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Chapter 8

SACRED PLACES AND GEOPHYSICAL ACTIVITY

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ABSTRACT

Mystical experience is a phenomenon that has influenced and continues to influence the development of culture and civilization. Mystical experiences in particular places are known to all cultures. Every so often, such places become sacred. The author proposes a hypothesis that the following complex of geological and geophysical prerequisite factors is of importance to the sacralization of a place: regional and local active faults, local magnetic anomalies, regional and local lithospheric stresses, and regional seismic activity. The following cause and effect chain is assumed: Along faults and at fault intersections, the crust exhibits increased permeability over geological time scales. This creates conditions conducive to the occurrence of ore concentrations and magmatic bodies generating local magnetic anomalies. Geomagnetic storms modulate the intensity of the geomagnetic field at these anomalies. Before an earthquake, the rise of local and regional lithospheric stresses leads to electric currents carried by electron holes. Propagating along faults, these currents also modulate the intensity of local magnetic anomalies and sometimes produce self-luminous objects. Local fluctuations of the geomagnetic field and pulsating magnetic fields of self-luminous objects influence the human brain and can lead to a mystical experience.

To test the hypothesis for an initial approximation, one should demonstrate that sacred places are predominantly located along fault lines. For a part of the Crimean Peninsula, the author carried out a comparative analysis of a statistically representative sample of monasteries comprising 104 objects, as well as faults, earthquake intensity zones, and regional magnetic anomalies using geological and geophysical maps. Almost all Crimean monasteries are located along faults of various ranges or at their intersections. Most monasteries are placed within earthquake intensity zones of VII–VIII degrees as well as within regions with decreased regional geomagnetic intensity. These results are evidence in favor of the author's hypothesis.

Keywords: monastery; magnetic field; seismicity; fault; neurophysiology; brain.

8.1. INTRODUCTION

8.1.1. Mystical Experience: Neurophysiological Evidence

Altered states of consciousness are a phenomenon, which have influenced and continue to influence the development of personality, culture, and civilization (Maslow, 1964; Dobkin de Rios and Winkelman, 1989; Tortchinov, 1998). The term "mystical experience" is commonly used to describe a sort of altered state of consciousness characterized by visual and auditory hallucinations, including apparent contacts with divine or supernatural creatures. These contacts are often accompanied by extreme emotions, such as delight, euphoria, horror, panic, etc. Sometimes a person may experience *unio mystica*, that is, transcendence of space and time, cosmic unity, oneness, and other verbally inexpressible feelings (James, 1902; D'Aquili and Newberg, 1993; Levin and Steele, 2005; Lange and Thalbourne, 2007).

The particular content of mystical experience and its personal interpretation depend on cultural and religious stereotypes of an individual. Like other forms of altered states of consciousness, a mystical experience may be both spontaneous and induced. In the latter case, various accidental and goal-oriented exposures may result in mystical experiences, such as psychedelic drugs, intoxication, fasting, natural and artificial magnetic and electromagnetic fields, extreme conditions in polar regions, deserts, and high mountains, hypoxia, hyperventilation, deep relaxation, physical and emotional overloads, injuries, severe somatic diseases, as well as psychological techniques (e.g., meditation) known in all cultures (Vaitl et al., 2005).

Let us refine the key difference between mystical experience and religiosity (James, 1902). Mystical experience is a result of natural neurophysiological processes, whereas religiosity is developed by instructions and social contacts of a person (D'Aquili and Newberg, 1993, 1998). Religiosity influences the personal interpretation of a mystical experience. The latter may increase a level of personal religiosity. However, religiosity is not a necessary condition for a person to obtain a mystical experience. Mystical experience forms a basis for both religiosity and religion (Tortchinov, 1998). Mystical experience and religiosity may have different neurophysiological correlates. The former is apparently evoked by neural activity of deep structures of the right temporal lobe of the brain (see below), whereas the latter is probably controlled by activity of the right frontal cerebral cortex (Devinsky and Lai, 2008).

It is well known that the brain exhibits functional lateralization. In particular, the right hemisphere is responsible for intuition, emotions, and space perception, whereas the left hemisphere specializes in logic, analytical thinking, and formal linguistic procedures (Bradshaw and Nettleton, 1981; Springer and Deutsch, 1981; Ashbrook, 1996). It is assumed that the development of the individual sense of Self is closely linked with linguistic skills (Jaynes, 1976; Dobrokhotova and Bragina, 1977). This is a basis for the proposal that (a) the sense of Self arises after development of some "critical mass" of neuron chains; (b) functioning of the sense of Self is chiefly controlled by left-hemispheric processes; and (c) the right hemisphere develops an unaware "homolog" of the sense of Self (Persinger and Makarec, 1992; Persinger, 2003; Booth et al., 2005). Properties of the sense of Self and its homolog relate to specializations of the left and right hemispheres, respectively. A person is not usually aware of the information exchange between the sense of Self and its homolog.

According to the Persinger hypothesis (Persinger, 1983b, 1993b; Booth et al., 2005), a mystical experience of a healthy person is a result of natural neurophysiological processes during spontaneous or induced short microseizures in deep structures of the right temporal lobe, such as amygdala and hippocampus (Persinger, 1983b). These microseizures lead to the very short (20–200 ms) activation of interhemispheric neuron pathways through the corpus callosum and hippocampal commissure (Persinger et al., 2000; Persinger and Healey, 2002). These pathways allow awareness to occur between the sense of Self and its homolog (Persinger, 2003). In this instant, a mystical experience takes place. The epiphysis probably plays some role in these processes (Hill and Persinger, 2003).

Several facts support the Persinger hypothesis:

(1) Numerous experiments have demonstrated that a short (3–5 min) transcranial exposure of the right hemisphere to an extremely low frequency weak magnetic field (0.5–10 Hz, 0.1–5 μT, the signal has a complex pulsed form) evokes an experience of the sensed presence in 80% of the general population (Johnson and Persinger, 1994; Cook and Persinger, 1997; Persinger and Healey, 2002; Roll et al., 2002; Booth et al., 2003, 2005; St-Pierre and Persinger, 2006). The sensed presence is a form of mystical experience. It consists in the feeling or apparent observation of a supernatural creature located near the observer (James, 1902; Brugger, 1994). The sensed presence might also be induced by an accidental exposure to extremely low frequency pulsed weak magnetic fields generated by electric and electronic household devices (Persinger et al., 2000, 2001; Persinger and Koren, 2001).
(2) Electroencephalographic measures revealed an increase in spike frequency and domination of theta waves in the temporal lobes of persons who reported mystical experiences (Makarec and Persinger, 1985; Munro and Persinger, 1992). Short (1–2 s) spikes in electrical activity of the temporal lobes were observed during the induced sensed presence (Persinger et al., 2000; Booth et al., 2003).
(3) Personal characteristics and behavior of healthy individuals predisposed to mystical experience are similar to signs of increased temporal lobe lability and minor symptoms of temporal lobe epilepsy, such as low self-esteem, hypertrophic sense of guilt, dependence on circumstances, aggressive irritability, egocentricity, affective viscosity, hypergraphia, frequent dèjá vu, etc. (Waxman and Geschwind, 1975; Persinger, 1983b, 1984b; Makarec and Persinger, 1985; Persinger and Fisher, 1990; Persinger and Makarec, 1993; Saver and Rabin, 1997; Thalbourne et al., 2003). It is common knowledge that temporal lobe epilepsy patients may have mystical experiences (Dewhurst and Beard, 1970; Saver and Rabin, 1997; Ogata and Miyakawa, 1998; Devinsky and Lai, 2008). Clinical practitioners usually consider the sensed presence as an epileptic aura (Landtblom, 2006).

Notice that sometimes it is hard to distinguish a mystical experience from a disease manifestation, such as psychoses and hallucinations with mystical content (Cook, 2004; Heriot-Maitland, 2008). Therefore, mystical experience is at times considered within the continuum of "normality–disease" states (Persinger and Makarec, 1993; Heriot-Maitland, 2008). There is a criterion to classify a mystical experience as either healthy or pathological: If it leads to the personal degradation, it should be considered as a manifestation of illness.

Otherwise, a mystical experience is unrelated to psychopathology (Tortchinov, 1998; Clarke, 2001). In this case, it may promote personal growth (Maslow, 1964).

8.1.2. Mystical Experience: Geophysical Factors

Among natural and artificial triggers of a mystical experience (Section 8.1.1), magnetic fields are of principle interest for our study since the geomagnetic field persistently influences all humans.

During geomagnetic storms, variations in the electrical activity of the brain of healthy individuals can be observed (Raevskaya, 1988; Doronin et al., 1998) including unstable states (Belisheva et al., 1995), and acute attacks of mental illnesses (Friedman et al., 1963; Rudakov et al., 1984; Persinger, 1987) including epilepsy (Wool, 1976; Persinger and Psych, 1995). The probability and intensity of a mystical experience increase if geomagnetic activity increases by 10–40 nT during high frequency variations of the geomagnetic field (Persinger, 1988b; Booth et al., 2005). It was proposed that biotropic effects of the geomagnetic field are connected with the structure, exposure time, and dose of short-period fluctuations rather than an increase in their intensity alone (Belisheva et al., 1995).

Within local magnetic anomalies, the frequency of mental illnesses is not different from that in adjacent territories where the geomagnetic field is normal (Travkin and Kolesnikov, 1972). However, the frequency of neurosis and the probability of mystical experiences tangibly increase under exposure to a pulsed magnetic field at local magnetic anomalies (Suess and Persinger, 2001).

Lithospheric magnetic anomalies are usually associated with magnetized rocks, such as ore concentrations, magmatic and ore bodies (Gunn and Dentith, 1997). They are also observed within increased permeability zones of the crust (i.e., along lineaments, faults, and at their intersections – Simonenko, 1968), where intense rock fracturing forms favorable conditions for igneous intrusions and fluid penetration (Kerrich, 1986). Intensity fluctuations of the local magnetic field within these anomalies are enhanced during geomagnetic storms (Kutinov and Chistova, 2004). During earthquake preparation processes, the increase of local and regional lithospheric stresses leads to mechanoelectrical phenomena causing electromagnetic fluctuations. In particular, when rocks are mechanically stressed they can cause electric currents due to electron hole charge carriers (Freund et al., 2006, 2007). These phenomena, which have also been explained by piezoelectric and electrokinetic effects (Stacey, 1964; Parkhomenko and Martynov, 1975; Sobolev et al., 1975; Gokhberg et al., 1995), can lead to local low frequency magnetic field fluctuations (up to 200 nT) observed before earthquakes along adjacent faults (Kopytenko et al., 1993; Johnston, 1997; Yen et al., 2004).

