

**The Localized Geographies of Violence in  
the North Caucasus of Russia, 1999-2007**

John O'Loughlin

Frank Witmer

Institute of Behavioral Science  
University of Colorado at Boulder  
Campus Box 487  
Boulder CO. 80309-0487  
USA

Email: johno@colorado.edu; witmer@colorado.edu

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## **Abstract**

The second Chechen war, starting in the North Caucasus in August 1999, shows few signs of a ceasefire after almost ten years, though the level of violence has declined from the peaks of the war's first two years. Initially framed by both sides as a war between separatists versus the federal center, the situation is now complicated by the installation of a Moscow ally into power in Chechnya and the splintering of the opposition into groups with diverse aims and theaters of operation. The main rebel movement has declared the establishment of an Islamic caliphate in all the Muslim republics of the North Caucasus as its ultimate goal. Fears of regional destabilization of the entire North Caucasus of Russia are propelled by reports of increased militant activism in republics adjoining Chechnya due to possible contagion effects of violence on these poor areas. Temporal and spatial descriptive statistics of a large database of 14,177 violent events, geocoded by precise location, from August 1999 to August 2007 provide evidence of the conflict's diffusion into the republics bordering Chechnya. "Hot spots" of violence are identified using Kulldorf's SatScan statistics. A geographically-weighted regression predictive model of violence indicates that locations in Chechnya and forested areas have more violence, while areas with high Russian populations and communities geographically removed from the main federal highway through the region see less violence.

**Key words:** *civil war, Chechnya, North Caucasus, spatial-statistical analysis, diffusion*

At the height of the Vietnam War forty years ago, Robert McColl published an article in this journal titled “The insurgent state: Territorial bases of revolution”. He proposed a descriptive geographic model of rebel strategies from early (mobile) attacks to later phases of a rebellion (building a parallel insurgent state with well-protected core areas) as a manifestation of a territorial imperative (McColl 1969, 613). Using contemporary insurgencies in China, Indonesia, the Philippines, Indochina and Greece, McColl identified targeting schemata that balanced rebel resources against the relative value of the targets. McColl concluded his analysis by stressing the viability of base areas as a factor in the eventual probability of insurgent success.

Many of the military-geographic studies published since 1969 have a similarly descriptive and avowedly territorial character. Recently, however, there are calls for the application of more rigorous methodologies, both to understand the ebb and flow of fighting in war zones and for post-conflict peace-keeping purposes (see, for example, the chapters in Palka and Galgano, 2005). In contrast to the environmental and terrain analysis of military geography stand critical geographic accounts of massive killings of civilians in Germany and Japan during World War II (Hewitt 1983), the effects on civilians of U.S. bombings of the dikes in the North during the Vietnamese war (Lacoste 1976), the destruction of cities (Graham 2004), the ‘war on terror’ in the Middle East (Gregory 2004), and the environment and society impacts of militarization (Woodward 2004). However, compared to other social sciences (history, political science, economics, social psychology, and sociology) concerned with the impacts of wars on communities and their inhabitants, the relative lack of geographic work is evident. This article

attempts to redress this imbalance by focusing on the localized, geographically disparate nature of civil wars, now constituting almost all modern warfare. Taking advantage of the advances in the methods of spatial analysis that have developed since McColl's early work on rebellion, it demonstrates the valuable insights of a geographic approach to understanding the nature of local wars and tracking their dynamics.

In the North Caucasus region of Russia, a second post-Soviet civil war erupted in August 1999 and continues to the present. Unlike the first Chechen-Russian war of 1994-1996, the current insurgency is diffuse, diverse, geographically- and ethnically-disparate, and less visible on the world's television screens. It has evolved into simmering violence across the six ethnic republics (Chechnya, Dagestan, Karachaevo-Cherkessia, Kabardino-Balkaria, Ingushetia, and North Ossetia) and the predominantly ethnically Russian Stavropol' *krai* (Gammer 2007; Hughes 2007; Sagramoso, 2007; Yarlykarpov 2007; Moore and Tumelty 2008; Human Rights Center "Memorial" 2008). (Locations of the republics are identified on Figure 1). Though highly variable and subject to the competing claims of federal and insurgent sources, the estimates of dead in the two wars range from 80,000-100,000 and hundreds of thousands more have been displaced or fled to avoid violence (O'Loughlin, Kolossov, and Radvanyi 2007; ICG 2008). Though the level of violence is down significantly from its 2001 peak, political solutions are not widely supported and fears of regional instability due to poverty, religious and political militancy, corruption and criminality, paramilitary and police brutality, and the spread of violence from its Chechnya core are frequently expressed by Russian and international commentators (see, *inter alia*, Kramer 2005; Peuch 2005;

Dunlop and Menon 2006; Russell 2007; Smirnov 2007; Moore 2008). After a long delay due to reluctance in acknowledging the changing nature of the insurgency, General Nikolai Rogozhkin, head of Russian Interior Ministry forces in the region, was quoted by *RIA-Novosti* as saying that in 2007, a surge in militant activity has been registered in Chechnya, Dagestan, Ingushetia and Kabardino-Balkaria (North Caucasus Weekly 2008) and rebel websites (e.g. [www.kavkaz.org.uk/russ](http://www.kavkaz.org.uk/russ)) report an increasing geographic range of attacks. Tracking and mapping the diversity of violent events (rebel attacks on security forces and installations, police arrests, military reprisals, and civilian deaths due to the fighting) over the first eight years of the second Chechen-Russian war allows analysis of these and similar claims (Moore 2008). Unlike previous studies that relied on major incidents to make a case for growing regional instability, 14,177 violent events between 1999 and 2007 that are coded precisely by day of occurrence and geographic location offers a more reliable database for testing the claims and counter-claims of federal and local governments and the various insurgent groups.

Over the past half-century, the scientific study of war has evolved from mathematical models of superpower arms races to understanding the distributions of conflicts through use of economic and political correlates of states at war and recently, a more focused attention on the characteristics of civil wars in the post-Cold War era as interstate conflicts are now very rare (Collier and Hoeffler 2001; Sambanis 2002; O'Loughlin 2004). The most recent development is disaggregating conflict data down from the country-level to regions and localities under the rubric of GROW (Geographic Research On War). Because civil wars are usually concentrated in specific regions

within a state (e.g. Assam within India) and country-level analysis is thus inappropriate (Buhaug and Gates 2002; Buhaug and Lujala 2005; Raleigh 2007; O'Loughlin and Raleigh 2008), this impetus demands detailed information - typically events data (specific violent events coded for place, time, actor, target, and type). In this respect, a re-focus on developments *within* the state (disaggregating violence to its local elements) is responding to a long-standing parallel critique of "the territorial trap" of international relations by political geographers, with its fixity of structures and paucity of cases (only the states of the international system) (Agnew, 1994). Because of the perceived threat to the territorial integrity of post-Soviet Russia especially in the 21 ethnic republics and 10 ethnically-autonomous regions, the rebellion in Chechnya was always more than a local insurrection. Attempts by the federal center to confine the fighting inside the republic's borders has been undermined since the beginning of the conflicts in 1994 by close ethnic links to neighboring republics, raids by the rebels into adjoining Russian territories, frequent attacks on Moscow and other targets far from the war-zone, and ties between the Chechen rebels and supporters abroad.

Since the numerous large and well-used datasets in conflict studies are helpful only in setting the overall study dimensions (Raleigh and Hegre 2005), our study fits this new attention to localized violence. Unlike earlier works, we adopt an explicit spatial-analytical perspective to map and understand violence over time and between places. Specifically, our study: a) offers a descriptive account of the ebb and flow of conflict in the North Caucasus between August 1999 (start of the second war in the region) and August 2007 through cartographic and geo-statistical analysis of

dispersion-concentration trends; b) tests the hypothesis of diffusion of conflict from Chechnya with its important implications for regional stability and for Russia's regional politics; and c) examines the ratio of violence (events per population) in the region's 143 *rayoni* (counties) and major cities in relation to key political, environmental and demographic factors in a geographically weighted regression (GWR) analysis.

### **The Study of Civil Wars and their Geographical Disaggregation**

The limitations of so-called country-year approaches that generate a large N by multiplying all countries and all years (typically since 1945) are evident. In revisiting the literature published on the subject where conflict typically is represented in less than 5 percent of the country-year cells, there are multiple and compound explanations of civil wars, such as greed (economic) and grievance (ethnically-based), locations of rebel and government targets and bases, environmental (terrain and forest), institutional factors (effective governance and possibilities for expressing dissent), and historical factors (the legacies remaining from previous conflicts in specific locales). The most cited study concluded that civil war presence in a country in a particular year is related to the factors that encourage insurgency (poverty, weak governments, unstable politics, rough terrain, and large populations) while undermining arguments that diverse ethnic populations experience more conflicts (Fearon and Laitin 2003). In fact, a higher rate of diversity can be more stabilizing than a permanent majority-minority

struggle since control of the state apparatus by an ethnic majority can instigate insurgency (Cederman and Girardin 2007).

The main debate in the civil war literature has been between those who prefer greed explanations that emphasize the economic and resources incentives to fight, and the creed emphasis, that examines differences according to ethnicity, religion, and (increasingly) geographic location (Collier and Hoeffler 1998; de Soysa 2002; Collier, Elliott, Hegre et al. 2003). A major World Bank research project has highlighted the evident economic incentives to rebel, especially amongst young men (Collier 2000; Collier and Hoeffler 2001; Sambanis 2002; Collier, Elliott, Hegre et al. 2003). The geographer, Philippe Le Billon, has contributed to this debate by drawing attention to the uneven distribution of lootable resources (e.g. diamonds, oil, forest products, gold) that can pay for rebellions and thus become the focus of government-rebel actions, coupled with a strong involvement of outside interests (corporate, criminal and government) (LeBillon 2001; LeBillon 2008).

The geographic dimension of civil war study, however, still suffers from a weak conception and poor measures of possible environmental effects on war onset, frequency, and location. Among the limitations of country-level study is the assumption of an even distribution of conflict within a country when it is obvious that most countries experience civil conflicts only in selected locales. Use of country-level data also tends to ignore non-state actors and international cross-border influences for which information is difficult to obtain. Specifically, without geo-located information on conflict events (battles, attacks, reprisals, raids, arrests, etc.), it is not possible to track



the to-and-fro of conflict that McColl (1969) identified as a missing piece of the puzzle. Only with such data can rebel strategies and tactics, as well as government responses, be analyzed, and explanations for the relative concentration in certain places pursued.

