3) unidentified (Ti-hematite?) iron oxide, formed within the disintegrating detritic chlorite and biotite grains.

The detrital hematite (with small content of Ti) is a primary magnetic mineral contained inside the rock. This is a good candidate for being a carrier of the Devonian component of NRM. Unidentified iron oxides (Ti-hematite?) can be responsible for the Permo-Carboniferous remagnetization. Authigenic, pure hematite crystals (1—2 µm size) occurring in the ferruginous cement of sandstones are the main source of SIRM but majority of grains does not carry any stable component of NRM.

Lessons of recent strong earthquakes in the world for Ukraine

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Experience of catastrophic earthquakes that occurred one after another in Haiti (12/01/2010, with Mw=7.0) and in Chile (01/12/2010 with Mw=7.0), makes seismologists to re-evaluate their effects and to compare the situation with the seismic protection in these countries with the situation in Ukraine. Both earthquakes are confined to the powerful seismically active zone of the planet. Earthquake in Haiti occurred within a seismically active zone associated with the zone of collision of the Caribbean plate with the South America plate. An earthquake near Chile — with the feat of the Nazca plate under the South American continental plate [http://upload.wikimedia ..., 2010]. In both cases, the earthquake occurred in areas where strong seismic events is not uncommon, which made seismologists and leadership of both countries in advance to shape up for strong earthquakes.

Unfortunately, from a comparison of maps of general seismic zoning (GSZ) of the territory of Haiti [http://neic.usgs …, 2010] and maps of macroseismic manifestations of the 01/12/2010 earthquake [http://earthquake.usgs …, 2010], the intensity of seismic manifestations of the earthquake was, in fact, higher than predicted by seismologists to map of the Haiti GSZ. The level of projected acceleration of seismic vibrations on the map, which, with probability 90 % will not be exceeded over the next 50 years, corresponds to the average acceleration of seismic vibrations in the 7-balls earthquake. In fact, during the 12/01/2010 earthquake in the Port-au-Prince capital city of Haiti were observed 9 balls macroseismic effects (on 12 point scale). Clearly, projected onto the 7-ball impact homes and buildings could not remain 9-balls intact. As a result, the main shock and several hundreds of aftershocks have killed more than 280 thousand people, several million people lost their homes and jobs. According to the Inter-American Development Bank's the losses caused by the earthquake could reach 14 billion dollars [http://www.rbc.ua/rus …, 2010]. In addition, the experience of similar past disasters is well known that after their income level of the population is reduced on average by 30 %, despite the assistance provided by the international community.

The earthquake near the coast of Chile, was much more powerful, but according to official information, the number of his victims was much lower (780 person), primarily because the country for many years considerable attention devote for earthquake-protection design and construction, as well as for the protection from tsunamis. Especially intensive, this work is carried out after the 22/05/1960 quake with Mw=9.5, which is considered as the strongest since 1900, when the registration of seismic events in the world have been widely used the instrumental techniques.

Comparison of the earthquakes effects in Haiti and Venezuela shows the importance of properly assessing the level of Seismic risk of the sites of existing and planned buildings and structures. Adopted at this time in the world the concept of seismic protection includes the need for protection from earthquakes by each investor, owner and developer who are building houses and industrial buildings in seismic zones. At the same time, it should be noted that self-investors, owners and developers are unable to obtain the seismological information about the magnitude of the parameters of the maximum seismic effects, which with a given probability of exceeding can be realized at the site of the existing or projected development, and is needed for its seismic protection. This task must be decided by the State.

In particular, the Ministry of Regional Policy and the building of Ukrainian together with the National Academy of Sciences have developed and introduced into operation at 2007, State Building Codes B.1.1:12-2006 “Building in seismic regions of Ukraine” [State …, 2006], where in Appendix A, the table of communities with specification of seismic shaking projected intensity, and in Appendix B — the general seismic zoning maps, which shows the predicted intensity of seismic shaking on a MSK-64 macroseismic scale, which is likely 90, 95 and 99 percent will not be exceeded over the next 50 years. In the main text of this document the provides rules for the use of seismic data as well as rules for the protection of structures and buildings in the different seismic conditions [State …, 2006].

The territory of Ukraine to the south and southwest is comprehended by the influence of powerful seismically active zone of the planet, which resulted from the collision of large tectonic plates: Eurasian, African, Arabian and Indian. The belt stretches from the Azores through the Mediterranean and Black Sea, Caucasus, Central Asia and further to the Hindu Kush, Tibet — the island of Sumatra, and further south, where it connects with the Pacific planetary seismically active zone. Influence from this zone extends to the western regions of Ukraine, Bukovina, south-western part of the Odessa region, south of Mykolaiv, Kherson, Zaporozhye regions and the territory of Crimea. The belt includes the Carpathian arc with strong subcrustal earthquakes in the Vrancea area, which in the past 5 times shaken not only the territory of Ukraine, but even Moscow and St. Petersburg. Earthquakes in the territory of Ukraine were in the past, recorded by seismic stations and are felt by the people at present and, unfortunately, will be in the future.