Before strong earthquakes (magnitude > 4), electron hole currents in adjacent faults can cause air ionization and corona discharges (St-Laurent et al., 2006) forming earthquake lights (Popov, 1928; Ulomov, 1971; Derr, 1973; Parkhomenko and Martynov, 1975; St-Laurent, 2000). Most likely, these phenomena also include short-lived natural self-luminous objects (SLO – Lunev, 1992; Shitov, 1999), such as luminous balls and fire columns (Section 7.2.3). According to the Derr–Persinger hypothesis (so-called “tectonic strain theory”), SLO formation is connected with the rise of local and regional lithospheric stresses (Persinger, 1976, 1980, 1984a; Derr and Persinger, 1986). SLO are frequently observed near faults and fault-controlled river valleys during minor seismic events (magnitude < 2) days or months ahead of a stronger earthquake. SLO can move along fault lines, probably, due to the redistribution of a lithospheric stress (Persinger and Derr, 1985, 1990a; Derr and Persinger, 1990). That is why SLO can be observed within up to 300 km of an earthquake epicenter (Persinger and Derr, 1990b). Natural and anthropogenic fluctuations of hydrological systems can provoke seismic activity and trigger SLO. Among these hydrological events are seasonal runoff fluctuations (Persinger and Derr, 1990a; Derr and Persinger, 1993), fluid injections into the crust (Derr and Persinger, 1990; Persinger and Derr, 1993), and pit flooding (Suess and Persinger, 2001). Usually, there is a temporal gap of up to several months between a hydrological event and SLO occurrence. The gap depends on the distance between points where hydrological and luminous events occurred. This time is necessary to form and redistribute a lithospheric stress (Derr and Persinger, 1990).

SLO characteristics, such as color, size, luminous intensity, and frequency of occurrences depend on the local geological situation (i.e., rock magnetic susceptibility), the presence of magnetic anomalies, topography (e.g., SLO are often observed above hills), and the proximity of technical objects generating electromagnetic fields (e.g., electric power lines). Geomagnetic storms may increase frequency of occurrences of SLO and their luminosity (Persinger, 1985a).

SLO may induce a mystical experience, probably by their magnetic fields. SLO are known to all cultures, but their interpretation depends on cultural and religious stereotypes of the observers (Persinger, 1976; Weightman, 1996). In particular, well-known appearances of the Virgin Mary above a Coptic Orthodox church in Zeitoun, a district of Cairo, Egypt in 1968–1971 were, most likely, SLO generated by the temporally increased seismic activity in the Red Sea (Derr and Persinger, 1989). In 1992, there were SLO observations at the Greensides' farm near the village of Marmora, Ontario, Canada (Section 4.3.2). They were interpreted as Christ and Virgin Mary appearances. The farm became a Catholic pilgrimage place (Suess and Persinger, 2001). Studies *in situ* demonstrated that these phenomena were caused by (a) the increased regional seismic activity in 1990–1997, and (b) the rise of local lithospheric stresses due to slow flooding of the open pit on the magnetite deposit situated at 2 km from Marmora (Figure 4.4). Pulsed magnetic field variations with periods of 1–7 s and 10–950 nT amplitudes were measured. This may explain reported feelings of deep relaxation and tranquility, even inability to drive a car, near the Greensides' farm (Suess and Persinger, 2001): exposure of the brain to pulsed weak magnetic fields induces an effect similar to the action of opiate drugs (Fleming et al., 1994).

Burke and Halberg (2005) reported striking magnetic discontinuities observed at ancient megaliths (henges, pyramids, mounds, and dolmen) in the Americas, Brittany, and southern England. A detailed magnetometric survey of some early medieval heathen cultic complexes (Scythian mounds) in the Altai Mountains demonstrated that their builders used ore-bearing rocks, which generated magnetic microanomalies (Drachev and Shitov, 2007).

Disturbances of the vegetative nervous system and emotional state were registered during visits to these sites (Voronkov et al., 2006). Probably, one of the forms of the Jerusalem syndrome – spontaneous anxiety, weeping, vocalization, and other unexpected behavior of healthy individuals during visits to Israel (Bar-El et al., 2000) – may also be connected with geological and geophysical characteristics of sacred places in this country.

8.1.3. Statement of the Hypothesis

A periodical occurrence of mystical experiences in particular places on the Earth's surface is familiar to all cultures and religions. Every so often, these places become sacred pilgrimage centers with sanctuaries, temples, and monasteries (Hughes and Swan, 1986; Chamberlain, 2001). Based on the insight described in the previous subsection, the author proposes that the following complex of geological and geophysical factors is important for the sacralization of a place (Florinsky, 2008):

1. Active faults;
2. Local magnetic anomalies;
3. Regional and local lithospheric stresses; and
4. Regional seismic activity.

The author proposes the following cause and effect chain: Along faults and at fault intersections, the crust exhibits increased permeability over geological time scales. This creates conditions conducive to the occurrence of ore concentrations and magmatic bodies generating local magnetic anomalies. Geomagnetic storms modulate the intensity of the geomagnetic field within these anomalies. Before an earthquake, the rise of local and regional lithospheric stress leads to electron hole currents, which also modulate the intensity of local magnetic anomalies and sometimes produce SLO. Local fluctuations of the geomagnetic field and pulsating magnetic fields of SLO influence the brain and can lead to a mystical experience.

All four prerequisite factors are rather stable in time and space. This provides an opportunity to produce repeated mystical experiences at a particular sacred place. Indeed, the spatial distribution of faults is invariant on the time scale of human history. Although the intensities of local and regional magnetic anomalies vary in the course of time, their locations are stable. Likewise, stress fields and regional seismicity vary with time across an active region (Mogi, 1968; Pustovitenko and Kamenobrodsky, 1976), but they can also be considered as invariant factors on the historical time scale.

To test the hypothesis to a first approximation, one should demonstrate that sacred places are predominantly located along fault lines. One should analyze a statistically representative sample of sacred places complying with two requirements. First, the sample should be homogeneous: one cannot mix sacred places of different types, such as parish temples, monasteries, and sanctuaries, in one sample. Second, the sample should be complete for a particular region: no rejection according to "importance" of a sacred place is tolerated since there are no criteria to determine the importance.

One can compose a representative sample of sacred places with monasteries only. It is incorrect to use samples of parish temples or heathen sanctuaries because of two reasons. First, monasteries are usually founded (at least, in the ideal case) by persons with a strong quest to achieve a contact or unity with God (Bratton, 1988), i.e., mystical experience. This quest should dictate a careful selection of a site to erect a monastery considering personal mystical experience of founders as well as the past local experiences and legends. Political, social, and random factors *a priori* played a secondary role in this case as compared with a selection of a site for a parish temple.

Second, monasteries are more recent cultic complexes than heathen sanctuaries. This allows one to obtain the most reliable and complete, documented and/or archaeologically supported data on monasteries for a particular region, as well as to localize them in the field or on a map with minimal errors. In contrast, there is a high probability to miss some unknown ancient heathen sanctuaries.

At a continental scale, Fedorov (2004, 2007) reported that Russian Orthodox monasteries are commonly aligned with transregional faults and lineaments of the East European Plain. For regional and local scales, there are no *scientific* data on relationships between monasteries and geological environment. For any scale, these relationships have never been considered in the context of neurophysiology. In this chapter, the author studies regularities in spatial distribution of monasteries according to their geological and geophysical situation at regional and local scales, as well as explains these regularities in the context of neurophysiological data.

8.2. STUDY AREA

The study is exemplified by a part of the Crimean Peninsula. Geologically and archaeologically, the peninsula has been much studied over the decades. In different historical periods, there were more than 100 monasteries of several denominations distributed over a relatively small area of about 26,000 km^2 (Figure 8.1 and Table 8.1).

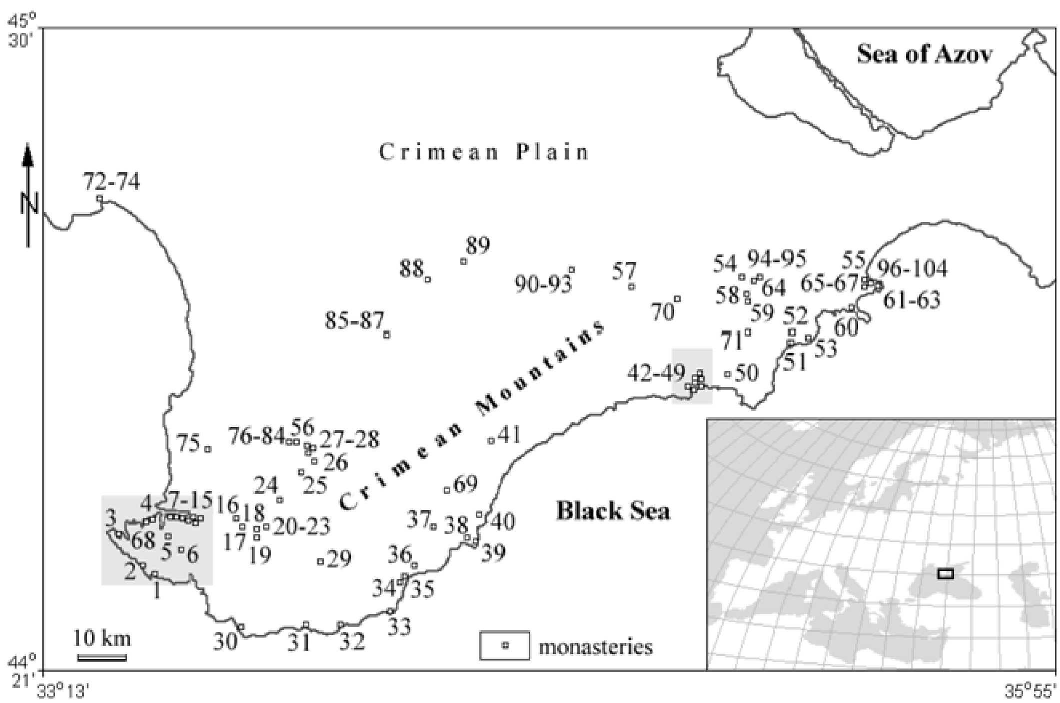

Figure 8.1. The Crimea: monasteries (see Table 8.1 for description and references); two gray areas are represented in detail in Figure 8.3.