Geo-located data are the basis for the possible use of GIS-based techniques, including spatially-weighted regression modeling that emphasizes non-stationarity and coefficient drift, and geo-statistical frameworks to tackle these questions of intra-state violence (Bailey and Gatrell 1995; Maguire, Batty, and Goodchild 2005). Predictive (e.g. contagious diffusion) models can be developed to anticipate future attacks on the basis of spatio-temporal trends, akin to hot-spot and trend analysis for crime data. Key ideas that lend themselves to aggregate analyses about the causes of wars drawn from the greed-creed literature can be examined at the local scale if disaggregated data are available. Such conflict data offer further benefits that are, as yet, rarely pursued in conflict study; for example, by connecting the local impacts of wars to the immediate and contextual nature of the communities affected, aid programs can be properly targeted and distribution points located (Sambanis 2005).

Historical study of civil war violence also suggests the advantages of a geo-statistical analysis of disaggregated data. While pinpointing the geographical distribution of revolutionary violence is a daunting task (Fitzpatrick 1978, 212), historians have nevertheless documented the dynamics of nationalist violence by compiling data on activists and combining this information with state responses. By comparing locales of political violence with nearby locales of inactivity, they have been able to document the key roles played by social and familial networks in mobilizing

nationalist agitation and offer a contextually-nuanced explanation of its geography. Irish studies, in particular, has benefited from this type of work (Rumpf and Helburn 1977; Fitzpatrick 1978; Hart 1997; Hart 1998). Typical data sources (police and military records, contemporary newspaper stories, memoirs, and interviews recording the time and place of events) allow the construction of rates of rebel mobilization and correlations with indices of economic and demographic composition. In Ireland, for example, rebellion at the local scale was negatively associated with the strength of economic links between local agricultural production tied to the British markets by middle-income families. On the other hand, violence was positively associated with rural poverty, the presence of local activist recruiters (especially school-teachers), a history of agrarian and nationalist agitation, and geographic peripherality.

What is evident in Irish revolutionary study, a field that is rife with legend, bias, traditional and revisionist accounts, hagiographies, and charges of brutality and war crimes is that every activist carried a mental map of 'good' and 'bad' communities – the former secure and hospitable, the latter potentially treacherous (Hart 1997, 166). Kalyvas (2006), in the literature review for his magisterial account of the Greek civil war of the 1940s, reviewed dozens of studies of similar conflicts and concludes that the key underlying dynamic is the uncertainty of who is friend and who is foe? This uncertainty sets up a moral hazard problem (i.e. a person insulated from risk may behave differently from the way he/she would behave if fully exposed to risk). Defection, denunciation, deterrence, and both discriminate and indiscriminate violence are perpetrated upon civilians by both rebel and state forces. While Kalyvas was able to

account for about two-thirds of the violence among Greek villages by his rational choice model, most accounts are anecdotal, tracking local legacies of enmity and hate that stem from previous hostilities. But stereotypical ethnic wars are not always as univariate as they seem. Bax (1995) delved beyond simple accounts of primitive “Balkanism” to account for the intra- and inter-ethnic atrocities perpetuated in a small village in Bosnia-Herzegovina as rational outcomes of strong clan loyalties, struggles for local economic dominance, competition by religious orders within the Catholic church, and reciprocity of brutality.

Despite the GROW initiative, much of the information collected is still highly aggregated and lacks the detailed day-to-day locality-based event information that is typical of the historical studies. Buhaug and Gates (2002), for example, analyzed yearly data and centroidal coordinates of 265 civil wars in the Uppsala conflict database from 1946-2000. Later work (Buhaug and Lujala 2005; Buhaug and Rød 2006) extended the Uppsala conflict data analysis to more sophisticated statistical modeling but the basic spatial information is still too coarse to facilitate localized accounts of violence. The research agenda motivating these analyses is inspired by traditional international relations topics – rebel and government resources, military strategy, terrain and distance to important objectives like capital cities, etc. Geographic units are generally assigned a violence score that is cumulated from either the presence of conflict in a given year, indexed to the scale of violence using the number of casualties or battles, or included within the spatial range of violence around a pre-identified centroid. A subset of these kinds of studies relates the ratio of violence to the economic and demographic

characteristics of the districts, hypothesizing that specific economic and ethnic attributes will raise the potential for violence (Gates 2002; Murshed 2002; Murshed and Gates 2005; Raleigh 2007). Recent worries that changing climates in vulnerable world-regions will lead to more conflict (through the agency of forced migration and increased competition with locals for scarce resources) have generated a flurry of interest (Homer-Dixon 1999). While the aggregate statistical evidence for the connection is still debatable (Hendrix and Glaser 2007; Nordås and Gleditsch 2007; Raleigh and Urdal 2007; Reuveny 2007), nuanced accounts of specific localities cautiously indicate a causal relationship (Meier, Bond, and Bond 2007).

Though a long-standing focus of geographic study of conflicts has been on the diffusion of wars, especially across international borders (O'Loughlin 1986; O'Loughlin and Anselin 1991; Gleditsch 2002; Ward and Gleditsch 2002; O'Loughlin 2004; O'Loughlin and Raleigh 2008), civil war study has not yet taken up a close examination of this phenomenon at the local level. Preliminary accounts are intriguing (O'Loughlin 2004; Raleigh 2007; O'Loughlin and Raleigh 2008) and the mechanisms of conflict diffusion through the actions of refugees, diasporas, and allied regimes in adjoining states are now being elaborated (Salehyan and Gleditsch 2006).

### **The Context of the North Caucasus Conflicts, 1999-2007**

In many respects, the North Caucasus conflicts resemble a classic separatist movement in Chechnya with knock-on consequences into adjoining districts. As noted by Trenin,

Malashenko, and Lieven (2004), three types of conflicts have occurred on Russia's frontier (the North Caucasus) since the end of the Soviet Union in 1991. The first, best-known and by far the bloodiest, are the Chechen wars of 1994-1996 and 1999-present (Dunlop 1998; Politkovskaya 2003; Zärcher, Baev, and Koehler 2005). A ramping-up of separatist claims in Chechnya, one of 89 subjects of the Russian Federation, developed at a time of confused political authority at the federal center and uncertainty regarding the unity of the state in the aftermath of the 1991 independence of the 15 republics of the Soviet Union. War broke out in August 1994 after President Boris Yeltsin ordered the end of the secession that had emerged under the leadership of the All-National Congress of the Chechen People (NCChP) party, headed by former Soviet general Dzhokhar Dudayev. This war was marked by major battles for control of Grozny (the capital), and ended with the Khasavyurt Agreement of August 1996 that effectively granted Chechnya autonomy within the Russian Federation. More than half the population fled the republic, including most ethnic Russians, and nearly 100,000 military personnel and civilians died (Lieven 1998; Tishkov 2004).

The inter-war period 1996-1999 in Chechnya saw a power-struggle between Aslan Maskhadov, a former Soviet officer elected as republic president, and Shamil Basayev, a guerrilla leader active in hostage-taking beyond the war zone, who advocated a more Islamist position from the leadership and who envisioned a caliphate across the entire Muslim region of the North Caucasus. As part of this wider strategy, Basayev and his followers invaded the bordering republic of Dagestan in August 1999, thereby triggering the second Chechen war. The new Russian leadership of Vladimir

Putin, determined to end separatism, developed the “Chechenization” strategy of placing local allies of the Kremlin into the power positions while isolating and destroying implacable oppositionists. After deciding on a local rebel clan as the best option to keep Chechnya within the Russian Federation, the Putin administration backed the former rebel, Ramzan Kadyrov, who succeeded his assassinated father, Mufti Akhmad Kadyrov, as Chechen president in 2007. Since 2001, the rebels have gradually been pushed out of the cities and towns of the steppe and piedmont in the north and center of Chechnya into the high mountains of the south and the war has devolved into a partisan-style conflict with frequent attacks on Russian forces and their local allies (Derlugian 2003; Sagamoso, 2007; Slider 2008).

A second type of conflict in the North Caucasus involves local ethnic groups disputing traditional territories. The most violent of these, in October 1992, was between Ingush and Ossetian militias contesting the Prigorodnyyy *rayon* near Vladikavkaz (Figure 1), which had been shifted by Stalin to North Ossetia in 1944 after he deported all Ingush (and Chechens) to central Asia as punishment for their supposed support of the Nazi invaders. The district remains under the control of the North Ossetian republic but the dispute remains unsettled as thousands of Ingush remain as IDPs (Internally Displaced Persons) in the adjoining republic of Ingushetia (O’Loughlin, Ó Tuathail and Kolossov, 2008). The terrorist attack on the school in the North Ossetian town of Beslan in September 2004 was connected to this territorial dispute by both the attackers and the families of the students killed and injured (Ó Tuathail 2009). Less

violent, but similar, territorial disputes resulting from Stalin's mass deportations remain unresolved in Dagestan (O'Loughlin, Kolossov, and Radvanyi 2007).

The third type of conflict is more amorphous and reflects the growing radicalization in the region, frequently taking on a religious form. Often, this militancy is a backlash against the rough and ineffective provocations of Russian military and police forces as they attempt to identify and arrest oppositionists in this most militarized region in the world (estimate from Dimitry Kozak, the former federal plenipotentiary in the region, quoted in Dunlop and Menon 2006). (See also Kramer 2005; Evangelista 2005; Hahn 2008; Hassel 2008). This third type of conflict tends to have strongly local elements since the impact of religious radicalism is quite scattered in Kabardino-Balkaria and Karachaevo-Cherkessia, and more widespread in Ingushetia and Dagestan as a result of the more intensive connections of these republic to events in Chechnya. Lyall (2006) counted 17 militant groups in the region, with many leaderships and aims unclear, but inspired by a combination of religious and ethnic goals. Individual communities such as Buinaksk and Gimry (Dagestan), Nal'chik (Kabardino-Balkaria), and Nazran (Ingushetia) have become known for frequent violent clashes between local militants and police-military detachments; this type of conflict is characterized mainly by assassinations and other attacks on political targets. It is difficult to parse political from criminal acts since, as is usual in war zones (Collier 2000), criminality and corruption flourish and what appears to be a political assassination might be motivated by a struggle for control of criminal assets (Moore 2008). The state has responded by supporting local interests who advocate regional,

cultural, and religious traditions, including renewed emphasis on Sufist rituals (Malashenko 2008).