Seismic risk in Ukraine is high also because of insufficient knowledge of local seismicity and the understatement of the real seismic hazard assessment regulatory by document SNIP-II-7-81 "Building in seismic areas" [Seismic …, 1980], which operated in Ukraine until 2007. Determination of the real parameters of seismic hazard requires instrumental seismological observations of the local seismic activity and of the powerful remote seismic events.

In the conditions of increasing anthropogenic loads and a significant depreciation of fixed assets in Ukraine the risks associated with the hazardous effects of earthquakes significantly increased, which, in turn, increases the level of technological risk in different sectors of the economy. Accompanied by faults, landslides, mudflows, tsunamis and other hazards, earthquakes can cause considerable material and social consequences.

In recent years, with a sufficiently short time intervals, there were a catastrophic earthquake (12.05.2008 in China with Mw=7.8; 05.10.2008 in Kyrgyzstan with Mw=6.6; 06.04.2009 in Italy with Mw=6.3; 13.01.2010 at the Haitian with Mw=7.0; 26.02.2010 in Japan with Mw=7.2, 27.02.2010 in Chile with Mw=8.8; 04.03.2010 in Taiwan with Mw=6.4 etc.), which led to deaths and huge financial losses. In most cases, the destruction of structures and buildings is due to underestimation of the real seismic hazard of areas. In turn, destroyed the house killing, maiming and causing man-made disasters. Losses from earthquakes can be substantially reduced with appropriate technical and organizational preparations for them. Properly determining the level of seismic hazard and its inclusion could to avoid casualties and material losses minimized.

In preparation for future earthquakes in the Ukraine it is current the studies of the seismic resistance of existing buildings and structures in areas where the real seismic hazard on the new seismic GSM-2004 maps [State …, 2006] proved to be higher than specified on the regulatory CP-78 map [Seismic …, 1980] current up to 2007. The input data should serve on observations of local and teleseismic earthquakes at seismic stations located in the studied areas, or as close as possible to them.

The world's modern science-based concept of effective seismic protection include: the identification of quantitative parameters of real seismic hazard and risk reducing, the vulnerability of populated areas by improving the seismic resistance of existing buildings and structures, development and implementation of earthquake-resistant construction norms that meet the real seismic hazards, monitoring of seismic design and regular maintenance of buildings and facilities, raising awareness by education and training, early warning of the emergence of a strong earthquake and rapid response, rehabilitation victim populations and areas; insurance against the effects of earthquakes.

Experience in the field of seismic protection of such developed countries as Japan, USA, Canada, France, Italy and others, shows that the basis of seismic protection in Ukraine should be the introduction of earthquake-resistant design and construction of housing and industrial facilities on the basis of objective knowledge about the quantitative parameters of real seismic hazard in their areas of deployment and on concrete construction sites. Knowledge of the real seismic hazard, along with reliable data on the seismic vulnerability of structures is necessary for earthquake resistant design and develop measures to reduce the seismic risk. The main link, which provides objective data for activities of protection against earthquakes, are seismic observations.

S. I. Subbotina Institute of Geophysics of NAS provides activity of a seismic stations network, which actually performs the role of the national seismological network for providing information for all seismic protection works. The network provides standardized data on seismic manifestations on the territory of Ukraine. On these data the evidence-based forecasts of seismic hazard values are determined. It is necessary for central and local authorities to ensure the stable development of the seismic regions, as well as for the research institutes of other ministries and agencies working in related industries of earthquake-resistant design and construction.

Results of seismic observations are widely used in solving problems in key directions of fundamental research of IGPh of NAS: the study of the tectonics, structure, geodynamics, and evolution of continental and oceanic lithosphere; construction three-dimensional integrated geophysical and petrophysical models of geological structures in order to predict mineral development and introduction of new technological systems for processing and interpreting geophysical data; geophysical studies of the environment in order to predict seismic hazards and other threats to natural phenomena. Geodynamic processes that are constantly changing stress-strain state of geological environment, not only in seismically active zones, but as it is now scientifically proven, in the territories of ancient platforms of planet, requires permanent monitoring tools.

The integration of seismic and other geophysical studies can learn communication geophysical fields with the preparation of strong earthquakes sources.

Conclusion. Earthquake-resistant design and development of anti-seismic measures require knowledge of the quantitative parameters of the real seismic hazard and seismic data on the vulnerability of structures. The main link supplying objective data for activities to protect against earthquakes are seismological observation.

To obtain reliable baseline data is necessary to ensure the further expansion (increase in the number and uniformity of the distribution) network of seismic stations and its reequipment by modern equipment and software.

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Melt segregation and matrix compaction: closed governing equation set, numerical models, applications

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Partially molten systems are commonly modeled as an interpenetrating flow of two viscous liquids and are therefore described in terms of fluid mechanics [Drew, 1983; McKenzie, 1984; Nigmatulin, 1990]. In the gravitational field a liquid filling a viscous permeable porous matrix is in mechanical equilibrium only if its pressure gradient is equal to the hydrostatic one, and the pressures of the liquid and matrix are the same. If the liquid and matrix densities differ, with the liquid forming an interconnected network, the two conditions cannot be satisfied simultaneously, and the liquid segregates from the matrix while the latter compacts. The averaged momentum and mass conservation equations for a multi-phase medium are formulated separately for every phase. Considering the energy conservation