Table 8.1. Crimean monasteries (Figure 8.1)

#	Name	Location	Reference
	I. Medieval Byzantine monasteries		
	Vicinity of Chersonese (present-day Sevastopol)		
1	St. George Monastery*	Cape Fiolent	(Tur, 2006, p. 101)
2	Skete	Cape Vinogradny	(Yashaeva, 1994)
3	Monastery	Kazatch Bay, an islet	(Markevich, 1909)
4	Mother of God of Blachernai Monastery	Quarantine Ravine	(Fomin, 2004)
5	Monastery	Sarandinaki Ravine	(Yashaeva, 2006)
6	Skete	Zefir-Koba Cave, Mount Sapoune	(Yashaeva, 1997)
	Vicinity of the Calamita Fortress (present-day Inkerman)		
7	Skete	Trinity Ravine	(Mogarichev, 2005, p. 88)
8	Skete	George Ravine	(Ibid., p. 87)
9	Skete	Inkerman-1 rail station	(Ibid., p. 87)
10	St. Sophia Monastery	Inkerman-1 rail station	(Ibid., p. 86)
11	Monastery	Zagaitan Rock, eastern cliff	(Ibid., p. 84)
12	Monastery	Zagaitan Rock, south-western cliff	(Ibid., p. 83)
13	Skete	Gaitan Ravine	(Ibid., p. 80)
14	St. Clement Monastery*	Monastery Rock, western cliff,	(Ibid., p. 74; Tur, 2006, p. 132)
15	Skete	Martynov Ravine	(Mogarichev, 2005, p. 88)
	Cave towns		
16	Skete	Cherkess-Kermen Ravine	(Mogarichev, 2005, p. 115)
17	Monastery	Chilter-Marmara	(Ibid., p. 89)
18	Monastery	Shuldan	(Ibid., p. 96)
19	New Saviour Skete*	Village of Ternovka	(Yashaeva, 2007)
	Mangoup-Kale:		
20	Monastery	Southern cliff	(Mogarichev, 2005, p. 138)
21	Monastery	South-eastern cliff	(Ibid., p. 135)
22	Monastery	Tabana-Dere Gully	(Ibid., p. 139)
23	Monastery	Teshkli-Burun Cliff	(Ibid., p. 131)
24	Monastery	Chilter-Koba	(Ibid., p. 145)
25	St. Anastasia Skete*	Kachi-Kalyon	(Ibid., p. 150)
26	Monastery	Tepe-Kermen	(Ibid., p. 155)
27	Monastery	South Gate, Chufut-Kale	(Ibid., p. 171)
28	Dormition of the Mother of God Monastery*	Mariam-Dere Ravine, Bakchisarai	(Tur, 2006, p. 117)
29	Monastery	Danillcha-Koba Cave, Village of Sokolinoe	(Republican Committee, 2004)
	South Coast		
30	St. Elijah Monastery	Laspi Bay	(Dombrovsky, 1974)
31	Monastery	Ifigenia Rock, town of Kastropol	(Ibid.)
32	Monastery	Mount Panea, town of Simeiz	(Ibid.)
33	Monastery	Cape Ai-Thodor	(Ibid.)
34	Monastery	Palecur Hill, Yalta	(Ibid.)
35	St. John Monastery	Cape John, Yalta	(Ibid.)

#	Name	Location	Reference
36	Monastery	Cataract, town of Upper Massandra	(Ibid.)
37	Skete	Gurzuf Saddle	(Novichenkova, 1993)
38	Sts. Apostles Monastery (Biyuk-Kastel)	Mount Ayu Dagh	(Dombrovsky, 1974)
39	Monastery	Mount Ayu Dagh, south-eastern slope	(Adaksina, 1997)
40	Monastery	Mount Ai-Thodor, village of Small Mayak	(Dombrovsky, 1974)
41	Monastery	Mount Demerji, foothill	(Ibid.)
	Vicinity of Sugdeya (present-day Sudak):		
42	St. Anastasia Monastery	Anastasia Ravine	(Tur, 2003)
43	Monastery	Mount Sokol, foothill	(Ibid.)
44	Cave monastery	Road Sudak – Novy Svet	(Republican Committee, 2004)
45	St. Dimitri Monastery	Cape Dimitraki	(Baranov, 1984)
46	Monastery	Saddle between Mounts Perchem and Sokol	(Tur, 2003)
47	Monastery	Mount Perchem, summit	(Ibid.)
48	Monastery	Mount Perchem, southern slope	(Baranov, 1994; Tur, 1997)
49	Monastery	Ai-Sava Valley	(Tur, 2003)
50	St. George Monastery	Mount Ai-George	(Aivazovsky, 1844; Farbei, 2002)
51	Monastery	Kordon-Oba Hill, town of Kururtnoe	(Barsamov, 1929)
52	St. George Monastery	Kara Dagh, Koz-Tepe Ridge	(Botscharow, 2001)
53	St. Peter Monastery	Kara Dagh, Mount Svyataya	(Ibid.)
54	St. George Monastery	Mount Agarmysh	(Markevich, 1888)
55	St. Peter Monastery	Theodosia	(Vinogradov, 1884, p. 30)
	II. Medieval Armenian Apostolic monasteries		
56	St. Gregory the Illuminator Monastery	Bakchisarai	(Aibabina, 2004)
57	St. Salvator (St. Elijah) Monastery	Village of Bogatoe	(Jakobson, 1964)
58	Surb-Khach (St. Cross) Monastery	City of Stary Krym	(Dombrovsky and Sidorenko, 1978)
59	St. Stephan (St. George) Monastery	Forest southward from Stary Krym	(Ibid.)
60	St. John the Baptist Monastery	Biyuk-Enishar Ridge	(Aibabina, 2001, p. 157; Botscharow, 2001, Sargsian, 2004a)
61	St. Anton Monastery	Caffa (present-day Theodosia)	(Botscharow, 2000)
62	Mother of God Hamchak Monastery	″	(Botscharow, 2000; Sargsian, 2004a, b)
63	St. Thoros Monastery	″	(Botscharow, 2000)
	III. Medieval Catholic monasteries		
64	Franciscan Monastery	Stary Krym	(Kramarovsky, 1989)
65	St. Nicolaes Monastery	Caffa (present-day Theodosia)	(Sargsian, 2006)
66	St. Menas Monastery	″	(Botscharow, 2000; Sargsian, 2004a)
67	St. George Monastery	″	(Aibabina, 2001)

Table 8.1. (Continued)

#	Name	Location	Reference
	IV. Russian Orthodox monasteries		
68	St. Vladimir Monastery	Sevastopol	(Tur, 2006, p. 92)
69	Sts. Kozma and Damyan Monastery	Crimean Mountain Forest Reserve	(Ibid., p. 152)
70	St. Trinity-Paraskeva Convent at Toply	Village of Uchebnoe	(Ibid., p. 160)
71	St. Stephan of Surozh Monastery at Kiziltash	Town of Krasnokamenka	(Ibid., p. 146)
	V. Muslim tekkes		
72	Shukurla-Efendi Tekke	Gezlev (present-day Eupatoria)	(Zasypkin, 1927; Anokhin and Kutaisov, 2005)
73	Caliph Ahmed-Efendi of Kolech Tekke	″	(Çelebi, 1999)
74	Tekke	″	(Ibid.)
75	Khyzr Shah-Efendi	Village of Efendikoi (present-day Aivovoe)	(Ibid.; Monastyrly, 1890b)
76	Tekke	Bakchisarai, Eski-Ürt	(Monastyrly, 1890b; Bashkirov and Bodaninsky, 1925)
77	Yeshil Jami Tekke	Bakchisarai	(Monastyrly, 1890b; Bodaninsky, 1916)
78	Sulu-Koba Tekke	″	(Monastyrly, 1890b)
79	Sakyz-Khan Tekke	″	(Ibid.)
80	Yer-Utkan Tekke	″	(Ibid.)
81	Khodji-Suleiman Tekke	″	(Ibid.)
82	Kady-Male Tekke	″	(Ibid.; Voloshinov, 1918)
83	Tekke	″	(Çelebi, 1999)
84	Gazy-Mansur Tekke	Mariam-Dere Ravine	(Monastyrly, 1890b)
85	Yeni Jami Tekke	Ak-Mechet (present-day Simferopol)	(Voloshinov, 1918)
86	Muhammed-Efendi Tekke	″	(Çelebi, 1999)
87	Tekke	″	(Ibid.)
88	Tekke	Village of Beshterek (present-day Donskoe)	(Monastyrly, 1890b)
89	Kyrk-Azis Tekke	Village of Litvinenkovo	(Ibid.)
90	Khan Jami Tekke	Kara Sou Bazaar (present-day Belogorsk)	(Monastyrly, 1890b; Zasypkin, 1927)
91–93	Tekkes	″	(Çelebi, 1999)
94	Tahir-Bey Tekke	Eski-Kyrym (present-day Stary Krym)	(Çelebi, 1999)
95	Kemal-Ata Tekke	″	(Smirnov, 1886; Kramarovsky, 1989)
96	Ahmed-Efendi Tekke	Caffa (present-day Theodosia)	(Çelebi, 1999)
97–98	Damad-Efendi Tekkes	″	(Ibid.)
99–104	Tekkes	″	(Ibid.)

* the monastery was resumed by the Russian Orthodox Church.

8.2.1. Monasteries

8.2.1.1. Medieval Byzantine Monasteries

Reasons for and times of foundation of Byzantine (Greek Orthodox) monasteries in the Crimea are still debated. One possibility is that they were founded by monks-iconodules emigrating from Byzantium in the 8th century, in the iconoclastic period (Tur, 2006, p. 27). An alternative proposition is that their foundation was associated with economical and social activity of the local Christian population supported by the Byzantine administration in the 11th–13th centuries (Mogarichev, 2005). Like in other regions, some of the Crimean monasteries were constructed on the locations of heathen sanctuaries. This is certainly known for the skete at Gurzuf Saddle only (Figure 8.1: # 37) (Novichenkova, 1993). The 11th–13th centuries were a golden age of Byzantine monasteries in the Crimea: there were up to sixty monasteries and sketes both in the mountains and on the coast at that time (Figure 8.1 and Table 8.1: # 1–55) (Mogarichev, 2005; Tur, 2006). Most of them were small kinovias for 3–15 monks. A decay of Greek Orthodox monasteries began in the 14th century, after occupation of most of the Crimea by the Golden Horde and Islamization of Tatars. The problem was embellished in 1475, when the Crimean Peninsula was annexed by the Ottoman Empire. Three Greek Orthodox monasteries functioned in the Crimea (Figure 8.1 and Table 8.1: # 1, 28 and 55) by the year 1778, when most Crimean Christians were resettled to the north coast of the Sea of Azov (Tur, 2006, p. 75). Then, only the St. George Monastery functioned (Figure 8.1: # 1). In the mid-19th century, the Russian Orthodox Church (ROC) resumed function of four Byzantine monasteries (Figure 8.1 and Table 8.1: # 14, 19, 25, and 28). However, the Soviet government closed all of them in the 1920s. In the 1990s, the ROC resumed their function (Tur, 2006).

Geographically, one can subdivide the Byzantine monasteries of the Crimea into three groups:

1. Monasteries of the medieval city of Chersonese on the Heraclean Peninsula, and cave monasteries of the Calamita Fortress near the city of Inkerman (Figure 8.1 and Table 8.1: # 1–15);
2. Monasteries of the South-Western Crimean Mountains located in so-called *cave towns*, medieval settlements on cuestas of the Inner Ridge of the Crimean Mountains (Figure 8.1 and Table 8.1: # 16–29);
3. Monasteries of the South Coast, from Cape Aya in the west to Cape St. Elijah on the east (Figure 8.1 and Table 8.1: # 30–55).