In the North Caucasus environment of great uncertainty about a political future and of widespread concern about economic prospects, especially amongst young men (Mendelson and Gerber 2006), the categorization of violent acts is often an uncertain enterprise. The overall situation in the North Caucasus was summarized by plenipotentiary Dimitry Kozak in 2005 as a systemic crisis caused by powerful clans monopolizing the economic and political power in the region. Kozak wrote that “In all North Caucasus republics, the leading positions in the organs of power and the largest economic entities are occupied by people who are related to one another. “ (quoted in Dunlop and Menon 2006, 106). While inter-ethnic violence has been rare, the fine balance of distribution of resources amongst the dozens of ethnicities in the region remains an ongoing concern, especially in Dagestan, the most diverse republic. Though the Putin administration makes frequent recourse to the moniker of Wahhabite fundamentalism to explain the causes of violence in the North Caucasus (Kynsh 2004), public opinion locally is more likely to attribute it to poor federal government actions and criminal activities (Kolossoff and Ó Tuathail 2007). Only a tiny minority of the populations of the North Caucasian republics want separation from Russia through formation of a national homeland (O'Loughlin and Ó Tuathail 2009).

#### **The North Caucasus Violent Event Database, 1999-2007**



Following in the tradition of disaggregating civil conflicts through the accumulation of information on individual incidents, we coded 14,177 violent events between 1 August 1999 and 31 August 2007 in the six ethnic republics (Chechnya, Ingushetia, Karachaevo-Cherkessia, Kabardino-Balkaria, Dagestan, and North Ossetia) and the adjoining large territory, Stavropol' *kray*, populated mostly by ethnic Russians. (The locations are identified on Figure 1). We do not analyze the few violent events in the other parts of the southern Federal district often included in the North Caucasus such as parts of of Krasnodar *kray* and the republic of Adygeya because of their distance from the conflict zone.



Figure 1: Location Map of the North Caucasus of Russia, with boundaries of the republics, their capitals, and key locations mentioned in the text.

Unlike Lyall (2006), who collected information on 1,667 rebel attacks between 1999 and 2005, we coded all events that could be construed to be of a political character, using Lexis-Nexis as our primary source, with rebel internet sites, and Russian and foreign newspapers and wire services consulted for specific details. Erring on the side of caution, we did not code killings or injuries that could conceivably be the result of common criminality; either the target or attacker had to have a clear political character, often identified through claims of responsibility - whether the victim was a political office-holder, or location (e.g. police barracks). It is preferable to view the war as a collection of loosely connected insurgencies that unfold according to different republican-level logics (Lyall 2006, 16).<sup>1</sup>

It is increasingly difficult to completely produce a binary classification of political and non-political events, their admixture being a characteristic of contemporary wars (Kaldor 1999). Like Lyall, we coded the target (federal, state, or local police; the varied types of Russian military forces; political figures; civilians; rebels or purported rebels; non-governmental organizations; media outlets; infrastructures such as bridges, railway lines, and communications installations; border posts; governmental offices); actors (the claimants, or in many cases, those attributed as the attackers by the media source or the official press release and coded as police, military or rebels); date; location - village, town/city or specific point such as a crossroad that was geo-coded using placename/coordinate websites, FallingRain's Directory of Towns and Cities in Russia ([www.fallingrain.com/world/RS](http://www.fallingrain.com/world/RS)) and the Geonames database (<http://geonames.nga.mil/ggmagaz/geonames4.asp>) from the National Geospatial

Agency; casualties (killed and injured – civilians, federal, local, or rebel forces); newspaper or other wire service source; and confirmation by other media reports. Though we geo-coded events as precisely as possible, locations could not be pinpointed for 3560 events and these were allocated to the centroid of the *rayon* or cities in which they occurred.<sup>2</sup>

Some data uncertainties limit the analysis. Estimates of casualties are often highly variable with rebels claiming high numbers for their success in killing Federal and allied troops, while government sources give much lower figures for the same event. Because these claims are usually so contradictory, we do not use casualty figures in this article. We only divided battle-events if there was a significant shift in the location or scale of the violence during the course of the fighting. Thus, the Beslan (North Ossetia) killings of September 2004 that resulted in the deaths of 336 civilians and rescuers and 32 terrorist hostage-takers was coded as one event, even though it stretched over 3 days. Finally, all events were categorized as military actions, police actions, rebel actions, or arrests. These latter operations, called *zachistki* (“mopping-up” operations featuring mass arrests), often result from the sweeping of a village of young men by combined military-police forces after a nearby rebel action (Kramer 2005). By separating the violence into the four categories, we provide more disaggregated information about both sides (military, police and mass arrests on the government side, as well as rebels) than is typically the case in civil war research and thus, allows analysis of both sets of violence perpetrators.

To understand the distribution of violence across the 143 *rayoni* and cities of the North Caucasus, we collected aggregate information from the 2002 Russian census, supplemented by population estimates for the geographic units of Chechnya and Ingushetia by the Danish Refugee council (Trier and Deniev 2000). (In the fog of war, the reliability of the census figures for these republics is highly questionable). Ethnic figures and urban-rural populations are generally reliable but we dispensed with measures of wealth due to concerns about accuracy in an environment with a high proportion of income generated from unofficial sources (Vendina, Belozarov and Gustafson, 2007).

Land use/land cover data for the *rayoni* are derived from the University of Maryland's Global Land Cover Facility (GLCF) (<http://glcf.umiacs.umd.edu/index.shtml>). This land cover dataset was created using AVHRR satellite data acquired between 1981 and 1994 using a decision tree classifier and finer resolution Landsat imagery (Hansen, DeFries, Townshend et al. 2000). For our aggregate analyses, the satellite data were downloaded and georeferenced to the boundary files from ESRI (country borders) and the University of Washington Central Eurasian Atlas (oblasts and rayons; <http://geo.lib.washington.edu/website/ceir/>). To simplify the presentation of the land cover data, the original 14 categories were reclassified and forest cover defined as Evergreen Needleleaf/Broadleaf, Deciduous Needleleaf/Broadleaf, Mixed Forest, and Woodland where each has more than 40 percent canopy cover with trees exceeding 5m in height (Hansen, DeFries, Townshend et al., 2000). The mean elevation data for *rayoni* and

cities were calculated from the Shuttle Radar Topography Mission (SRTM) elevation data (nominal 90m pixel resolution), and available from <http://seamless.usgs.gov/>.

### **Descriptive Longitudinal and Geographic Distribution of Violence**

Violence in the North Caucasus peaked in April 2001, about 18 months after the second war began. Though there has been a reduction in overall violence, and in each of the 4 types of events (police, military, rebel, and arrest), a detectable seasonal pattern of violence, with an upsurge in spring followed by a decline in late autumn, is evident in Figure 2a. After a fairly steady period of moderate violence between 2002 and 2006, the last 18 months of the data series confirm a significant decline to spring 2007, followed by an upsurge in the last four months of the series. Much of the explanation for these trends relates to the Chechenization of the war and the switch of the former rebel Akhmad Kadyrov (and later his son, Ramzan) to the government side in 1999. Well-armed and well-financed, hundreds of rebels are estimated to have switched their support to the republican leadership (Kramer 2006; Ouvaroff 2008). Furthermore, the leadership of the Chechen rebels was devastated in 2005-06, with the killing of key leaders including Aslan Maskhadov and Shamil Basayev, and while the active rebels are estimated to number no more than 1000, they still launch daily attacks despite Kremlin claims of stability (Smirnov 2007; Abdullaev 2008; North Caucasus Weekly 2008).

By classifying the violent events by republic location in Figure 2b, we can clearly see the dominance of Chechnya (81 percent of all events) and the growing

importance of Ingushetia toward the end of the series. Dagestan was more prominent early in the second Caucasus war since it started there in August 1999, and this republic suffered an upsurge in violence in 2005; Dagestan has been the site of 8 percent (1151) of all events. Ingushetia accounts for 6.6 percent of all violence, a ratio that increased in the last few years of the data series as militant groups became more active in this small republic bordering Chechnya, a trend that continued into 2008. Beyond these three republics, the other four regions (Stavropol' *kray*, North Ossetia, Kabardino-Balkaria, and Karachayevo-Cherkessia)

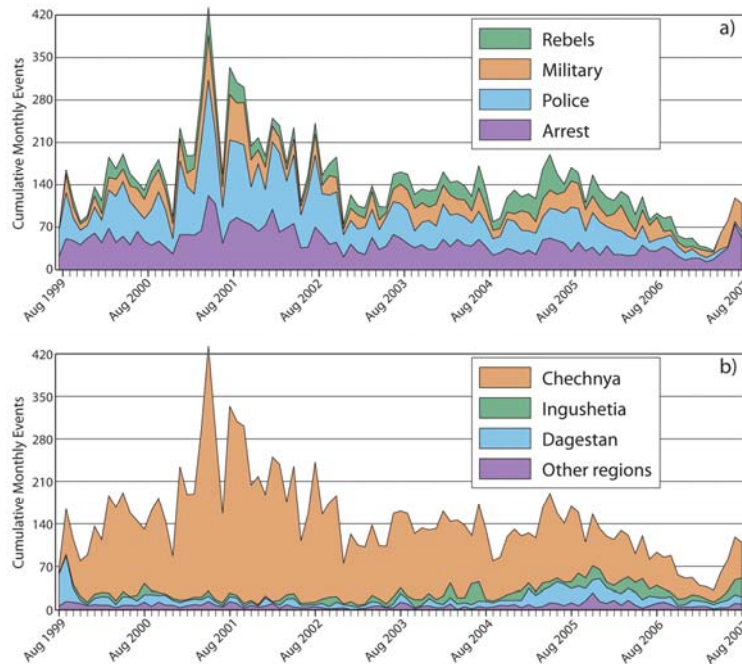


Figure 2: Monthly Distribution of Violent Events in the North Caucasus August 1999-August 2007, a) by Type of Violence and b) by Republic.

collectively only counted for 4 percent of events but two of these were very violent with hundreds of lives lost in hostage-taking at a school (Beslan, September 2004), and attacks on military and police installations (Nal'chik, October 2005). While violence

dropped in the core region, it has proportionately grown in neighboring republics. Since 2004, violence in Chechnya has decreased from over 90 percent to nearly 50 percent of the total in the North Caucasus at the end of the time-series.

The event map of violence shows a concentration in Chechnya and bordering regions of the adjoining republics, but also clearly indicates incidences of violence located hundreds of kilometers from Chechnya (Figure 3).

