 - 2013." *Human Rights Watch*. 30 January 2014.
- Sulik, John J, and Scott Edwards. "Feature Extraction for Darfur: Geospatial Applications in the Documentation of Human Rights Abuses." *International Journal of Remote Sensing* 31, no. 10, 2010.
- Van Wyk, Jo-Ansie. "Space for Peace? The Use of Space Technology to Monitor Conflict Trends and Human Security in Africa." *Conflict Trends* 1, 2008.
- Vasagar, Jeevan. "Grassroots justice." *The Guardian*. www.theguardian.com. 17 March 2005. Available at <http://www.guardian.co.uk/world/2005/mar/17/worlddispatch.rwanda>
- Walker, James and Raphael Di Febo. "Remote Sensing and the Humanitarian Crisis in the C.A.R.: The Utility of VIIRS Fire Detection as an aid in the Documentation and Verification of Crimes Against Humanity." University of California Los Angeles, 2014.
- Wald, Patricia M. "International Criminal Tribunal for the Former Yugoslavia Comes of Age: Some Observations on Day-to-Day Dilemmas of An International Court, the." *Wash. UJL & Pol'y* 5, 2001.

Wang, Ben Yunmo, Nathaniel Raymond, Gabrielle Gould, and Isaac Baker. "Problems From Hell, Solution in the Heavens?: Identifying Obstacles and Opportunities for Employing Geospatial Technologies to Document and Mitigate Mass Atrocities." *Stability: International Journal of Security and Development* 2, no. 3, 2013.

Williams, Alison J. "Re-Orientating Vertical Geopolitics." *Geopolitics* 18, no. 1, 2013.