Monasteries of Chersonese, Calamita, and cave towns included surface edifices and rock-cut churches, cells, and household premises. Most of rock-cut premises persist today, whereas surface buildings were mainly destroyed. On the South Coast, there were so-called *isars*, a sort of fortified provincial Byzantine monastery, on coastal hill and rock summits. The remains of their foundations persist. The archaeology of most Byzantine monasteries in the Crimea has been extensively studied (Dombrovsky, 1974; Tur, 2003; Mogarichev, 2005).

8.2.1.2. Medieval Armenian Apostolic monasteries

The foundation of Armenian Apostolic monasteries in the Crimea was connected with the mass immigration of Armenians in the 13th–14th centuries caused by wars and general instability in Armenia (Mikaelian, 1974). These monasteries were mainly situated in the southeastern Crimea (Figure 8.1 and Table 8.1: # 56–63). They did not function after most of the Crimean Christians had resettled to the north coast of the Sea of Azov in 1778. Archaeologically, these objects are scantily known in comparison with Byzantine monasteries (Jakobson, 1964; Dombrovsky and Sidorenko, 1978). The Surb-Khach Monastery (Figure 8.1: # 58) is the only Armenian Apostolic monastery in the Crimea remaining in relatively good condition. Remains of some other objects were also investigated, excluding monasteries of the city of Caffa (present-day Theodosia) as at this point they are not correctly localized (Botscharow, 2000).

8.2.1.3. Medieval Catholic Monasteries

Foundation of Catholic monasteries in the Crimea was associated with the existence of Genoese colonies there in the 13th–15th centuries (Starokadomskaya, 1974; Botscharow, 2004) and the Vatican's proselytism (Sargsian, 2006). There were at least four Catholic monasteries (Figure 8.1 and Table 8.1: # 64–67) in the Crimea. Three of them were founded by Armenian Catholics. A church belonging to one of them persists (Figure 8.1: # 67), whereas others were destroyed and cannot be correctly localized. Most likely, these monasteries did not function after 1475, when the Crimea was annexed by the Ottoman Empire.

8.2.1.4. Russian Orthodox monasteries

In the mid-19th century, the ROC resumed function of four Byzantine monasteries (Section 8.2.1.1). Besides these, four new monasteries were founded (Figure 8.1 and Table 8.1: # 68–71). Sites for these monasteries were selected based on their proximity to sacred landscape features, such as rocks and springs, and legends of "miraculous" recoveries in those places (Tur, 2006, p. 86). In the 1920s, the Soviet government closed these monasteries. The ROC resumed their function in the 1990s (Tur, 2006).

8.2.1.5. Muslim tekkes

Tekkes were founded in the Crimea in the 14th century, when members of various Sufi orders, such as Naqshbandi and Suhrawardi, began to visit the peninsula. In the 17th century, there were more than thirty tekkes in the Crimea (Çelebi, 1999) (Figure 8.1 and Table 8.1: # 72–104). One peculiar feature of a tekke was that only a sheikh, the head of an order, lived permanently there. Dervishes traveled nearby or lived with their families, and gathered in the tekke for a relatively short period. The Soviet government closed all of them in the 1920s.

Tekkes are the least known monasteries of the Crimea. In the late 19th – early 20th centuries, there were several attempts to describe them from ethnographic and architectural points of view (Monastyrly, 1890b; Bodaninsky, 1916; Voloshinov, 1918; Zasypkin, 1927). Archaeological studies of tekkes have not been conducted, excluding the only persisting Shukurla-Efendi Tekke in the city of Eupatoria (Figure 8.1: # 72) (Anokhin and Kutaisov, 2005).

8.2.2. Geology

8.2.2.1. General Characteristic

Rather complicated topography and geological setting are typical for the territory under study due to an interaction of the Precambrian East European Platform and the Alpine-Himalayan orogenic belt. It is customary to distinguish three main areas: (a) the Epi-Paleozoic Scythian Plate correlating with the Crimean Plain; (b) the Crimean Meganticlinorium topographically manifested as the Crimean Mountains; and (c) an adjacent foredeep system geomorphologically related to the continental shelf and slope of the Black Sea Basin. One can distinguish several elevated blocks of the Proterozoic folded basement covered by Miocene and Pliocene sediments within the Scythian Plate. The central part of the meganticlinorium – the Main Ridge of the Crimean Mountains – is mainly comprised of Tauric series as well as Middle and Late Jurassic rocks. The Main Ridge and piedmonts include several anticlinoria and synclinoria covered by the Early Cretaceous, Paleogene, and Neogene limestones, clays, and marls (Muratov, 1969).

8.2.2.2. Faults

Two systems of transregional deep mantle faults intersect the Crimean Peninsula:

1. The pre-Riphean approximately north-striking faults of the southern part of the East European Platform crossing the Ukrainian Shield, Scythian Plate, and extending southward to the Anatolian Peninsula; and
2. The Paleozoic approximately east-striking faults separating the Crimean Mountains from the Crimean Plain and the Black Sea Basin (Figure 8.2) (Chekunov et al., 1965; Pustovitenko and Trostnikov, 1977).

Deep mantle fault zones range in width from 15 to 20 km. They include numerous smaller faults (Pustovitenko and Trostnikov, 1977). The latest reactivation of the fault zones 1, 3, and 4 (Figure 8.2) happened in the Mesozoic time, whereas the latest reactivation of the fault zones 2, 5, and 6 (Figure 8.2) – in the Neotectonic age (Borisenko, 1986).

There is a network of deep crustal faults (Figure 8.2) (Borisenko, 1986). Spatial orientation of regional (Figure 8.2) and local (Figure 8.3) faults is generally controlled by deep crustal faults. Faults of three striking directions dominate:

1. Approximately northeast-striking normal and reverse dip-slip faults with vertical displacements of up to several hundred meters;
2. Approximately northwest-striking oblique- and strike-slip faults with horizontal displacements of up to several hundred meters;
3. Approximately north-striking steep sinistral oblique-slip faults with dominant horizontal displacements of up to 5 km (Rastsvetaev, 1977; Borisenko, 1986).

Northeast- and northwest-striking faults probably originated in the Triassic – early Jurassic time. Being reactivated several times, they are currently active (Borisenko, 1986).

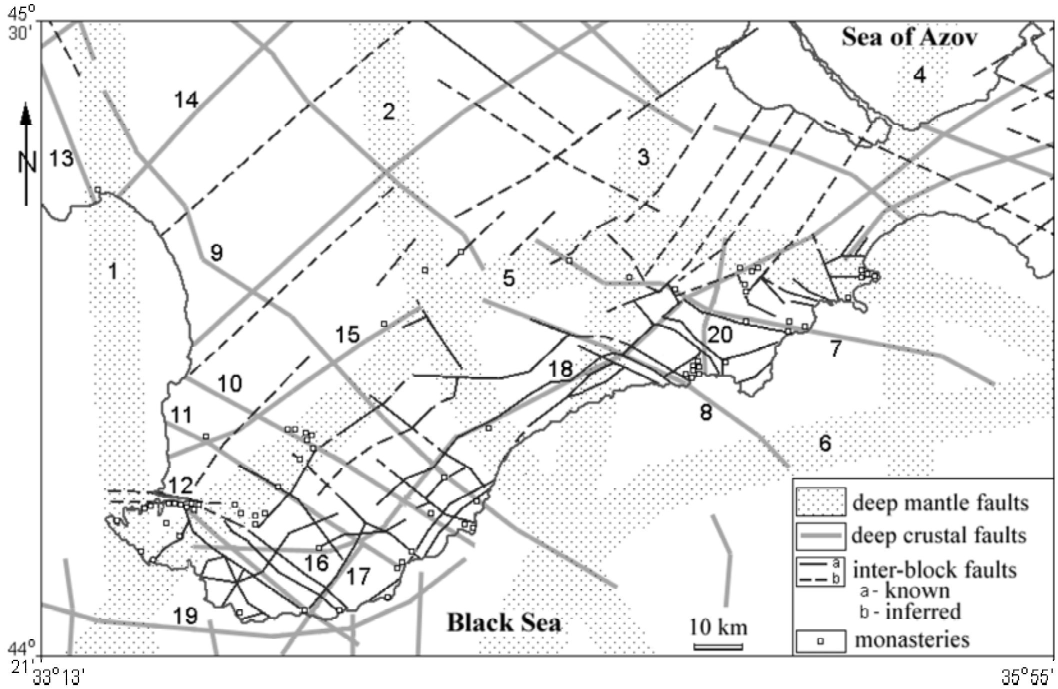

Figure 8.2. The Crimea: faults and monasteries. Deep mantle fault zones: 1 – Eupatoria-Skadovsk zone, 2 – Salgir-Oktyabrskoe zone, 3 – Orekhovo-Pavlograd zone, 4 – Korsak-Theodosia zone, 5 – Foothill Crimean-Caucasian zone, 6 – Central Crimean-Caucasian zone (Chekunov et al., 1965; Lebedev and Orovetsky, 1966; Pustovitenko and Trostnikov, 1977; Borisenko, 1986). Deep crustal faults: 7 – Kara Dagh fault, 8 – Molbai fault, 9 – Kuchuk-Lambad fault, 10 – Gurzuf fault, 11 – Yalta fault, 12 – Chernaya River fault, 13 – Moinaki fault, 14 – Sasyk fault, 15 – Kacha fault, 16 – Belbek fault, 17 – Kastropol fault, 18 – Demerji fault (Borisenko, 1986), 19 – South Coast fault (Pustovitenko and Trostnikov, 1977), 20 – Agarmysh-Sudak fault (Shtengelov, 1980).

8.2.2.3. Seismicity

The Crimea is a seismically hazardous region. VIII degree earthquakes are possible on the South Coast, from Cape Sarych to the city of Sudak, as well as along some deep mantle and crustal faults (Figure 8.4) (Borisenko, 1986).

Most earthquake epicenters (Figure 8.4) are located on the continental slope of the Black Sea Basin, along the length of the Central Crimean-Caucasian deep mantle fault zone (Figure 8.2). Epicenter numbers increase at the intersection of this fault with the Salgir-Oktyabrskoe and Orekhovo-Pavlograd deep mantle faults (Figure 8.2) (Pustovitenko and Trostnikov, 1977; Borisenko, 1986).

In the 20th century, earthquake epicenters migrated from the land southwestward to the abyssal basin with an average velocity of 1 km per year. The reactivation period of seismic processes in the region is about 240 years (Pustovitenko and Kamenobrodsky, 1976). The last strong earthquake measuring 8 on the Richter scale occurred on September 11–12, 1927. Its epicenter was located offshore, about 25 km from the city of Yalta (Voznesensky, 1927; Muratov, 1969, p. 447).