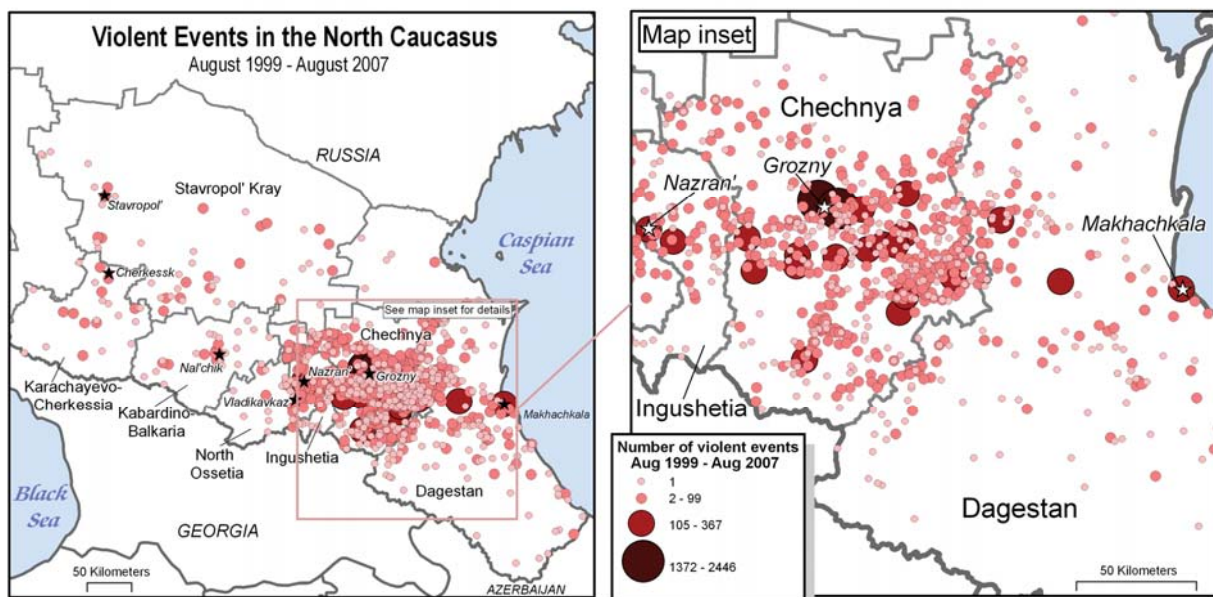


Figure 3: Geographic Distribution of Violent Events in the North Caucasus August 1999-August 2007. Circle size is proportional to number of events at each location.

The main highway of the region, the Caucasian Federal Highway can be generally picked out in Figure 3. Linking Makhachkala to Grozny and then west to Nazran, Nał'chik and Mineral'nyy Vody before turning northwest toward Rostov-na-Donu (see Figure 1), its course is visible by the clusters of violence at its major towns and cities. A border effect is also evident for Chechnya due to rebel attacks on border posts and

military checkpoints. For the first 8 years of the war, the federal authorities imposed a ‘ring of steel’ on Chechnya to try to contain the violence and road, rail, transport, and oil links were diverted around the republic. The posts that marked this ‘ring of steel’ thus became the targets of intense violence. Key locations can also be picked out in the region of greatest violence. Grozny city with 2446 events, Grozny *rayon* (county) around the city with 1372 events, Makhachkala (Dagestan’s capital) with 272 events, and cities in Chechnya (Vedeno - 173 events; Gudermes - 285; Shali - 238 events, Urus-Martan - 191 events). An animation by season of the violence (32 map frames for eight years) is available for download from our website at [www.colorado.edu/ibs/waroutcomes/maps.html](http://www.colorado.edu/ibs/waroutcomes/maps.html).

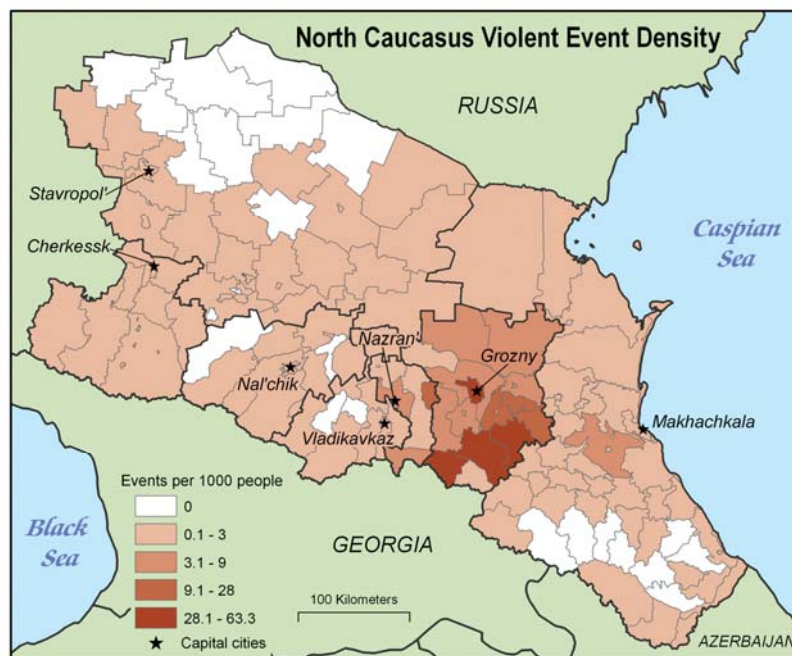


Figure 4: Geographic Distribution of Violent Events per 1000 people in the North Caucasus *rayoni* and cities, August 1999-August 2007.



The mountains in the south of the Chechen republic with up to 63.3 events per 1000 people over the eight years of the data show the highest ratio of violence (Figure 4). The Buinaksky *rayon* in Dagestan and two in Ingushetia have higher intensities than two of the Chechen *rayoni*; only 21 of the 143 geographic units in the entire study area experienced no violent event. The sparsely-populated steppes of northern Stavropol' *kray* and the mountains of southern Dagestan are most peaceful.

Comparison of our statistics to other accounts of the Caucasian wars after 1999 suggests that our data are more comprehensive than those heretofore published. For the same time-period as Lyall's (2006) study, we counted 3735 rebel actions compared to his 1667 for the same areal coverage. For a comparable 2004-2007 time-frame, we counted 1139 rebel attacks compared to 570 events in the WITS terrorism database. While our data for casualties are not used in this article since the range is large due to rival claims, they are certainly much higher than the approximate 3000 deaths for federal and local police and military given by Russian government sources (Mukhin 2007; *Kavkazskiy Uzel*, 2007). "Memorial", a Russian human rights organization, count more than 75,000 civilians killed in the two wars since 1994 (*Kavkazskiy Uzel*, 2007).

### **Geo-statistical Analysis of North Caucasus Violent Events**

Using the geo-coordinates of the individual events, we examined the distribution for geographic-temporal trends and evidence of clusters of violence, checking the accuracy of the frequent claims by commentators (e.g. Peuch 2005; Kramer 2006; Smirnov 2007)

that violence is diffusing from Chechnya. Most of the analyses of the point data were conducted in the Splancs package written for R (Splancs 2007). A kernel density that effectively converts the point data on a grid so that intensity can be visualized is particularly effective.

Figure 5 shows the three-dimensional plot for space-time interactions in the conflict event data and indicates the basis for the cutoff of 5 km in our geo-statistical analysis. The values are calculated from the equation

$$\hat{D}(h,t) = \hat{K}(h,t) - \hat{K}_S(h)\hat{K}_T(t)$$

where  $\hat{K}(h,t)$  is the estimate for the bivariate space-time  $K$  function defined as the expected number of events within distance  $h$  and time  $t$  of an arbitrary event (Bailey and Gatrell 1995; Diggle, Chetwynd, Haggkvist et al. 1995).

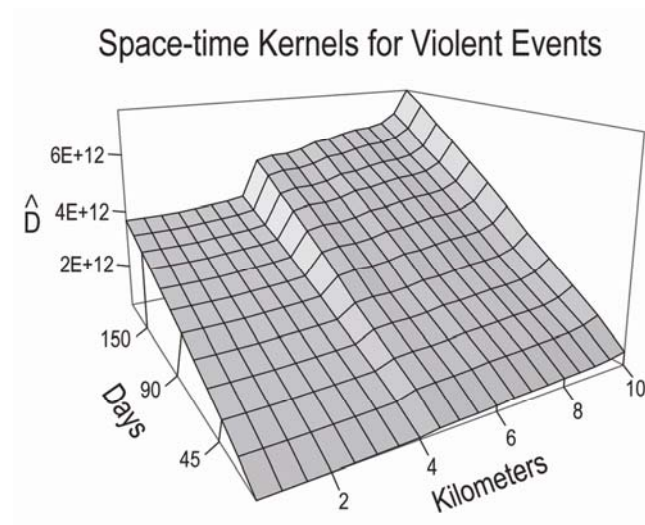


Figure 5: Time-Space Plot of Violent Events in the North Caucasus, August 1999-August 2007 (geo-located 14,177 events).

To assess whether there is any space-time interaction in the data, the estimates for the spatial  $K$  function,  $\hat{K}_S(h)$ , and temporal  $K$  function,  $\hat{K}_T(t)$ , are multiplied and subtracted from the combined space-time function. Raised values in the resulting plot indicate evidence of space-time interaction. Figure 5 shows little variation in the temporal dimension as  $\hat{D}$  rises gradually, but a significant spike between 4 and 5 kms indicates increased spatial dependence of the events at this distance. There is also a smaller rise at 10km, beyond which (not shown) the plot resumes its steady rise. The extreme value of the observed statistic on the plot of the distribution of 99 Monte Carlo simulations (not shown) provide further evidence of strong space-time interaction in the data. The low spatial threshold of 5 km points to the localized nature of violence in the region and the graph indicates that the spatial effect has a more significant effect than the temporal one.

For each of the 8 years in the study, we generated an intensity map, creating a smoothed version of the individual events in grid form (Figure 6). Using the *spkernel2d* function within SplanCS, a kernel estimation is calculated for each grid cell by summing the weighted distances between the center of each grid cell and every event within a given bandwidth. For our analysis, a distance of 5 km was chosen on the basis of the  $K$  function results (see Figure 5). The weights for nearby events are determined by the quartic kernel such that events close to the grid cell center are weighted strongly while points near the edge of the bandwidth contribute little to the estimation; the larger the

bandwidth, the smoother the resulting map. (For full details, see pages 84-88 in Bailey and Gatrell 1995.)

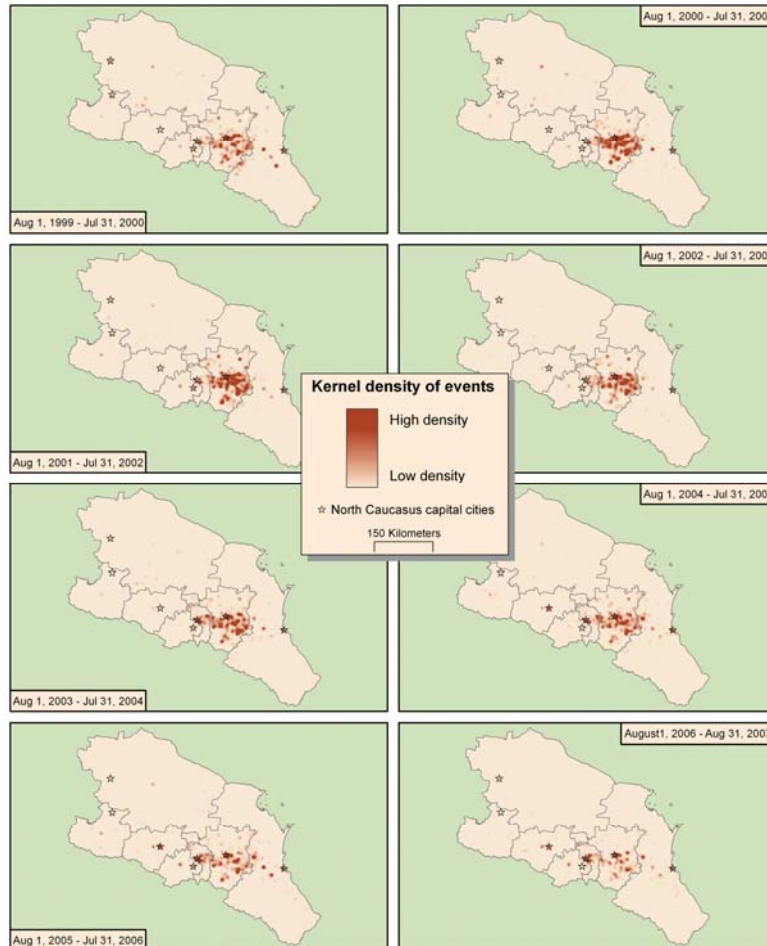


Figure 6: Kernel Density of Violent Events in the North Caucasus, August 1999- August 2007 (geo-located 14,177 events).

The intensity maps for the 8 years (August 1999 to August 2007) show the clustering of events along the Caucasian Federal Highway in central Chechnya in all years (Figure 6). Points of higher density correspond to cities and major towns, the same hot spots appear on multiple maps: Khasavyurt and Buinaksk in Dagestan, the major cities of Chechnya on the steppe and piedmont, and the capital cities of Nazran

(Ingushetia) and Nal'chik (Kabardino-Balkaria). In the last three years of the study, a reduction in violence intensity is also noted.

While the  $\hat{D}$  function provides an indicator of overall space-time interaction at increasing spatio-temporal distances, an alternate approach can be used to identify individual space-time clusters. For this, a scan statistic as implemented in the SaTScan software was calculated (Kulldorff 2007). While geographers have frequently identified spatial clusters for specific time-periods (a recent application of this methodology to identify crime clusters before and after a major bridge completion between Denmark and Sweden can be seen in Ceccato and Haining, 2004), the use of both time and spatial measures is typically found in epidemiology (see the extensive bibliography in Kulldorff 2007; also see Kulldorff, Heffernan, Hartman et al. 2005; Conley, Gahegan, and Macgill 2005). Specifically, the space-time permutation scan statistic used here compares the observed number of events in a space-time cylinder to the expected number of events within specific area and time dimensions. Events are assumed to follow a Poisson distribution within a given cylinder whose base area represents the spatial dimension and whose height is the temporal dimension. For cylinders with observed to expected ratios greater than one, a likelihood ratio test is calculated and compared to a Monte Carlo generated distribution of test statistics to assess the significance of each potential cluster. This simulation approach has the advantage of eliminating problems associated with multiple testing and edge effects. (See Appendix 1 for more details on the method).

For our analysis, we limited the search criteria to include cylinders with a maximum radius of 20km and temporal length of 3 months (using a time aggregation unit of 2 days). Furthermore, to reduce duplicate clusters, no neighboring pairs of clusters could both have their centers within the radius of other clusters. To limit the impact of a temporal edge effect, a week's content of event data on either end of the 12 month period were included. For example, the period from August 1, 2000 to July 31, 2001 was expanded from July 24, 2000 to August 7, 2001.

The eight yearly space-time maps in Figure 7 are focused on Chechnya since no significant clusters were found in the outer reaches of the North Caucasus study area. Most clusters are generated by the spatial coincidence of violent within a short period of time, though we mapped clusters up to 30 days in length. An example is the 8-31 day cluster visible south-east of Nazran in Ingushetia for the map for the 2002-2003 map. On 26 September 2002, a helicopter was shot down with the loss of two lives near Galashki. In the succeeding three weeks, federal forces launched attacks on rebel positions, made mass arrests, and engaged in significant battles with the rebels with dozens killed on both sides. The database includes 22 events in the immediate vicinity of Galashki during this short time-period.

In the first year of the war, the clusters are evident along the border between Chechnya and Dagestan, as Chechen rebels penetrated into their eastern neighbor in August 1999 triggering the war; the clusters are also evident in the cities of central Chechnya, which became the sites of heavy fighting when the federal authorities attacked the rebel government in Grozny. Temporally-longer but spatially-reduced

clusters are visible for later years on the Chechen-Ingush border, in and around Grozny, and in the mountains of southern Chechnya. As the war tended to take on a less urban character after the Russian military pushed the rebel government out of Grozny in February 2000, almost as many clusters are seen in Ingushetia as in Chechnya.

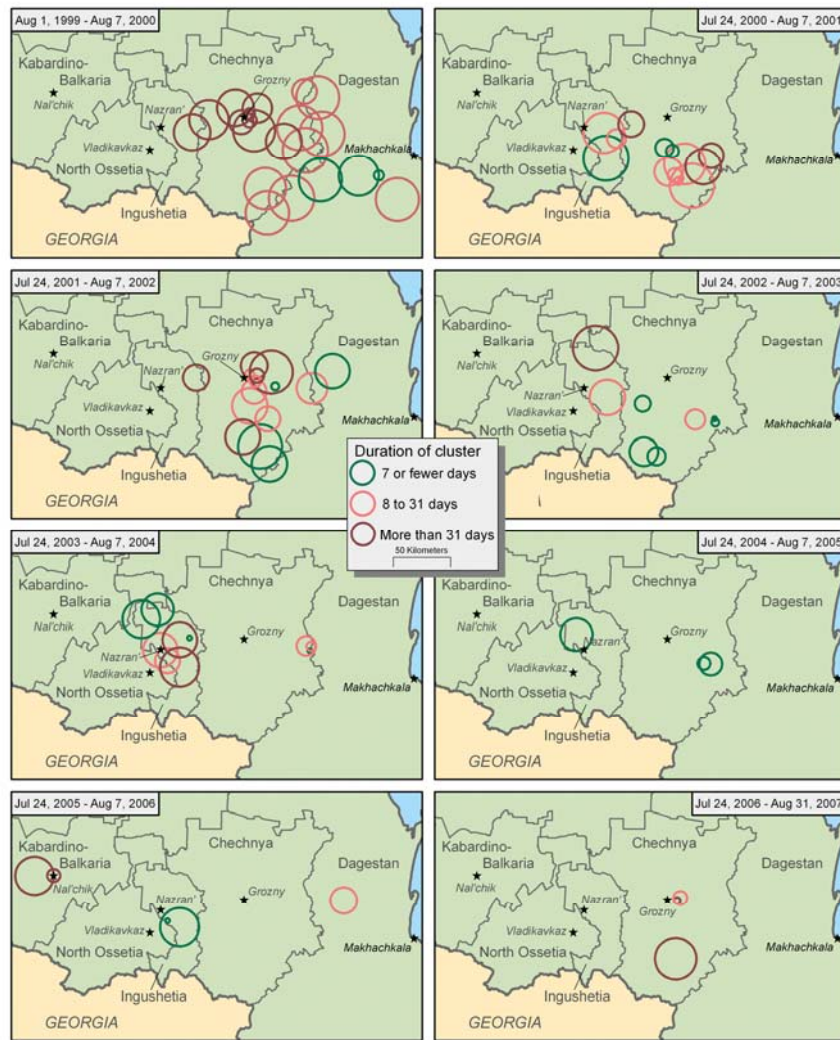


Figure 7: Significant Space-Time Clusters of Violent Events in the North Caucasus, August 1999- August 2007 (geo-located 14,177 events).

Major rebel attacks, as in Nazran in June 2004 and Nal'chik in October 2005, where the fighting was followed by *zachistki* (mass arrest) operations over many weeks, in turn generating further violence are also visible. In the last three years of the study, few space-time clusters are apparent since the overall level of violence has reduced drastically.

The descriptive account of the second Chechen war shows a decline in both the level of overall violence over time as well as a reduction in the spatial density and space-time clustering of conflict. At first blush, the arguments of Russian and Chechen government officials about the ending of significant violence in the region would seem to be supported, though the region remains highly militarized and politically unstable. However, as can be gleaned from the three maps for August 2004-August 2007 (Figure 7), although Chechnya has experienced a striking drop in violence, adjoining regions have seen relatively more concentrations of conflict than in the 1999-2004 period. This trend suggests that the arguments of Russian and external observers that the conflict is spreading and changing its character also have credence. A low-intensity conflict over a broader geographic area over the long-term can be more destabilizing to a state than a confined, though more destructive, war in one territory.

### **The Spread of Violence in the North Caucasus, 1999-2007**

There have been numerous claims that a new style of conflict has emerged during the second Chechen war. As the rebels were pushed out of the more densely-populated



urban centers in central Chechnya and as the Russian military, with their *Kadyrovtsi* Chechen allies, have increased their control of major routes in the piedmont and steppes that constitute about two-thirds of the republic, the conflict has proportionately become more manifest in the forested mountainous south and the adjoining parts of Dagestan and Ingushetia that offer protection to the rebels. An analysis of maps of rebel attacks 1999-2005 claimed that “it is clear, however, that violence is spreading: war touched only 11 districts (*rayoni*) in 1999, principally in Chechnya and (briefly) Dagestan, but reached 19 by 2003, 25 by 2004, and 32 in 2005” (Lyll 2006, 16). Other commentators (e.g. Kramer 2005; Smirnov 2007; Vatchagaev 2008a) concur with the specter of long-term hostilities in the poor North Caucasus bolstered by an increase in assassinations and politico-criminal activity. In Dagestan, violence is mostly caused by *jihadists*, not by inter-ethnic tensions, and a tit-for-tat pattern has been produced by the special operations of the republic and federal security forces against Islamic militants (ICG 2008). Ingushetia has become the most violent region (in terms of events per population) in the past two years due to attacks by Islamist militants on pro-government forces and repressive governmental counter-actions (Vatchagaev, 2008b)

There are numerous options of geographic analytical methods used to check claims of spatio-temporal diffusion. We present two summary measures for each of the eight years of the study; a) Moran’s I index for the events aggregated to the *rayon*/city scale with the inverse of inter-centroidal distances as the spatial weighting measure, and b) centrophonic indicators of mean center and standard distance ellipses for the individual geo-located events. While the Moran’s I index has been used in studies of

conflict (e.g., O'Loughlin and Anselin 1991; Raleigh 2007), centrographic methods have not been applied, possibly because of the absence of detailed geocoded data.