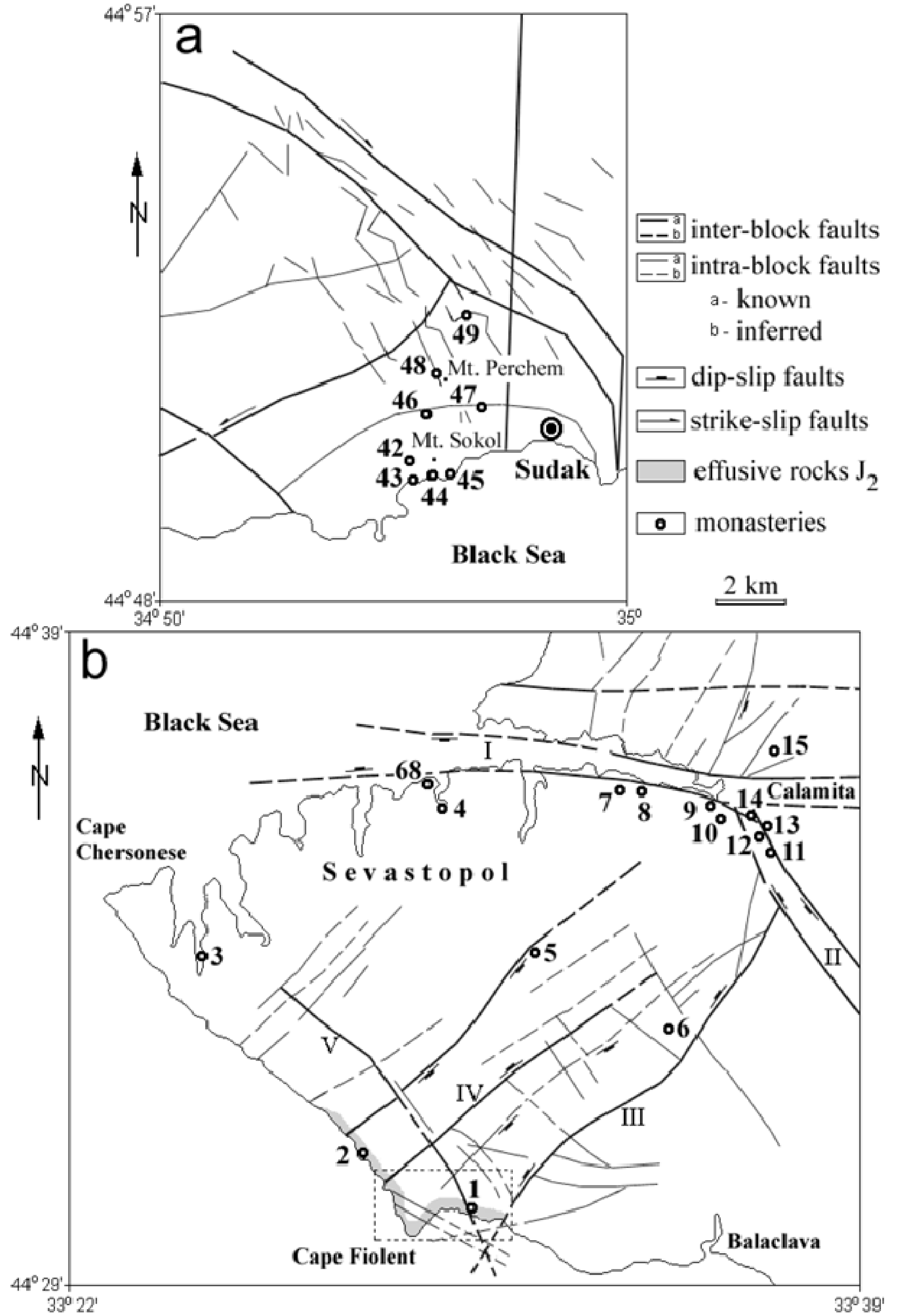

Figure 8.3. Local faults and monasteries: (a) Sudak vicinities (Shtengelov, 1980; Borisenko, 1986; Saintot et al, 1999); (b) the Heraclean Peninsula: I – North Bay graben, II – Chernaya River graben, III – George dip-slip fault, IV – Fiolent dip-slip fault, and V – Monastery dip-slip fault (Borisenko et al., 1982); a framed area is shown in detail in Figure 8.7a. Arabic numerals denote monasteries (Table 8.1).

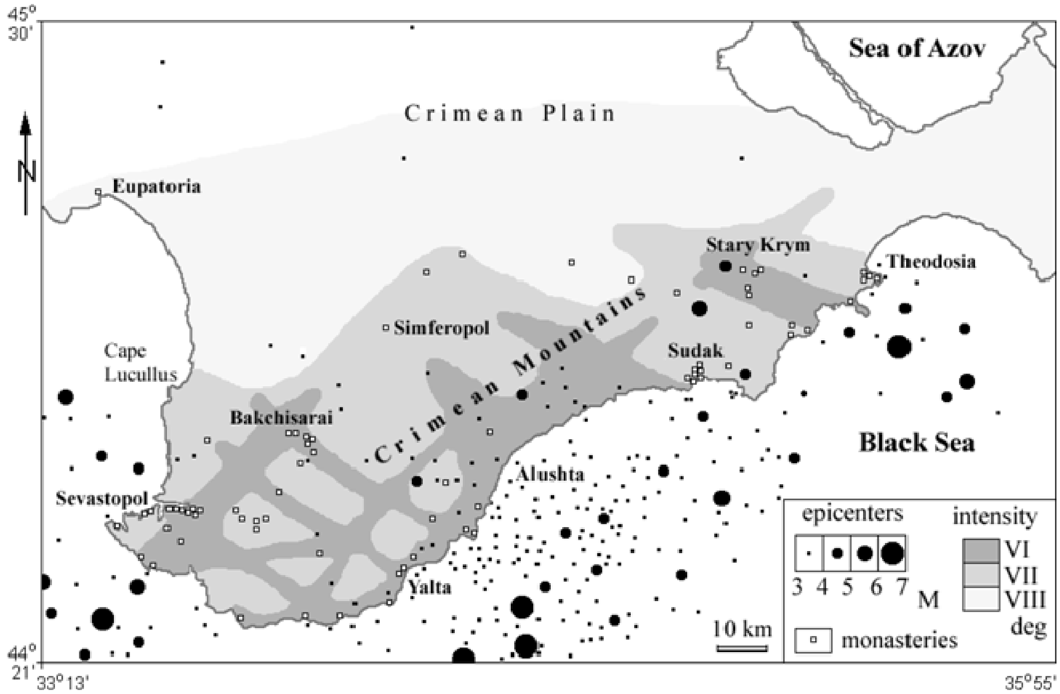

Figure 8.4. The Crimea: earthquake intensity zones (Borisenko, 1986), earthquake epicenters from 63 BC to 1980 (Pustovitenko and Trostnikov, 1977; Borisenko, 1986), and monasteries.

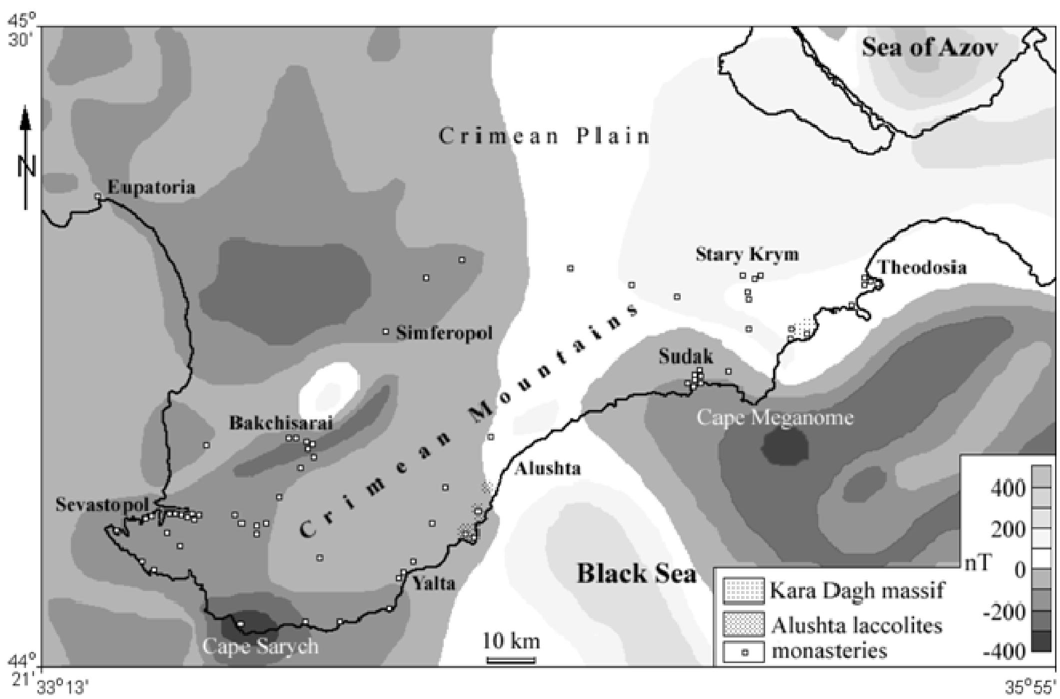

Figure 8.5. The Crimea: regional magnetic anomalies (Makarova, 1974) and monasteries.

8.2.2.4. Geomagnetic Field

Regional magnetic anomalies reflect a distribution of magnetized rocks in the sediment cover and basement (Makarova, 1974). The geomagnetic field intensity is generally decreased in the western Crimea, whereas it is increased in the eastern Crimea (Figure 8.5). The border between the two areas correlates with the Salgir-Oktyabrskoe deep mantle fault zone (Figure 8.2). There is also the large negative regional anomaly with the minimum located offshore, southeastward from Cape Meganome (Figure 8.5).

In the Crimea, local magnetic anomalies correlate with intrusions observed along deep faults (Dvoitchenko, 1928; Lebedev et al., 1963; Avdulov, 1966). Particularly, igneous rocks are marked by the increased content of magnetic components within the Foothill Crimean-Caucasian deep mantle fault zone. Magnetic susceptibility of local intrusive rocks and sediments enclosing them is $126–333 \times 10^{-4}$ and $3.2–8.8 \times 10^{-4}$ SI units, respectively (Lebedev et al., 1963, p. 57). There are also local magnetic anomalies associated with the Kara Dagh volcanic massif and laccolites of the Alushta area (Avdulov, 1966).

8.3. MATERIALS AND METHODS

8.3.1. Monasteries

To produce a monastery sample, the author considered cultic complexes with a monastery status that was documented and/or archaeologically supported (see Table 8.1 for references). This is because in the 19th century, Crimean Tatars used the word “monastery” to refer to remains of all Christian cultic buildings including churches and chapels (Köppen, 1837, p. 12). This led to numerous confusions in the regional and historical literature. As a result, the monastery sample consists of 104 objects (Florinsky, 2008):

- Medieval Byzantine monasteries and sketes, 55 objects;
- Medieval Armenian Apostolic monasteries, 9 objects;
- Medieval Catholic monasteries, 4 objects;
- Russian Orthodox monasteries, 4 objects;
- Muslim tekkes, 33 objects.