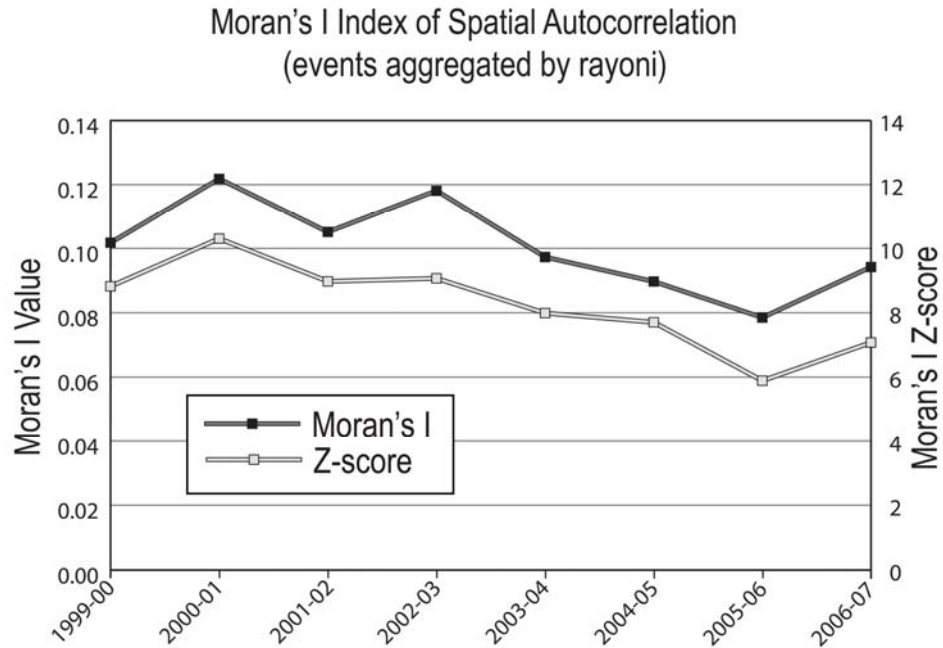


Figure 8: Spatial Clustering of Violent Events in the North Caucasus, August 1999- August 2007 using Moran's I index by year. Z-score of 1.64 is significant at the .05 level, one-tailed test.

The Moran's I measure and its associated Z-score plot in Figure 8 for the violence ratio (events per 1000 inhabitants) over the 8 years of the war shows significant spatial clustering in all years across the 143 *rayoni*/cities, with the peak clustering occurring in the second year as the fighting centered on control of Grozny and surrounding cities. After 3 years of de-clustering, the index shows an uptick in 2006-07, as violence re-concentrated in the mountainous areas of south Chechnya (note the cluster on Figure 7 in this region). The trend in the index is consistent with a diffusion hypothesis but since

it is a global measure, more localized indicators are needed to document a diffusion of conflict process.

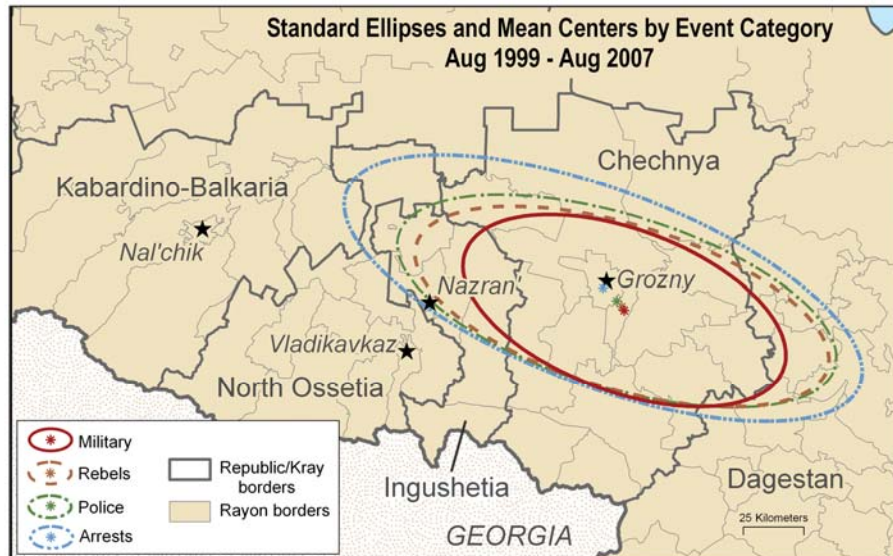


Figure 9: Mean Center and Standard Deviational Ellipse of Violent Events in the North Caucasus, August 1999- August 2007 by type of event.

The maps of the standard deviational ellipses (containing 68 percent of observations; the x-axis is twice the standard deviation of the x values, extending one standard deviation in both directions along the x-axis from the mean center with the y-axis calculated in a similar way) and the mean centers for the four types of conflict over 8 years of the study are clearer expressions of the spatio-temporal trends for the 14,177 geo-located events in the database (Figures 9 and 10). While the mean centers are grouped tightly just south of Grozny for all the distributions, the standard ellipses are more varied. Military actions against the rebels are concentrated within a 25 km radius of Grozny, while arrests (usually in *zachistki* by joint police and military units) show the greatest geographic dispersion (Figure 9). With mass arrests having a broader reach than the

rebel or military actions, the ellipses provide another indicator of the broad sweep strategy of the authorities to try to capture rebels, militants and their supporters (Human Rights Watch 2008). However, these arrests in turn generate bitter local resentment and further attacks on government officials and armed forces (Human Rights Center "Memorial", 2008). The primary orientation of the ellipses (northwest-southeast) generally follows the line of the Caucasian Federal Highway through the densest zones of violence from the mountains on the Chechen-Dagestan border through central Chechnya to northern Ingushetia.

The most dramatic evidence of spatial diffusion is visible in Figure 10, the standard deviational ellipses for each year for each type of violence. The same pattern of greater spatial extent for arrests is visible for all eight years but an examination of the yearly plots for the arrests shows a shrinking ellipse over time. None of the other plots show this trend; their shapes, ranges and predominant axes show a great deal of consistency over the years. One interpretation of the arrest maps is that the authorities are becoming more spatially selective in their sweeps to concentrate on the areas of rebel activity. Excluding the ellipses for August 1999-July 2000 and August 2000- July 2001 from the plots would bring the ellipses for the arrests into conformity with the other distributions. In contrast to the arrest maps, the other distributions show indications of spread especially in the last 3 years of the study. The ellipses now reach into North Ossetia to the west and to a point within 40 km of Makhachkala, the Dagestani capital on the Caspian Sea; the eastern and western extensions of the ellipses

are about equal in length and stand in sharp contrast to the north-south elongation, which hardly changes over time.

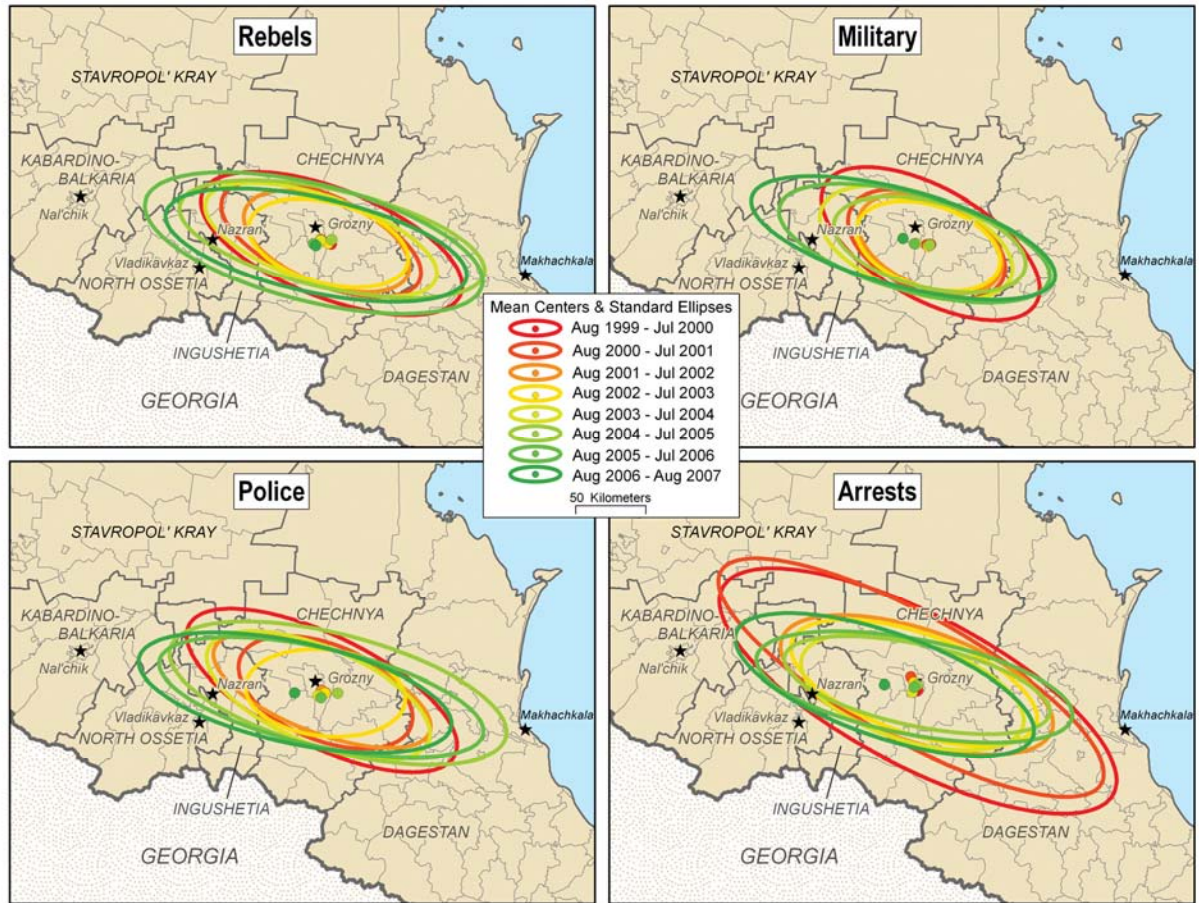


Figure 10: Mean Center and Standard Deviational Ellipse of Violent Events in the North Caucasus, August 1999- August 2007 by year.

The evidence in Figure 10 for the diffusion of the North Caucasian conflicts from the center in Chechnya is clear, though it is not as dramatic as might be gauged from the comments of military pundits and journalists. The reason for the lack of dramatic shifts on the maps is that the core of violence (rebel attacks, military, and police

operations) is still in Chechnya's most densely populated region – especially the cities and military targets along the Caucasian Federal Highway. Even in the last months of the study, over half of all violent events still took place in the Chechen republic.

Violence has spread, in the sense that places further from Chechnya are now seeing violence more frequently; it is doubtful these places ever experience the intensity of conflict that marked the 1994-96 war and the 1999-2002 period in the second war since their violent events are generally guerrilla hit-and-run attacks on federal and republic installations and personnel, and are followed by the inevitable arrests crackdown.

### **Explaining the Distribution of Violence in the North Caucasus, 1999-2007**

Having presented evidence for the modest diffusion of violence from Chechnya during the course of the war that started in August 1999, we turn now to an explanation of the distribution of the violence. We summarize all violence as the rate of violent events per 1,000 persons in each *rayon* and city (n=143) as mapped in Figure 3. Using geographical weighted regression (GWR) (Charlton, Fotheringham, and Brunson 2003; Fotheringham, Brunson, and Charlton 2002), we account for the distribution of violence using the aggregate characteristics of the *rayoni*/cities. Our choice of GWR is predicated on our interest in identifying localized correlates of violence and is in line with the advantages of a geographically-disaggregated analysis promoted by Fotheringham 1997). War studies have been characterized for too long by generalized explanations of violence that emanate from the institutional lens that political scientists

prefer; a complementary disaggregated geographic account examines place-to-place variations in the distributions of wars.

In his examination of the distribution of rebel attacks in the North Caucasus, Lyall (2006) introduced an explanation that combines the ethnic mix of an area with the level of popular support for rebel actions. He expected that the smaller a group's share of the conflict area population, the more restraint an insurgent organization will show while their actions are further curtailed by the number of competing organizations, the nature and type of counterinsurgency practices adopted by the Russian government and its local allies, and the intensity of popular support. Without reliable information on the size and ambition of the plethora of insurgent groups, it is very hard to examine these hypotheses and Lyall had to resort to a descriptive account for selected districts. Our study is more circumspect because, while our event data are numerous and more comprehensive, the correlates needed to understand rebel and state strategies are not available.

Though dozens of explanations have been proffered for the onset and duration of wars, the match of available information to the desiderata of predictive variables is poor for the analysis of violence distribution in the North Caucasus. Drawing from the civil war theories evident in the political science literature, we gathered data for measures of ethnicity, terrain, land cover, targets, and separatist tradition in Chechnya. In collecting data for analysis, we applied a natural log transformation for each of the 143 observations because of the skewed distribution of the dependent variable. The Russian census data for 2002 are not reliable for Chechnya and Ingushetia and instead, we

substituted population data from the Danish Aid Agency and estimated the percentage of the population that is Russian, the majority population throughout the area (O'Loughlin, Kolossov, and Radvanyi 2007). Similarly, we have no reliable data on income distribution or inequalities that might offer a test of the grievance hypothesis, such as is available for Nepal and other states (Murshed 2002; Murshed and Gates 2005).

The targets for rebel actions are readily identified and include Grozny and the neighboring political and population centers and the vital transportation arteries, especially the Caucasian Federal Highway, known colloquially as the "highway of death" (Lyll 2006). The urban indicator was percentage urban residents; according to Lyll (2006, 16), urban areas over 10,000 persons have been the predominant, though not the overwhelming loci of insurgent attacks. To calculate the mean distance to the Caucasian Federal Highway, we turned to the Digital Chart of the World road network (available from <http://data.geocomm.com/catalog/index.html>); a distance-to-highway grid was then derived and an average distance value was assigned for each district. Only the section of the highway from Makhachala west was used for the calculation since the southern part of the highway does not serve the same military role.

We can revisit McColl's (1969) hypothesis about the importance of a secure base for rebels by calculating the median elevation (meters) above sea-level of the *rayoni*/cities. In his preliminary analysis of rebel attacks, Lyll (2006, 17) claimed that "simple visualization reveals that there is no clear relationship between difficult terrain and attack propensity". The expectation that difficult terrain can shelter rebels and



invite government responses is now a standard feature of disaggregated studies of war and can be estimated in the GWR model. Similarly, forested areas are expected to offer cover for rebel actions and bases. Since Chechnya accounts for over four-fifths of the cases in our data set and since the war's origins lie in the attempt of rebels in this republic to assert their independence, we added a dummy variable, location in Chechnya, to reduce the variance unexplained.

GWR analysis allows the heterogeneity of parameters in the prediction of the distribution of violence to be estimated and mapped. It relies on the assumption that locations nearer to the point where violence is estimated are more influential on the estimates than places farther removed. This method estimates a local regression model for each observation by weighting near neighbors more than far neighbors according to a spatial kernel. There are two main types of spatial kernels, adaptive and fixed. Adaptive kernels specify a set number of neighbors to include in each local regression estimate while fixed kernels specify a set distance bandwidth around each observation. The drawback of the adaptive kernel method is that it assumes that the influence of neighbors varies according to proximity. Since we have no expectation of such variation in the North Caucasus, a fixed kernel was used. The distance bandwidth for the fixed kernel was chosen by minimizing the Akaike Information Criterion (AIC) using an iterative approach (Fotheringham, Brunson, and Charlton 2002). For our model, this resulted in a fixed bandwidth of 78.19 km. This distance is large enough that most areal units will have enough neighbors included for estimating the model parameters. The weights for the local regression models are then calculated as

$$w_{ij} = \exp(-d_{ij}^2/78.19^2)$$

where  $d_{ij}$  is the distance between centroid  $i$  and centroid  $j$ . Given our bandwidth distance, this means that neighbors beyond about 100 km from the observation being estimated are weighted so that they add little contribution to the regression parameter estimates. The parameters for the global (not geographically weighted) and the GWR models are shown in Table 1.

Repeating the GWR analysis for each of the four types of violent events and for the cumulative total allows us to check the consistency of the predictive factors. Only the model for arrests differed from the others. In this case, the predictive variable for forest cover was not significant, as it was in the other four models. Otherwise, the dependent variables show the same strength and direction of relationships and we report the results for the total events model in Table 1.

As is usual with GWR models, there is a significant improvement in the fit of the model compared to the global one. An improvement of 83.7 in jump in the the residual sum of squares estimates, a corresponding drop in the AIC and the adjusted R-square value from .622 to .705 attests to the improvement. Of the six predictors, only two (distance to the Caucasian Federal Highway and Russian percentage) show significant spatial variation in its parameter estimate using a Monte Carlo test procedure. The OLS estimates for the global model generally follow the hypothesized relationship with the rate of violence. Location in Chechnya is highly significant as might be expected from the maps shown earlier, while the farther the *rayon*/city is from the Caucasian Federal Highway, the lower the rate of violence.

Table 1: Parameter estimates for global and geographically-weighted regression

	b-value	St. error	t-value	GWR median value	P-value (Monte Carlo test of spatial variation)
Chechnya	3.568	0.40	8.98	3.605	.08
UrbanPct	0.009	0.01	1.26	0.011	.64
Mean Elevation	-0.000	0.00	-1.61	0.000	.13
ForestPct	0.016	0.01	2.47	0.012	.47
Hwy_distance	-0.008	0.00	-2.62	-0.005	.00
RussianPct	-0.016	0.00	-4.11	-0.009	.00
Intercept	-1.468	0.29	-5.01	-1.826	.02
Resid. sum of squares	263.67		179.99		
Sigma	1.392		1.229		
AIC	510.39		499.46		
Adjusted R-square	.622		.705		

models of the distribution of violence in the North Caucasus, 1999-2007.

Similarly, the ratio of Russians in the population is negatively associated with the rate of violence. Mean elevation is not significant, nor is the urban ratio (Table 1). Contrary to Lyall (2006), the urban factor does not emerge as important when Chechen location and the distance to the main highway through the area, linking many of the major towns and cities, are taken into account. Finally, the forest cover measure is positively related to the level of violence in a *rayon*/city.

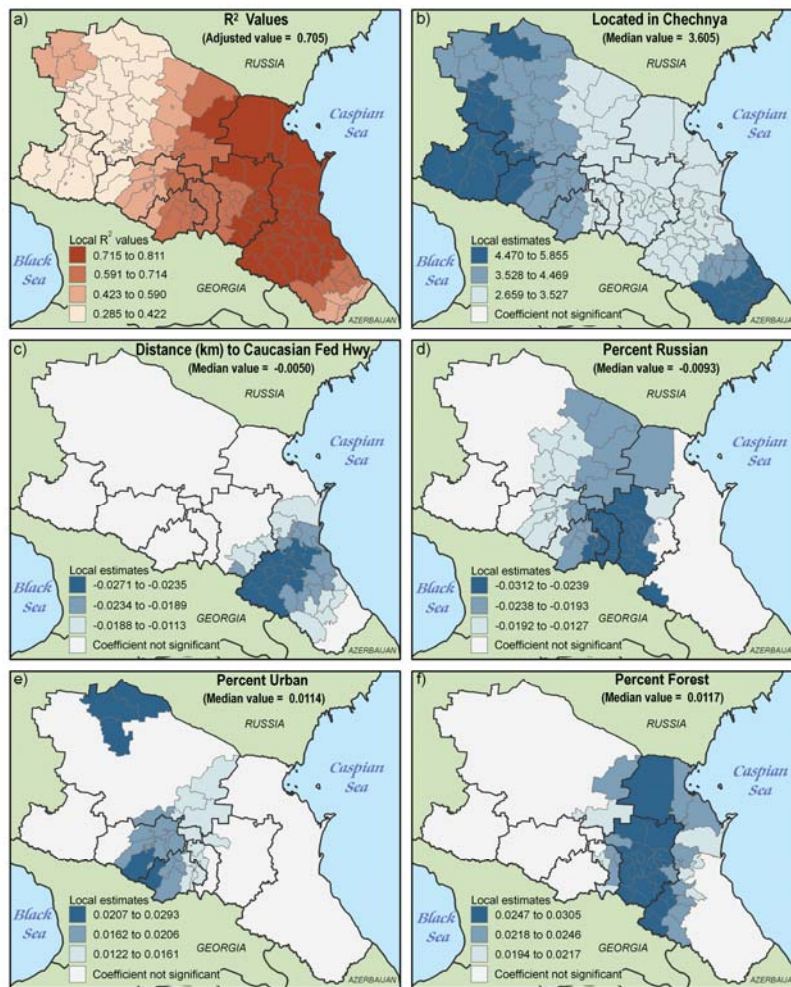


Figure 11: Distribution of Coefficients for the Geographically-Weighted Regression model of Violent Events for the *rayoni*/cities in the North Caucasus, 1999-2007. Significance is defined as a t-value of 1.68 for a one-tail test (40 degrees of freedom).