Locations of all monasteries were set on medium-scale topographic maps (General Headquarters, 1976–1990). Then, they were used to produce a small-scale map of the Crimean monasteries (Figure 8.1).

The author did not insert four cultic complexes with evident monastery status into the sample:

- St. George Russian Orthodox Monastery at Kartelez near the city of Kerch (a Byzantine monastery resumed by the ROC) (Tur, 2006, p. 142) and a tekke in Kerch (Çelebi, 1999) because they are situated outside of the study area;
- Bishop’s House in the city of Simferopol with the official status of a monastery (Tur, 2006, p. 166) since its administrative purpose is clear;

- St. Trinity Russian Orthodox Convent in Simferopol since it was founded on the basis of a parish church in 2003.

Several objects with questionable monastery status were also not inserted into the sample as follows:

- Caves at the Baksan Ridge in the Crimean Mountains (Ivanov et al., 1963), a settlement at Mount Boika (Dombrovsky, 1968), the cave town of Bakla southward from Simferopol, (Mogarichev, 2005, p. 181); and caves at the Karani and Fedyukhin Heights near Sevastopol (Yashaeva, 1997) because there is no firm evidence of monasteries there;
- St. Basil Monastery in Theodosia (Démidoff, 1855, p. 208) since it was not mentioned in other sources and was not localized;
- Several non-localized monasteries (?) near the villages of Morskoe, Bogatovka, and Shchebetovka (Aivazovsky, 1844).

The author did not consider other types of sacred places:

- *Azises*, viz., tombs of local Muslim saints (Monastyrly, 1890a);
- Sacred landscape features, such as sacred groves, mountains, rocks, springs, and trees (Kovalenko, 2001);
- Classical and early medieval heathen sanctuaries.

8.3.2. Geology

A fault map (Figure 8.2) was compiled using several sources including maps obtained by the interpretation of geological, geophysical, and remotely sensed data (Chekunov et al., 1965; Lebedev and Orovetsky, 1966; Pustovitenko and Trostnikov, 1977; Borisenko, 1986). The map represents faults of three spatial ranges: deep mantle fault zones, deep crustal faults, and inter-block faults. A map of earthquake intensity zones (Figure 8.4) represents results of the regional seismic zonation carried out employing data on spatial distribution of faults, paleoseismic dislocations, seismogravitational phenomena, and archaeological information on earthquake-related damage (Borisenko, 1986). A map of the regional magnetic anomalies (Figure 8.5) was compiled using data from aeromagnetic and hydromagnetic surveys (Makarova, 1974). Large- and medium-scale maps of magnetic anomalies were not available for the Crimea.

The author carried out a comparative analysis of spatial distribution of monasteries (Figure 8.1) relative to faults (Figure 8.2), earthquake intensity zones (Figure 8.4), and regional magnetic anomalies (Figure 8.5). There are two areas marked by an abnormally high number of monasteries: the vicinity of Sudak and the Heraclean Peninsula. These areas are examined in detail (Figure 8.3).

8.4. RESULTS

Let us analyze the distribution of the Crimean monasteries depending on faults (object numbering below corresponds to that in Figure 8.1 and Table 8.1).

There are ten objects running lengthwise with the Kara Dagh fault and attendant inter-block fault (Figure 8.2): three Byzantine monasteries of the Kara Dagh area (# 51–53), two functioning Russian Orthodox monasteries of St. Stephan of Surozh and St. Trinity-Paraskeva (# 71 and 70), St. Salvator Armenian Apostolic Monastery (# 57), and four tekkes of Kara Sou Bazaar (# 90–93). St. Trinity-Paraskeva Convent is located in the junction node of the Kara Dagh fault with three inter-block faults, St. Salvator Monastery is at the intersection of the Kara Dagh fault with the Orekhovo-Pavlograd fault zone, and tekkes are at the intersection of the Kara Dagh fault with an inter-block fault within the Foothill Crimean–Caucasian fault zone.

One of the two areas of the increased number of Byzantine monasteries (# 42–49) encloses slopes of Mounts Perchem and Sokol in proximity to Sudak (Figure 8.3a). The area is located near an inferred offshore intersection of the Molbai and Sudak-Agarmysh faults, and at the intersection of the Sudak-Agarmysh fault with two inter-block faults (Figure 8.2). The area measures 2.5 by 5 km. The average density of monasteries is one object per 1.5 km^2. An analysis of medium-scale maps demonstrated that one-half of the objects are located on intra-block faults (Figure 8.3a).

Remains of a Byzantine monastery (# 40) and the functioning Russian Orthodox Monastery of Sts. Kozma and Damyan (# 69) are located on the Kuchuk-Lambad fault (Figure 8.2), at its intersection with inter-block faults. There are fourteen objects along the Gurzuf fault (Figure 8.2): the skete at Gurzuf Saddle (# 37), a monastery of Tepe-Kermen (# 26) at the intersection with an inter-block fault, and monasteries of the city of Bakchisarai (# 27, 28, 56, and 76–84) at the intersection with the Foothill Crimean-Caucasian fault zone. On the Yalta fault (Figure 8.2), there are remains of two Byzantine monasteries (# 34 and 35), Chilter-Koba monastery (# 24) at the intersection with an inter-block fault, and a tekke (# 75) at the intersection with the Kacha fault. There is a monastery in Danillcha-Koba Cave (# 29) at the intersection of the Belbek fault with an inter-block fault (Figure 8.2).

There are ten objects along the Chernaya River fault (Figure 8.2): remains of a Byzantine monastery at Ifigenia Rock (# 31) are placed at the intersection with the Kastropol fault and two inter-block faults, whereas the area of the increased number of Byzantine monasteries near the Calamita Fortress (# 7–15) is located at the junction node of the North Bay and Chernaya River grabens (Figure 8.3b). The area size and monastery density are the same as in the vicinity of Sudak (see above). Objects 11–14 are close to the east side of the Chernaya River graben, whereas objects 7–10 are to the south side of the North Bay graben. Nearby, there are the Byzantine Monastery of the Mother of God of Blachernai and the Russian Orthodox Monastery of St. Vladimir (# 4 and 68).

Three tekkes of Ak-Mechet (# 85–87) are situated on the Kacha fault (Figure 8.2). Three tekkes in Gezlev (# 72–74) are located at the intersection of the Moinaki and Sasyk faults within the Eupatoria-Skadovsk fault zone. There are five objects along the Demerji fault (Figure 8.2): two tekkes of the city of Stary Krym (# 94 and 95), two Byzantine monasteries (# 41 and 54), and a Franciscan monastery (# 64).

St. Cross Armenian Apostolic Monastery (# 58) and the Byzantine monasteries of Kachi-Kalyon, Mangoup-Kale, Simeiz, and Ayu Dagh (# 25, 19–23, 32, 38, and 39) are set at inter-block faults. St. Stephan Armenian Apostolic Monastery (# 59) and two Byzantine monasteries (# 36 and 50) are located at junction nodes of inter-block faults. Monasteries of Theodosia (# 55, 60–63, 65–67, and 96–104) are situated within the Foothill Crimean-Caucasian fault zone, near its intersection with the Korsak-Theodosia fault zone (Figure 8.2). Several monasteries of the Heraclean Peninsula (# 1–6) are located at the Eupatoria-Skadovsk and Foothill Crimean-Caucasian fault zones (Figure 8.2), in proximity to their intersection. St. George Monastery and a Byzantine monastery in Sarandinaki Ravine (# 1 and 5) are placed on inter-block faults (Figure 8.3b). Monasteries of the cave towns of Tepe-Kermen, Chilter-Marmara, and Shuldan (# 16–18) are located within the Foothill Crimean-Caucasian fault zone, whereas a tekke in Beshterek (# 88) is set within the Salgir-Oktyabrskoe fault zone.

Thus, almost all Crimean monasteries are situated on fault lines of various ranges or at their intersections (Figures 8.2 and 8.6a). The analysis of the spatial distribution of monasteries relative to the earthquake intensity zones and the regional magnetic anomalies demonstrated that most objects are located within the VII–VIII degree zones (Figures 8.4 and 8.6b), whereas about 70% of monasteries are placed within negative magnetic anomalies of the South-Western Crimea and the Meganome Peninsula (Figures 8.5 and 8.6c).

8.5. Discussion

8.5.1. Faults, Magnetic Anomalies, and Monasteries

There is no preferential dependence of monastery location on a particular strike orientation or kinematic characteristic of faults. Contrary to expectations, there is also no preferential relation between monasteries and fault intersections (Figure 8.6a). Favorable conditions for fluid migration and ore formation exist in these sites due to more intensive rock fracturing in comparison to faults (Kutina, 1969; Fedorov et al., 1989; Florinsky, 2000). Earthquake epicenters frequently occur within fault intersections (Gelfand et al., 1972). At a continental scale, spatial distribution of dynamically developing cities correlates with fault intersections, probably because of increased geophysical activity observed there (Skvortsov, 1991; Zhidkov et al., 1999), which can provoke systematic progressive changes in human group behavior (Section 4.3.1).

Thus, it is not clear why a particular monastery is located at a specific point of a fault. Secondary factors are obviously important in the selection of a site to erect a monastery, such as relative remoteness, availability of water, soil, and forest resources for monastery life and manufacturing.

The selection of a specific point may be connected with the existence of a local magnetic anomaly there. Available geophysical data shows that three Byzantine monasteries (# 51–53) are placed near the local magnetic anomaly (Avdulov, 1966) of the Jurassic volcanic massif of Kara Dagh (Muratov, 1969, p. 308). Byzantine monasteries of Mounts Ayu Dagh and Ai-Thodor (# 38–40) are located at the late Triassic – early Jurassic gabbro-diabase intrusive massives (laccolites) in proximity to Alushta (Muratov, 1969, p. 331) (Figure 8.5). A

Byzantine monastery at Kartelez in the vicinity of Kerch (Tur, 2006, p. 142), located 50 km east of the study area, is placed near the Kartelez iron ore deposit (Muratov, 1974, p. 72).