Estimates for the local parameters, as well as the estimated  $R^2$  value, are mapped in Figure 11. Clearly, there is considerable heterogeneity on the maps with much of the pattern related to the specific nature of the multiple conflicts that have started and developed in the past decade. The overall fit for the southwestern part of Stavropol' *kray* (the Mineral'nyy Vody tourist region), Kabardino-Balkaria and part of Karachaevo-Cherkessia is poor (local  $R^2$  value less than .422). This area has had a moderate level of

violence and has both a strong Russian presence and a high urbanization ratio. The model shows the best fit (higher than .715) for the border area between Dagestan and Chechnya, including the capital cities (Makhachkala and Grozny, respectively) and the main towns along the Caucasian Federal Highway, and a coefficient of determination that is above the global average for other *rayoni* near Chechnya and for nearly all of Dagestan (Figure 11a). The model fit is better for high violence locations than regions with an absence of violence.

Interpreting the intercept value (not mapped) as an indicator of unexplained variance, the high local values for this estimate in the west of the study region (Stavropol' *kray*, and the republic of Karachaevo-Cherkessia) (not mapped) reflect a lower overall level of violence. *Rayoni* with low levels of violence in southern Dagestan and Kabardino-Balkaria are evident on the map of the estimates of the Chechnya location predictor (Figure 11b) with the largest coefficient values found in the west of the study area and in southern Dagestan, both regions farthest from this republic. The mountainous area along the Chechen-Dagestan border has the highest values for the distance to the federal highway predictor, a reflection of the embedded nature of rebel activity in this inaccessible terrain. Though not bisected by the main highway, it has seen consistent violence since the first month (August 1999) of the second Chechen war (Figure 11c). The areas of greatest increase in recent violence on the borders of Ingushetia, Chechnya and North Ossetia are marked by high estimates for the Russian population percentage which is low in these *rayoni* (Figure 11d). For the non-significant factor, urban percentage, the map shows only a few *rayoni* with significant coefficients

(Figure 11e). The pattern of the forest cover coefficients (Figure 11f) emphasizes again the significance of this factor in Chechnya, and western Dagestan (the high values of this coefficient in northern Dagestan could be an artifact of the few neighbors within the 78.19 km kernel for this *rayon*, though in this area of steppe, little violence would be expected. Finally, the pattern of the estimates for the insignificant predictors, mean elevation and urban percentage, show most dispersed and idiosyncratic distributions.

The limitations of data access make the modeling of violence in the North Caucasus a challenging exercise. We have shown the strong influence of the Chechen locational factor, which despite many predictions and assertions of war diffusion, still maintains its predominance. The importance of the main transport route in the region, the Caucasian Federal Highway, as both an infrastructural asset to federal and republican forces and as a rebel target, is also evident in our analysis. Violence is also found disproportionately in non-Russian locations but despite recent press discussions and even rebel claims, such as on the main rebel website ([www.kavkaztsentr.org](http://www.kavkaztsentr.org)), that higher elevations favor their activities, elevation does not appear to be a major factor in the war to date. It is true that the pattern of rebel attacks and government responses has shifted to the south and west over recent years but the value of the high mountains to the rebels, as a refuge and a base from which to launch attacks, is not (yet) in line with McColl's (1969) expectations. The significance of the forest cover element, however, suggests the advantages to rebels of more difficult terrain. Having lost their main bases in the cities and the heavily-populated *rayoni*, the rebels have adapted a different, guerrilla strategy but refrain from trying to maintain control of specific towns

(Kramer, 2005). Doing so invites massive governmental retaliation. As the Caucasian conflicts spread regionally, with more terrorist incidences in both Dagestan and Ingushetia than in Chechnya from October 2006 to October 2008 (WITS data), the Russian state authorities are challenged by an increasingly disparate opposition motivated by harsh and ineffective tactics since the beginning of the first Chechen war in 1994.

### **Conclusions**

Our analysis has shown modest evidence of diffusion in the North Caucasian wars that is a result of the changing nature of the conflicts that have enveloped the region in the past nine years. With its origins in a separatist conflict that was bounded by the Chechen claims to their republic, the destabilization was exacerbated by the attack on Dagestan in August 1999 by Chechen rebels and by the nature of the response of the Russian security services. Over the past five years, the federal government has increased cooperation with local allies, has installed reliable officials in key public offices, and has increasingly relied on *zachistki* (mass arrest) operations to dampen the rebellion. The end result is that these tactics have now drawn all adjoining republics into the conflicts. Endemic poverty and poor employment prospects, coupled with a trend to join religious groups by many of the disaffected, has meant that the prospects for peace are no better now than a decade ago. In some ways, despite the reduction in casualties, the security situation is worse than ever as the region has settled into

(seemingly) permanent low-level hostilities between the power ministries and a myriad of oppositionists. A recent journalistic account concluded that Dagestan, not Chechnya, was now the most dangerous republic in Russia for visitors (Vatchagaev 2008a).

While we have gathered a large amount of information on the conflict, the event data are dependent on the sources that reported the events. The claims of government and rebels are so contradictory that reliable information is a particularly scarce commodity in the North Caucasus because of Russian control of information and the dangers to journalists from all sides, reflected in the murder of prominent reporters like Anna Politkovskaya in 2006. International agencies have great difficulty in serving the those fleeing the conflicts; the UNHCR (UN High Commission for Refugees) and other UN agencies withdrew from Nazran, Ingushetia in April 2007 due to a rocket attack on their offices.

To attempt to mitigate the potential inaccuracies of the reports, we resorted to different sources that noted the violent events, while avoiding the use of weights to scale their severity. This approach, obviously, understates the importance of some events such as the bloody end to the school hostage-taking in September 2004 in Beslan. The cumulative effect of local events of varying severity also has important repercussions for the tit-for-tat nature of the violence and the difficulty of finding solutions.

In coding and organizing the data for the spatial analysis, we chose to adopt a two-track approach, by analyzing both point and areal (density rate) events data. While



each has drawbacks and advantages, we were able to indicate the replicative nature of the analyses – both types of data demonstrate clear, though modest, evidence for diffusion of violence from the central Chechnya core area surrounding Grozny. Our geographically-weighted regression analysis showed the importance of the main transportation artery and the targets in Chechnya in explaining the distribution of violence. Lack of data for predictive variables (especially level of material wealth) do not allow an effective test of the ‘greed versus grievance’ explanation that has dominated the quantitative study of civil wars.

McColl’s (1967, 1969) articles at the time of the Vietnam war were filled with “counter-insurgency” language and tactics and produced a geography of rebellion that started from Mao Zedong’s principles for guerrillas. Central to these tactics was the strategy of building bases, in defensive sites that were accessible to targets, and McColl showed how difficult it was to destroy the hideouts, once they were established. While the technology of war and the nature of war (fewer international conflicts) has changed in the past half-century, the interest in geographically tracking the details of violence remains as prominent as ever. Modern technologies, especially GIS and associated spatial analytical techniques, allow a sophistication of analysis that descriptive accounts like McColl’s could hardly imagine. While we have confined ourselves in this paper to mapping and analyzing spatial distributions of violence, our data lend themselves to use in forecasting and extrapolation models, ascertaining the precise nature of spatial diffusion (contagious, hierarchical, relocation), comparison of the geographic tactics and targeting of specific rebel groups and governmental agencies, examination of the

influence of environmental factors (weather, terrain, landcover), and temporal developments in rebel and government actions as causes of and response to political changes. While spatial-analytical approaches have been applied to a diversity of environmental and social topics, the recent availability of large, disaggregated datasets on political violence now parallel data on criminal activities (location of offenses, homes of offenders, etc), epidemiology (disease occurrences), and geological distributions (e.g. petroleum), and allow similar sophisticated mapping and analysis.

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## Appendix 1

To assess whether the observations within each cylinder form a cluster, they are compared against the expected number of events with the given area and time period. Using the Kulldorff, Heffernan, Hartman et al. 2005 method, for each spatial location,  $s$ , and each time unit,  $t$ , an expected number of violent events is calculated:

$$E[c_{st}] = \frac{1}{C} \left( \sum_s c_{st} \right) \left( \sum_t c_{st} \right)$$

where  $c_{st}$  is the observed number of events cases at the given spatial location during  $t$  and  $C$  is the total number of observed violent events. From these individual calculations, the expected number of events within a given cylinder,  $A$ , can be calculated by the following summation:

$$E[c_A] = \sum_{(s,t) \in A} E[c_{st}]$$

For each cylinder, the observed to expected ratio, ODE =  $c_A/E[c_A]$ , is calculated and for each cylinder with an ODE > 1, the Poisson generalized likelihood ratio measure is

$$\left( \frac{c_A}{E[c_A]} \right)^{c_A} \left( \frac{C - c_A}{C - E[c_A]} \right)^{C - c_A}$$

where  $c_A$  is the observed number of events in the cylinder.

To evaluate the statistical significance of the cluster, a Monte Carlo method is used to generate 999 random permutations of the data for which the likelihood ratio statistic is calculated. A  $p$ -value is then calculated by comparing the rank of the test statistic generated from the real data,  $R$ , against the 999 simulated values,

$$p = R/(999+1).$$

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## NOTES

<sup>1</sup> To check our data against another extensive collection, we compared the graphs of incidences of terrorism from the National Counterterrorism center's database, WITS (Worldwide Incidences Tracking System, available from [wits.nctc.gov](http://wits.nctc.gov)) with those of rebel attacks from our database for each month and for republic. The two graphs track very closely, though we have 2-3 times more incidences coded consistently than the WITS data.

<sup>2</sup> On the suggestion from two anonymous reviewers, we also calculated the mean centers and standard ellipses by year for each event type after removing the 25% of events that contained no town or village geocoding. A comparison of these maps to Figure 10 show a nearly identical geographical distribution for all event types over the years. The only exception is for the distribution of arrests in 1999. Many mass arrests at the beginning of the second conflict took place in Chechnya and Dagestan but were not precisely geocoded. Removing these events from the arrests distribution yields a slightly elongated ellipse in the northwest-southeast orientation for 1999 but with little impact on the mean center. Therefore, we use the full database in all the analyses.