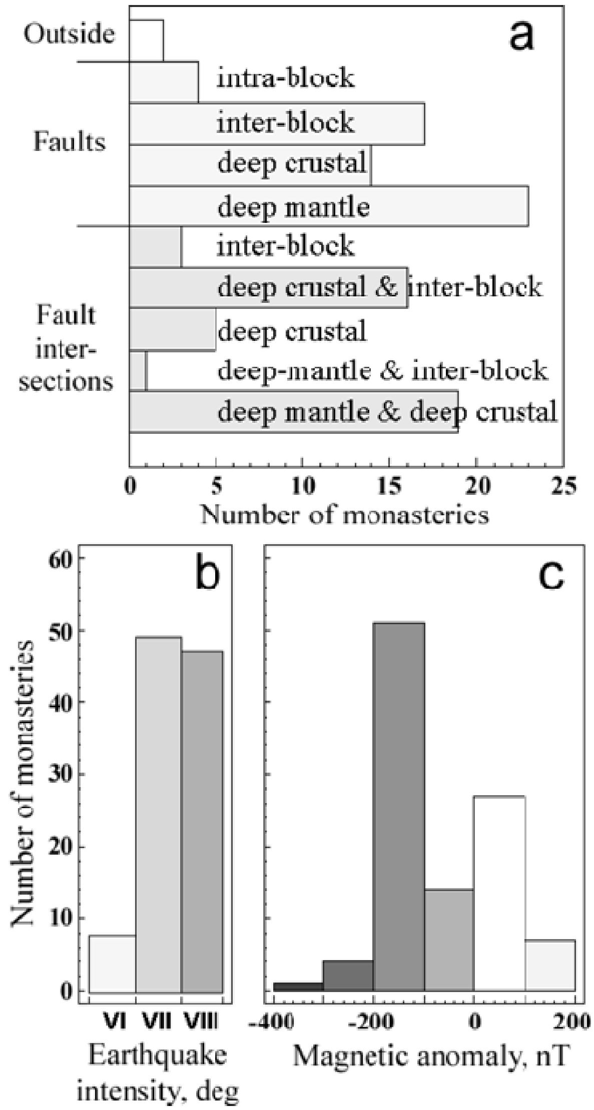

Figure 8.6. Distribution of monasteries depending to (a) faults and fault intersections; (b) earthquake intensity zone; (c) regional magnetic anomalies.

It is intriguing that one of the two areas of increased density of Byzantine monasteries (Figure 8.3b: # 7–15) is located around a hill with the medieval fortress of Calamita, which is also known as Kalamita (the vicinity of the present-day Inkerman – Mogarichev, 2005, p. 68). Kalamita is usually translated as *Reeded* (Greek: κάλαμος – reed), as the Chernaya River is reeded there. However, researchers are aware of the name of this fortress from medieval Italian nautical charts. *Calamita* means “magnet” in some Romance languages including Italian. This word is used as a toponym for areas known for iron ores (e.g., there are iron deposits and mines at the Calamita Peninsula, Elba Island – Benvenuti et al., 2004). Were there iron mines near the Crimean Calamita in the Middle Ages? The author has no archaeological or historical evidence. Are there sediments with an increased content of magnetic components in Inkerman's vicinities? There are generally Neogene oolitic limestones and Paleogene marls and clays there (Borisenko, 2001). The lack of detailed maps of magnetic anomalies hinders a verification of this proposal.

The author calls the reader's attention to the location of the majority of monasteries within negative regional anomalies of the geomagnetic field (Figure 8.6c). One may speculate that stronger mystical experience could occur at local magnetic anomalies against a background of a decreased regional geomagnetic field during a magnetic field pulsation (a contrast effect).

The role of active faults in the selection of a place for a monastery makes itself evident in the junction of the North Bay and Chernaya River grabens, nearby the Calamita Fortress (Figure 8.3b). There is an Upper Quaternary paleoseismic dislocation there associated with a dip-slip fault bounding the North Bay graben on the north (Borisenko et al., 1982). Catastrophic movements caused by an extremely strong earthquake have generated the dislocation. The fault is recently active: a railway tunnel was damaged there during the 1927 Crimean earthquake (Borisenko, 1986). One of the two areas of increased numbers of Byzantine monasteries is located precisely there (Figure 8.3b: # 7–15).

St. George Monastery at Cape Fiolent (Figure 8.7a) exemplifies the combined role of geological and geophysical factors in the sacralization of landscape features and origination of pilgrimage places. According to the official legend of the ROC (Berthier-Delagard, 1910), Greek fishermen were caught by a heavy storm in the sea nearby Cape Fiolent in the year 891. The storm drove their ship toward sea rocks. Suddenly, they noticed Saint George the Conqueror within a fiery column on top of a sea rock. Immediately afterwards the storm subsided. The rescued crew climbed the rock, and found an icon of St. George there. In memory of this event, a monastery was founded on the steep rocky cliff (Figure 8.7b), and the cross was installed on St. Appearance Rock at a distance of 100 m from the beach (Figure 8.7c).

The author supposes that the legend describes the SLO observation and a related mystical experience. Indeed, there are intensive striped magnetic anomalies ranging from 1,200 to -800 nT on the shelf between Cape Chersonese and the city of Balaclava (Figure 8.3b) (Gorodnitsky et al., 1967). Intrusive bodies associated with faults probably caused them. The cliffs are composed of effusive rocks (Figure 8.3b) with an increased content of magnetic components (Pechersky et al., 1991). There are several intra- and inter-block faults on the land in proximity to St. George Monastery (Figure 8.3b) (Borisenko et al., 1982). It is possible that there are offshore extensions of the faults and a complex offshore node of their intersection or junction at a distance of 1 km from the monastery (Figure 8.3b).

The seismicity is apparent for this territory (Figure 8.4). Variations of the geomagnetic field have been recorded during earthquakes in the Crimea (Dvoitchenko, 1928). Earthquake lights have also been observed there. During the 1927 Crimean earthquake, there were reports of large fiery flares erupting from the Black Sea about 40 km offshore between Sevastopol and Cape Lucullus (Voznesensky, 1927; Popov, 1928).

It is known that SLO are often observed above hills (Persinger, 1976, 1984a). In the case of the St. George's appearance near Cape Fiolent, SLO probably formed in the sea at the fault intersection, whereas St. Appearance Rock played the role of a hill.

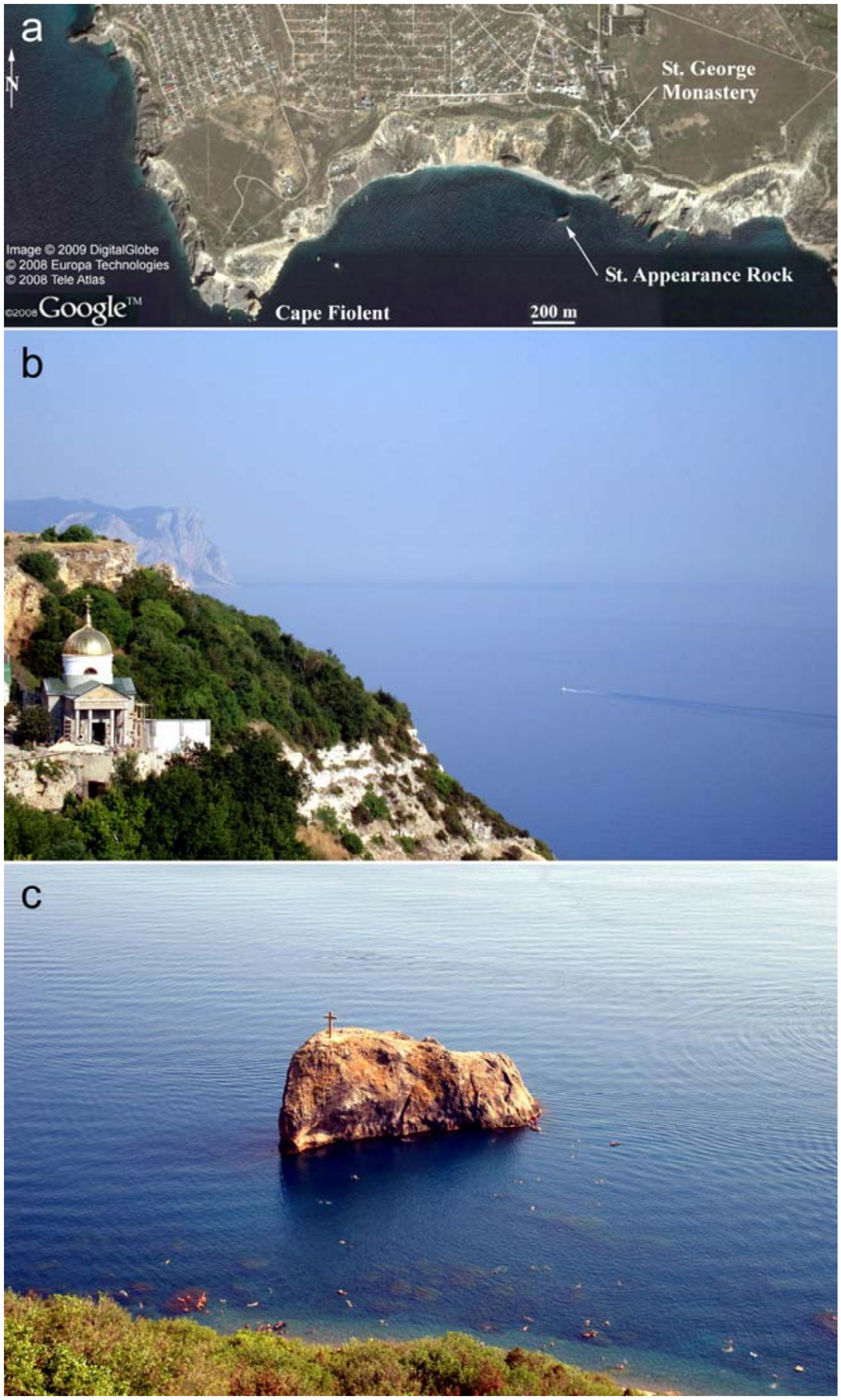

Figure 8.7. St. George Monastery at Cape Fiolent: (a) a remotely sensed image mosaic of the area; (b) a monastery church; (c) St. Appearance Rock (44º30'06" N, 33º30'31" E). Photos by Elizaveta Vershinina.

To avoid misunderstanding, the author should note several obvious facts. First, the foundation and functioning of monasteries depend not only on natural, but on social and political factors as well. Thus, the increased number of monasteries near Chersonese (Figure 8.3b), Sugdeya (present-day Sudak – Figure 8.3a), Caffa, and Bakchisarai (Figure 8.1) was also associated with political, religious, and administrative importance of these medieval cities. The Islamization of the Crimean Greeks and Tatars has caused the decay of Byzantine monasteries and concurrent foundation of tekkes. In the mid-19th century, there was a political necessity to re-Christianize the Crimea to integrate it into Russian life. This was the main reason to reactivate some medieval monasteries and to found new ones (Tur, 2006, p. 191). Ideological issues were the key factors for both the closing of monasteries by the Soviet government and their resuming in the post-Soviet era. Second, aside from mystical or religious motivations, there may be other reasons to become a monk. For example, the mass escape of Byzantine men to monasteries in the 7th century (the monk number is estimated at 100,000 persons) was economically motivated (Tur, 2006, p. 21). Third, sacralization of the landscape can be provoked by not only pulsed magnetic fields, but other environmental agents as well. For example, geothermal springs, usually located at fault zones, have been used by Native Americans as a sacred place (Lund, 1996) due to well known healing effects of thermal waters associated with their chemical and gaseous composition (Section 3.4.1). Finally, some sacred places may be selected without regard for geological setting, but maybe because particular persons had, say, biochemically induced *unio mystica* there (e.g., taking hallucinogenic plants, mushrooms, or drugs – La Barre, 1979; Dobkin de Rios and Janiger, 2003; Partridge, 2003; Griffiths et al., 2006). However, all these factors may be considered as secondary in the selection of the site for a monastery.

8.5.2. Mystical Experience and Human Health

Natural and artificial magnetic fields can influence all functional systems of the human organism (Persinger et al., 1973; Dubrov, 1978; Zhadin, 2001; Palmer et al., 2006) (Section 4.2). However, magnetic fields manifest their biotropic properties in narrow frequency and amplitude ranges (Adey, 1980; Raevskaya, 1988). The influence of magnetic fields can be both positive and negative depending on the intensity, frequency, exposure time, radiation source location, and individual health condition (Persinger et al., 1973; Andronova et al., 1982; Raevskaya, 1988; Markov, 2007). Therefore, it is hard to say if visits to sacred places are healthy for an average person. In particular, it is known that an SLO may induce a range of temporary dysfunctions, acute and chronic diseases, and death, depending on the SLO observation time and energetic characteristics and the distance between the SLO and an observer (Persinger, 1983a, 1988a; Bisson and Persinger, 1993; Shitov, 1999; Suess and Persinger, 2001). This is connected with a potential pathogenic influence of electromagnetic fields (Yakovleva, 1973; Marino and Becker, 1977; Raevskaya, 1988). Besides, there are fluid and gas emanations and geochemical anomalies along faults, lineaments, and at their intersections due to increased permeability of the crust (Kasimov et al., 1978; Trifonov and Karakhanian, 2004; King et al., 2006). On the one hand, such geochemical anomalies can cause temporary dysfunctions and chronic diseases of various nosologies (Persinger, 1987; Melnikov et al., 1994) (Section 3.3; Chapter 6). On the other, sources of healing geological products (e.g., mineral and thermal waters and muds) are also connected with active faults and local geochemical anomalies (Section 3.4).

It is also hard to say if a mystical experience is good for somatic or mental health. There is a stereotype that any mystical experience can improve the general condition of any individual (Levin and Steele, 2005; Lange and Thalbourne, 2007). However, a strong mystical experience can lead to mental and somatic injuries (Boiko, 2001). Probably, the relative metabolic level of brain hemispheres is the key factor responsible for positive or negative psychosomatic effects of a mystical experience (Persinger, 1993b). The possibility of the occurrence of mystical experience increases under the metabolic asymmetry of the brain. This is typical for persons with (a) a dominant right hemisphere, such as right-handed females and left-handers (Persinger and Richards, 1991; Tiller and Persinger, 1994); (b) changes in the structural symmetry of the brain due to injuries (Persinger, 1994); (c) decreased metabolism of the left prefrontal cortex during chronic depression; (d) temporarily decreased activity of the left hemisphere during drowsiness, hypnagogic states, and distress (Persinger and Healey, 2002); and (e) systematic meditative experience (Persinger, 1992). The intensity of mystical experience depends on the lateralization level of mental processes: it can be higher for right-handed men and lower for right-handed females and left-handers (Persinger, 2003). Emotional valence of mystical experience also depends on the lateralization of metabolic processes: pleasant emotions dominate under the increased metabolism of the left hemisphere (Persinger, 1993b, 1994).

The main problem is a trend towards increased frequency of the mystical experience (Persinger, 1993b). One can see a similarity to epilepsy developing from a pathological focus to an epileptic focus, and finally to the epileptic brain; or from repeated single seizures to periodical ones, and finally to the generalization of the disease (Chubinidze and Chubinidze, 1982). During prolonged increased activity of the right hemisphere, frequent mystical experiences lead to the increased expression of the adrenocorticotropic hormone, general immune deficiency, cell immune dysfunctions, and finally oncological diseases. During prolonged increased activity of the left hemisphere, frequent mystical experiences lead to increased immune reaction, activation of lymphocyte expression, and finally autoimmune diseases (Persinger, 1993b).

It is pertinent to recall some rules of traditional Yoga. First, a disciple is instructed to practice techniques triggering mystical experience after comprehensive preparation of the body and mind with special practices (Swami Satyananda Saraswati, 1989; Boiko, 2001). The preparation usually takes no less than five years. There are similar requirements in Sufism (Mekerova, 2005). Second, the aim of some yogic methods, specifically pranayama (breathing exercises), is the creation of equilibrium in the activity of the right and left hemispheres (Swami Satyananda Saraswati, 1989).

This seems contrary to a stereotype of “the healing power” of sacred places. However, one should consider that pilgrims usually spend a short time in monasteries or at adjacent territories: from several hours to several days. As noted above, mystical experiences can lead to the intensive immune reaction under the increased activity of the left hemisphere. This may explain recoveries of non-autoimmune patients after strong religious experiences or visits to sacred places (Persinger, 1993b). Another mechanism can explain “miraculous” recoveries of persons suffering from chronic or incurable autoimmune diseases: A nocturnal exposure of the extremely low frequency pulsed weak magnetic fields (7 Hz, 25–50 nT) for several consequent nights may suppress a hyperactive immune system and hence relieve an autoimmune illness (Cook and Persinger, 2000; Cook et al., 2000). Thus, the exposure time or dose of the pulsed magnetic fields is probably a key factor responsible for positive or negative somatic effects of visits to sacred places. Besides, recoveries can be associated with well known therapeutic effects of mineral and thermal water springs (Petraccia et al., 2006) (Section 3.4.1), which are commonly located at monasteries and other sacred places. Finally, one should also consider the possibility of the placebo effect.

As for persons permanently living in monasteries, it is known that an individual usually ceases to care about personal health after obtaining a mystical experience. This may explain a rather short life and death from oncological and autoimmune diseases typical for some famous mystics, such as Sri Ramakrishna and Swami Vivekananda (Rolland, 1929, 1930). It seems that the concept of hormesis – low-dose stimulation and high-dose suppression of a living organism by the same external agent (Calabrese, 1994, 2008) – can be used to interpret such contradictory effects of sacred places.

8.5.3. Geomagnetic Activity, Altered States of Consciousness, and "Paranormal" Skills

It is known that monks, persons who previously had mystical experiences, and people practicing psychological techniques (e.g., meditation) may possess some "paranormal" abilities, such as telepathy, remote viewing, and other poorly understood phenomena.

Mystical experience results from microseizures in the deep structures of the right temporal lobe (Section 8.1.1). Data from electroencephalography, magnetic resonance imaging, and photon emission tomography demonstrated that other forms of altered states of consciousness, achieved by meditation, religious rites, and hypnosis, have other neurophysiological correlates (Lou et al., 1999; Azari et al., 2001; Dietrich, 2003; Previc, 2006; Lutz et al., 2004). They may involve large cortical areas and deep brain structures. Moreover, different neurophysiological correlates may be activated in different phases of a psychological technique. The same holds true for "paranormal" abilities. For example, a remote viewing phenomenon (Puthoff and Targ, 1974) is associated with the activity of the parietal and occipital cortex (Persinger et al., 2002; Roll et al., 2002). Near-death experiences are speculatively linked to a number of brain structures (Greyson, 2006).

Different types of altered states of consciousness and extrasensory skills are differently stimulated by geomagnetic activity. Like mystical experiences, autoscopy (Brugger et al., 1997) is more probable during periods of the increased geomagnetic activity (Persinger, 1995). Regularities of telepathic skills, such as the forecast of crises, sudden illnesses, and death of relatives and friends, are more complex. A long-term forecast (in a period of several hours or days) does not depend on geomagnetic activity. A short-term forecast (in a matter of minutes) is more probable during decreased geomagnetic activity. A sudden awareness about a death 3–4 days after the event is more probable during increased geomagnetic activity (Persinger, 1985b, 1993a; Schaut and Persinger, 1985). These might testify to a preferential influence of different frequencies or frequency patterns of the geomagnetic field on neurophysiological correlates of the phenomena mentioned. This would be in agreement with the "window effect", the phenomenon of the preferential biotropy of narrow frequency and amplitude ranges of magnetic fields (Adey, 1980; Raevskaya, 1988; Kleimenova et al., 2007).

8.6. Conclusion

The author proposed the hypothesis that the complex of geological and geophysical factors is of importance for the selection of a sacred place: regional and local active faults, local magnetic anomalies, regional and local lithospheric stresses, and regional seismic activity (Florinsky, 2008). The following cause and effect chain is assumed: Along faults and at fault intersections, the crust exhibits increased permeability over geological time scales. This creates conditions conducive to the development of ore concentrations and magmatic bodies generating local magnetic anomalies. Geomagnetic storms modulate the intensity of the geomagnetic field within these anomalies. Before an earthquake, the rise of local and regional lithospheric stress leads to electron hole currents, which also modulate the intensity of local magnetic anomalies and sometimes produce SLO. Local fluctuations of the geomagnetic field and pulsating magnetic fields of SLO influence the brain and can lead to a mystical experience.

The analysis of the statistically representative sample of sacred places and geological and geophysical data lent some credence to this view. Almost all Crimean monasteries are located along faults of various ranges or at their intersections. Most monasteries are placed within earthquake intensity zones of VII–VIII degrees as well as within regions with decreased regional geomagnetic intensity.

Geologically, the Mountain Crimea may be considered as a relatively typical portion of the Alpine–Himalayan collision belt (Trifonov et al., 2002) (Figures 9.10 and 9.12). Therefore, the author supposes that his hypothesis can be applied to almost any part of this vast territory, and the obtained results can be reproduced in other tectonically active regions of the world. For example, the pillar, on which Saint Simeon the Stylite lived for about 40 years, as well as the St. Simeon Monastery near Aleppo, Syria are located on one of the seismically active branches of the St. Simeon fault (Karakhanian et al., 2008). However, many ancient monasteries are situated within platforms (Fedorov, 2004, 2007), which are relatively stable terrains. In this case, applicability of the hypothesis requires a special investigation.

The lack of large-scale data on the geomagnetic field did not allow us to compare spatial distribution of monasteries with local magnetic anomalies. This is a subject of further research. Statistically representative, synchronous geophysical, biochemical, biophysical, and neurophysiological measurements *in situ* would be useful to furnish insights into mechanisms of the occurrence of mystical experience under exposure of naturally pulsed magnetic fields as well as psychosomatic variations caused by mystical experience.

Researchers of neurophysiological roots of mystical experience have repeatedly stressed that results of their studies cannot support or demolish a hypothesis for the existence of God (D'Aquili and Newberg, 1993; Ashbrook, 1996; Saver and Rabin, 1997). This note also relates to the chapter.

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